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Baby's First 10 Words

Twila Tardif
University of Michigan

Paul Fletcher
University College Cork

Weilan Liang and Zhixiang Zhang
Peking University First Hospital

Niko Kaciroti
University of Michigan

Virginia A. Marchman
Stanford University

Although there has been much debate over the content of children's first words, few large sample studies address this question for children at the very earliest stages of word learning. The authors report data from comparable samples of 265 English-, 336 Putonghua- (Mandarin), and 369 Cantonese-speaking 8- to 16-month-old infants whose caregivers completed MacArthur-Bates Communicative Development Inventories and reported them to produce between 1 and 10 words. Analyses of individual words indicated striking commonalities in the first words that children learn. However, substantive cross-linguistic differences appeared in the relative prevalence of common nouns, people terms, and verbs as well as in the probability that children produced even one of these word types when they had a total of 1–3, 4–6, or 7–10 words in their vocabularies. These data document cross-linguistic differences in the types of words produced even at the earliest stages of vocabulary learning and underscore the importance of parental input and cross-linguistic/cross-cultural variations in children's early word-learning.

Keywords: vocabulary acquisition, infants, Chinese, English

Current research on children's first words has focused on what categories of words children produce, with debate centered around whether they exhibit a noun bias in early speech. On the one hand, authors who argue for the noun bias as a conceptually driven and innate predisposition toward learning the names for objects, people, and animals (e.g., Gentner, 1982; Gentner & Boroditsky, 2001; Gillette, Gleitman, Gleitman, & Lederer, 1999; Gleitman, & Gleitman, 1994) suggest that this bias ought to be universally present at the earliest stages of vocabulary learning. One view (Gentner & Boroditsky, 2001) argues that proper and concrete object nouns are earliest in acquisition because they are mapped onto perceptual categories of "individuable" concepts. Words that map onto less individuable concepts, such as relational naming systems, actions, and spatial relations, are said to be harder to learn and acquired later because they require more linguistic knowledge for children to make appropriate mappings. Other views (e.g., Golinkoff, Mervis, & Hirsh-Pasek, 1994; Markman, 1987; Waxman & Booth, 2003) propose that count nouns and/or proper names should be easiest and earliest in acquisition because initial assumptions (e.g., the whole object assumption) about the potential mappings of a word map well onto countable, bounded objects, rather than parts of objects, ill-formed masses of material (e.g., water), substances (e.g., plastic), or other concepts. Under both of these views, it is assumed that nouns (referring to people, animals, and objects) must be learned first before children can begin to develop words to express relations, properties, and other meanings (see Hollich et al., 2000).

However, there are a number of issues that render these accounts problematic as universal explanations for children's early word learning. First, the cross-linguistic evidence on this is mixed, with some studies finding clear evidence of a noun bias in early vocabularies in English as well as in Korean and Italian (Au, Dapretto, & Song, 1994; Caselli et al., 1995; Gentner, 1982; Kim, McGregor, & Thompson, 2000; Nelson, 1973). Other studies do not find evidence of a noun bias, even in English as well as in languages as diverse as French, German, Korean, Mandarin, and Tzeltal Mayan (Bassano, 2000; L. Bloom, Tinker, & Margulis, 1993; Brown, 1998; Choi & Gopnik, 1995; Kauschke & Hofmeister, 2002;

Twila Tardif, Department of Psychology and Center for Human Growth and Development, University of Michigan; Paul Fletcher, Department of Speech and Hearing Sciences, University College Cork, Cork, Ireland; Weilan Liang, Department of Children's Care, Peking University First Hospital, Beijing, China; Zhixiang Zhang, Department of Pediatrics, Peking University First Hospital; Niko Kaciroti, Center for Human Growth and Development, University of Michigan; Virginia A. Marchman, Department of Psychology, Stanford University.

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Correspondence concerning this article should be addressed to Twila Tardif, Center for Human Growth and Development, 300 North Ingalls, 10th Floor, Ann Arbor, MI 48109-0406. E-mail: twila@umich.edu

Nelson, Hampson, & Shaw, 1993; Tardif, 1996; Tardif, Gelman, & Xu, 1999), suggesting that the composition of early vocabularies is less a function of conceptual biases and more attributable to structural features of the language and characteristics of child-directed speech. Finally, yet other studies have found evidence for a noun bias across languages but only in later stages of vocabulary learning (i.e., after the first 50 words; Bornstein et al., 2004).

A second issue with the conceptual bias accounts and the assumption of a universal noun bias in early vocabularies is that important distinctions between common and proper nouns as well as distinctions between objects, animals, and people are conflated. We argue, based on perceptual, conceptual, syntactic, pragmatic, and neuropsychological distinctions across various nominal categories and the fundamental divisions that even young infants make between people and other types of objects and animates in the world (P. Bloom & Markson, 2001; Bushnell, 2003; Guajardo & Woodward, 2004; Hall, Lee, & Bélanger, 2001; Katz, Baker, & Macnamara, 1974; Legerstee, 1991; Semenza & Zettin, 1989), that it is important to be very careful in comparing categories of nouns across languages. Specifically, we propose that it is important to compare apples with oranges but that one should not lump common objects together with the perceptually, syntactically, and pragmatically salient category of people, particularly for children acquiring their first words. The distinction between people, animals, and objects is of particular importance and a dividing point in many theories. It is this distinction, in particular, that we feel needs to be elaborated when examining the composition of children's early vocabularies. On the one hand, people and animals may appear to be similar in that they are highly individuable (e.g., capable of self-directed motion, parts stay together while moving; cf. Gentner & Boroditsky, 2001) and, particularly in the case of household pets, can often be referred to by a proper name. On the other hand, animal terms like *cat* and *dog* are syntactically treated as common nouns, refer to a category of individuals rather than a particular individual, and, unlike terms for people, often refer to inert objects (stuffed toys, pictures) rather than the real animals themselves. Moreover, there are likely to be strong cultural differences in terms of the role of animals versus people in day-to-day life, as well as in the politeness and naming conventions that are associated with people. In Chinese culture, as in many other cultures, it is extremely important for even barely verbal children to address others properly—not by *hi* or a proper name, as is the case in English, but by role-appropriate kinship terms, regardless of whether there is a true kin relationship between individuals (Blum, 1997; Sandel, 2002; Stafford, 1995). Thus, Chinese children are expected to know multiple kinship terms early and address even unknown individuals by the appropriate term (e.g., *a1yi2,* or *auntie*, for an unfamiliar adult of mother's age; *jie3jie*, or *older sister*, for a female child who is older than the infant; and *di4di4*, or *younger brother*, for a male child who is younger). In English, not only are there relatively fewer kinship terms (e.g., only one word for *sister* versus two in Chinese; one word for *aunt* or *cousin* versus numerous terms depending on maternal/paternal side and age/status/generation relative to one's mother/father and self), but English-speaking children are also not expected to use kinship terms as address terms for unfamiliar individuals (see also Sandel, 2002).

Thus, looking across languages at children's earliest words, both in terms of their categories as well as the words themselves, is critical for answering questions about universals in early development and in answering fundamental questions about the relative role of conceptual versus social/pragmatic and cultural factors in early word learning. Moreover, most studies have not explicitly examined variations in vocabulary composition as a function of vocabulary size (but see Bornstein et al., 2004; Caselli et al., 1995; Kauschke & Hofmeister, 2002). Instead, research on this topic has focused primarily on children with 100 or more words, even though the largest divergence in theories is about children's very first words (Gentner & Boroditsky, 2001, Hollich et al., 2000, and others all make strong developmental claims about people and object terms first, followed by relational and action terms later). Nonetheless, aside from diary studies of individual children (e.g., Chen, 1925/1983; Clark, 1993; Dromi, 1987; Ingram, 1974; Leopold, 1939), little research has been conducted on children's very first words, for example, children who have 10 words or fewer in their vocabularies.

Nelson's (1973) naturalistic study of 18 English-speaking children and Kauschke and Hofmeister's (2002) study of 32 German-speaking children serve as important exceptions to this. In Nelson's study, regardless of whether children were expressive or referential in style, children learned nouns in their early vocabularies but of a particular kind. According to Nelson (1973), children at the earliest stages of vocabulary learning:

> do not learn the names of things in the house or outside that are simply "there" whether these are tables, plates, towels, grass, or stores. With very few exceptions all the words listed are terms applying to manipulable or movable objects. (p. 31)

On the other hand, Kauschke and Hofmeister's (2002) study of 32 German-speaking infants found a large preponderance of relational predicates (like *oben* [*up*] and *wieder* [*again*]) and social terms (e.g., *hallo* [*hi*] and *nein* [*no*]) in the earliest recordings (13 and 15 months), followed by larger proportions of nouns (including both proper and common nouns) and then verbs and other parts of speech at later recordings (21 and 36 months).

Nonetheless, even these studies found it difficult to capture large numbers of children at the very earliest stages of vocabulary production. Thus, it will be important to examine the very first words that children learn across different languages with larger samples of children and to examine this with respect to the particular categories and specific words that are learned. Are, for instance, the nouns that are learned by children speaking different languages the same types of words—primarily objects—or does the linguistic term *noun* obscure both the similarities and differences that exist across languages? Nonetheless, it is difficult to gather clear data on the earliest words for large numbers of children, as children acquire their first words in a brief window of time and the actual timing of this window varies enormously across children.

We address these issues in a unique sample of caregiver reports on 970 children learning one of three languages: American English, Mandarin Chinese (Putonghua), or Cantonese Chinese. Children in our study were selected from large norming samples of the MacArthur-Bates Communicative Development Inventories (CDIs; Fenson et al., 1993) in each language and include only those children who were reported to have 1 to 10 words in their production vocabularies.

Table 1
Age, Gender, and Vocabulary Size Distribution for Children in Each Sample

Variable	United States (n = 265)	Hong Kong (n = 369)	Beijing (n = 336)	Comparison statistics
Mean age in months	11.31 (2.12)	11.61 (2.38)	11.43 (2.16)	$F(2, 967) = 1.40$
% girls	48.7	48.2	44.6	$\chi^2(2, N = 970) = ns$
Mean of mother and father education[a]	3.48 (0.96)	2.58 (0.85)	2.61 (0.94)	$F(2, 964) = 90.09^{**}$
Mean total words	3.86 (2.34)	3.86 (2.40)	4.34 (2.59)	$F(2, 967) = 3.75^{*}$

Note. Standard deviations are in parentheses.
* $p < .05$. ** $p < .01$, with post-hoc Tukey's showing U.S. sample had significantly higher education levels than the two Chinese samples as would be expected from general demographic information across these locations.
[a] Because of differences in educational systems across the three locations the following scale was used for all three locations: 1 = less than high school certification (<12 years in Beijing and United States; <11 years [Form 5] in Hong Kong); 2 = high school certification; 3 = some college or post-high school technical college; 4 = 4-year-college graduation (BA, BSc, etc.); 5 = post-bachelor's education (MA, PhD, etc.).

Thus, with large numbers of children in each language and different approaches to analyzing the data (by children, by items), we are able to ask the following questions:

1. Do children exhibit word class biases in their first 10 words?
2. How variable are these words within a language?
3. How variable are these words across languages?

Method

Participants and Procedure

The data include children from the CDI Words and Gestures norming samples in the United States, Hong Kong, and Beijing, whose parents indicated that their child can say[1] a total of 1–10 words. In all three locations, children were screened for a number of medical exclusion criteria (i.e., full-term, healthy births, normal hearing) and selected from families whose parents were native speakers of the relevant language (English, Putonghua, or Cantonese). Details of the norming studies for English can be found in Fenson et al. (1993) and in Tardif et al. (2008, in press) for Putonghua and Cantonese. The only major difference in the administration of the English and Chinese versions of the CDI was that the U.S. questionnaires were mailed to the parents and self-administered, whereas the Chinese questionnaires (Putonghua CDI and Cantonese CDI) were administered in an interview format by trained research assistants.

The U.S. norming sample included 659 children from 8 to 16 months, and the subset of children used in this article included the 265 children who were reported to say between 1 and 10 words. The Beijing norming sample included 638 8- to 16-month-old children, and this article reports data from the 336 who were reported to say between 1 and 10 words. The Hong Kong norming sample also included 638 8- to 16-month-olds, and this manuscript includes the 369 children reported to say between 1 and 10 words. Further details of the samples can be found in Table 1. In addition, the Beijing children were 99% only children because of government policies, whereas the Hong Kong and U.S. samples had 49 and 51% firstborn or only children, respectively.

Vocabulary Questionnaires

MacArthur-Bates CDI. The MacArthur-Bates CDI was developed from observational and laboratory studies in children's early language. The Words and Gestures form used in this study is designed for use with 8- to 16-month-olds, who are most likely to be at the earliest stages of producing words. This form consists of 396 words, divided into 20 semantic categories, as listed in Table 2.

PCDI and CCDI. The Putonghua and Cantonese CDIs were developed from the English CDI and multiple studies of Putonghua- and Cantonese-speaking children's language. Adaptations were made to respect cultural and linguistic differences between English and Chinese and across the two Chinese locations. In total, 20 categories with 411 words appeared on the Putonghua CDI, and 19 categories with 388 words appeared on the Cantonese CDI. As much as possible, we tried to keep numbers of words within each semantic category consistent with English. Table 2 presents a comparison table with the numbers and percentages of words in each of the CDI categories across languages as well as the collapsed CDI categories, in boldface, used in our analyses.

Results

The first set of analyses was aimed at summarizing, for individual children, the most common categories of words in the first 10 words, as well as addressing whether there were variations in these categories across languages or for children who had different numbers of words in their vocabularies. Given that we were particularly interested in cross-cultural comparisons of person terms as opposed to concrete common nouns and other types of words, we collapsed across several CDI categories to form a common noun category (including animals, vehicles, toys, food/drink, clothing, body parts, household items, furniture and rooms, outside things/places) and a closed class category (time words, pronouns, question words, numerals and quantifiers/classifiers) but used the sounds, games and routines, people, verbs, and descriptive words categories as they appeared on the CDI. This is similar to strategies used by Caselli et al. (1995) and Kauschke and Hofmeister (2002), as well as others (e.g., Bornstein et al., 2004; Gentner, 1982; Nelson, 1973; Tardif, 1996), although it reflects

[1] Note that in all three versions of the CDI parents were explicitly instructed to include only words that children said spontaneously, even if they were not perfectly pronounced, and not to include immediate repetitions of a caregiver prompt. In the Putonghua and Cantonese samples, interviewers were trained to specifically probe parents to make sure that the words reported were truly spontaneous productions rather than repetitions.

Table 2
Numbers of Words on CDI Forms, by Language (With Percentage of Total in Parentheses)

Category on CDI	English	Putonghua (Mandarin)	Cantonese
Sound effects	**12 (.03)**	**11 (.03)**	**13 (.03)**
Animals	36	33	25
Vehicles	9	9	11
Toys	8	8	9
Food & drink	30	29	29
Clothing	19	15	12
Body parts	20	18	21
Furniture and rooms	24	19	20
Small household items	36	35	34
Outside things/places	27	22	21
Common nouns (sum)	**209 (.53)**	**188 (.46)**	**182 (.47)**
People	**20 (.05)**	**26 (.06)**	**24 (.06)**
Games and routines	**19 (.05)**	**22 (.05)**	**25 (.06)**
Action words	**55 (.14)**	**78 (.19)**	**64 (.16)**
Time words	8	6	6
Descriptive words	**37 (.09)**	**44 (.11)**	**45 (.12)**
Pronouns	11	7	8
Question words	6	6	5
Prepositions and locations	11	11	9
Numerals and quantifiers	8	6	8
Classifiers	N/A	6	
Total closed class (sum)	**44 (.11)**	**42 (.10)**	**36 (.09)**
Total items	396	411	389

Note. Boldface indicates collapsed CDI categories. CDI = MacArthur-Bates Communicative Development Inventories.

our particular interest in examining the noun category more carefully, particularly as it applies to people versus other types of nominals.

CDI Categories Across Languages

As can be seen in Tables 3 and 4, there are both similarities and differences in the words that children were reported to produce in their first 10 words. In a repeated measures analysis of variance, with language, gender, and parental education (see note for Table 1) as between-subjects variables, word type showed a significant main effect, $F(6, 5616) = 60.88$, $p < .01$, $\eta^2 = .06$. Across all three languages, most of the words children were reported to produce fell into the people and sounds/sound effects categories, with the fewest words in the adjectives and closed class categories.

Table 4
Rank-Ordered Top 20 Words for Children Who Can Say 1–10 Words on CDI and Percentage of Children Producing Them, by Language

United States ($n = 264$)	Hong Kong ($n = 367$)	Beijing ($n = 336$)
Daddy (54)	**Daddy (54)**	**Mommy (87)**
Mommy (50)	*Aah (60)*	**Daddy (85)**
BaaBaa (33)	**Mommy (57)**	*Grandma—Paternal (40)*
Bye (25)	*YumYum (36)*	*Grandpa—Paternal (17)*
Hi (24)	*Sister—Older (21)*	**Hello?/Wei? (14)**
UhOh (20)	**UhOh (Aiyou) (20)**	*Hit (12)*
Grr (16)	*Hit (18)*	Uncle—Paternal (11)
Bottle (13)	**Hello?/Wei? (13)**	Grab/Grasp (9)
YumYum (13)	Milk (13)	*Auntie—Maternal (8)*
Dog (12)	Naughty (8)	**Bye (8)**
No (12)	*Brother—Older (7)*	**UhOh (Aiyou) (7)**
WoofWoof (11)	*Grandma—Maternal (6)*	*Ya/Wow (7)*
Vroom (11)	*Grandma—Paternal (6)*	*Sister—Older (7)*
Kitty (10)	**Bye (5)**	**WoofWoof (7)**
Ball (10)	Bread (5)	*Brother—Older (6)*
Baby (7)	*Auntie—Maternal (4)*	Hug/Hold (6)
Duck (6)	*Ball (4)*	Light (4)
Cat (5)	*Grandpa—Paternal (4)*	*Grandma—Maternal (3)*
Ouch (5)	Car (3)	Egg (3)
Banana (3)	**WoofWoof (2)**	*Vroom (3)*

Note. All words were translated into English equivalents where possible. Boldface indicates the word is common across all three languages. Italics indicates commonality across two languages.

As can be seen from Table 3, however, there were significant differences in the relative ordering of common nouns, verbs, and routines, with a significant Language × Word Type interaction, $F(12, 5616) = 54.04$, $p < .01$, $\eta^2 = .10$. Specifically, English-speaking children were reported to produce many more words that fell into the common nouns category ($M = 19.4\%$) than verbs ($M = 0.7\%$), whereas Putonghua-speaking children were reported to produce twice as many verbs ($M = 7.0\%$) as common nouns ($M = 3.2\%$), and Cantonese-speaking children roughly equal numbers of common nouns ($M = 5.7\%$) and verbs ($M = 4.8\%$). However, even the English-speaking children were reported to produce just as many games and routines words as common nouns. Interestingly, neither gender nor parental education (mother's, father's, or average of mother's and father's education) had effects on word type. This was true in the total sample, as well as for the within-sample analyses.

Table 3
Mean Percentages (With Standard Deviations in Parentheses) of Words in Total Vocabulary by CDI Category for Each Location

CDI category	United States ($n = 264$)	Hong Kong ($n = 367$)	Beijing ($n = 336$)	Total ($N = 970$)
People	29.9 (30.5)^{a}	43.1 (31.1)^{a}	77.7 (28.2)^{a}	51.5 (35.8)^{a}
Sounds	29.5 (32.2)^{a}	40.6 (33.2)^{a}	8.7 (17.9)^{b}	26.6 (31.6)^{b}
Common nouns	19.4 (26.2)^{b}	5.7 (13.2)^{b}	3.2 (10.1)^{c}	8.5 (18.2)^{c}
Games and routines	15.8 (22.0)^{b}	3.4 (10.9)^{b}	2.3 (8.7)^{c,d}	6.4 (15.4)^{c,d}
Verbs	0.7 (4.3)^{c}	4.8 (12.7)^{b}	7.0 (16.8)^{b}	4.4 (13.0)^{d}
Adjectives	1.3 (8.2)^{c}	2.2 (8.1)^{c}	0.7 (4.6)^{d,e}	1.4 (7.1)^{e}
Closed class	3.3 (13.3)^{c}	0.2 (2.0)^{c}	0.4 (3.8)^{e}	1.1 (7.5)^{e}

Note. CDI = MacArthur-Bates Communicative Development Inventories. Means with different superscripts within a column are significantly different from each other at $p < .05$ or less.

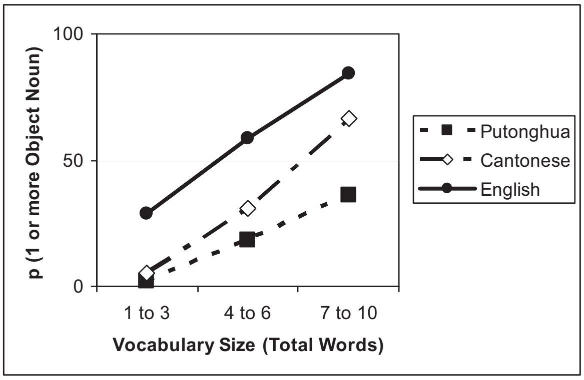

Figure 1. Probability of one or more common object nouns in child's total vocabulary, by language and vocabulary size.

Nonetheless, even though we restricted our sample to children who were reported to produce only 1–10 words, there was a Word Type × Vocabulary Size interaction, $F(54, 5616) = 3.96, p < .05, \eta^2 = .04$, and a significant three-way interaction between word type, vocabulary size, and language, $F(12, 5616) = 2.26, p < .05, \eta^2 = .04$. This interaction intrigued us and suggested further analysis of at least some of these categories across children with different vocabulary sizes across cultures.

Probability of Saying a Common Noun or a Verb Across Languages and Vocabulary Size

Given the interactions with vocabulary size, the differences in mean vocabulary size across the populations (see Table 1), and the fact that a difference in one word type for a child who produced only two words represented 50% of the vocabulary, versus a 10% change for a child who was reported to produce 10 words, we decided to narrow our focus to children within a much narrower range of vocabularies. Thus, in the following analyses, we examine, separately, children who could be described as producing only first words (those reported to produce only 1–3 words), those who were reported to produce only a few words (4–6), and those who were reported to produce more than just a few words (7–10) but who were still at a very early stage of vocabulary development. In addition, for these analyses, we chose to use log-linear modeling procedures to estimate the probability that a child within a relatively more homogenous vocabulary size group (1–3, 4–6, or 7–10 words) would be reported to produce a particular word type. Since we are predicting only whether the child is reported to produce the word type (a binomial outcome, treating one instance of the word type the same as multiple instances), we avoid the problem of our earlier analyses when a single token increase resulted in very different proportions depending on the child's total vocabulary size. Although we could have also used chi-square analyses to examine differences in the numbers of children in each group by language, the log-linear analyses allowed us, additionally, to compute odds ratios (ORs) and critically test the strength of the relationship, to control for the observed education differences across our samples, and to compute the probabilities that children would be reported to produce one or more word falling into each of the categories of interest for each vocabulary size group, which are potentially more meaningful than simply acknowledging that the groups differ (see Agresti, 2002, Green, 1988, and von Eye & Schuster, 2000, for helpful discussions of log-linear analyses and ORs vs. chi-squared analyses in developmental research).

Finally, although it was possible to analyze across all seven categories of words, these would not be independent analyses as the greater the likelihood of one category, particularly for the smallest vocabulary size group, the smaller the likelihood of the other categories. Thus, we chose to focus on the three categories of greatest interest to us theoretically and which also showed the most dramatic differences in the proportional analyses above: people terms, common object nouns, and verbs.

Despite a strong cross-linguistic difference in the number of people terms that appeared overall, children in all three groups were highly likely to produce one or more people terms by the time they had 7–10 words in their vocabulary. Putonghua-speaking children still had the highest probability (1.0) of producing people terms, but even the English-speaking children's probabilities (.96) were at ceiling by the time their caregivers reported 10 words in their total vocabularies. In other words, we do find universal support for an early appearance of people terms in English, Putonghua, and Cantonese. The data for the common object nouns and action words, however, were quite different. As can be seen from Figure 1, the English speakers were consistently more likely to produce one or more common object noun as one of their vocabulary words than were either the Cantonese or the Putonghua speakers, and this difference was most dramatic in the first three words when the two groups of Chinese speaking-children had an almost zero probability of producing any common object terms.

These differences were confirmed by contrasting the ORs for the three languages at each vocabulary-size level. The OR statistic is typically used in medical research and is calculated to compare the probability of an event happening as opposed to it not happening. In addition, it can be used to directly compare the probability of an event happening across a certain number of groups. Used this way, the OR is calculated by dividing the odds in Group 1 by the odds of the event happening in Group 2, and the result can range from 0 to infinity, with an OR of one meaning that there is no difference among groups (see Westergren, Karlsson, Andersson, Ohlsson, & Hallberg, 2001). In our data, we treated the U.S. sample as a baseline group and then computed the OR for the Beijing and Hong Kong samples against the U.S. sample and a

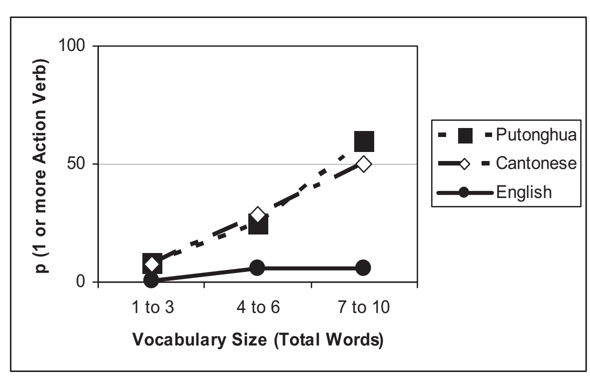

Figure 2. Probability of one or more action words in child's total vocabulary, by language and vocabulary size.

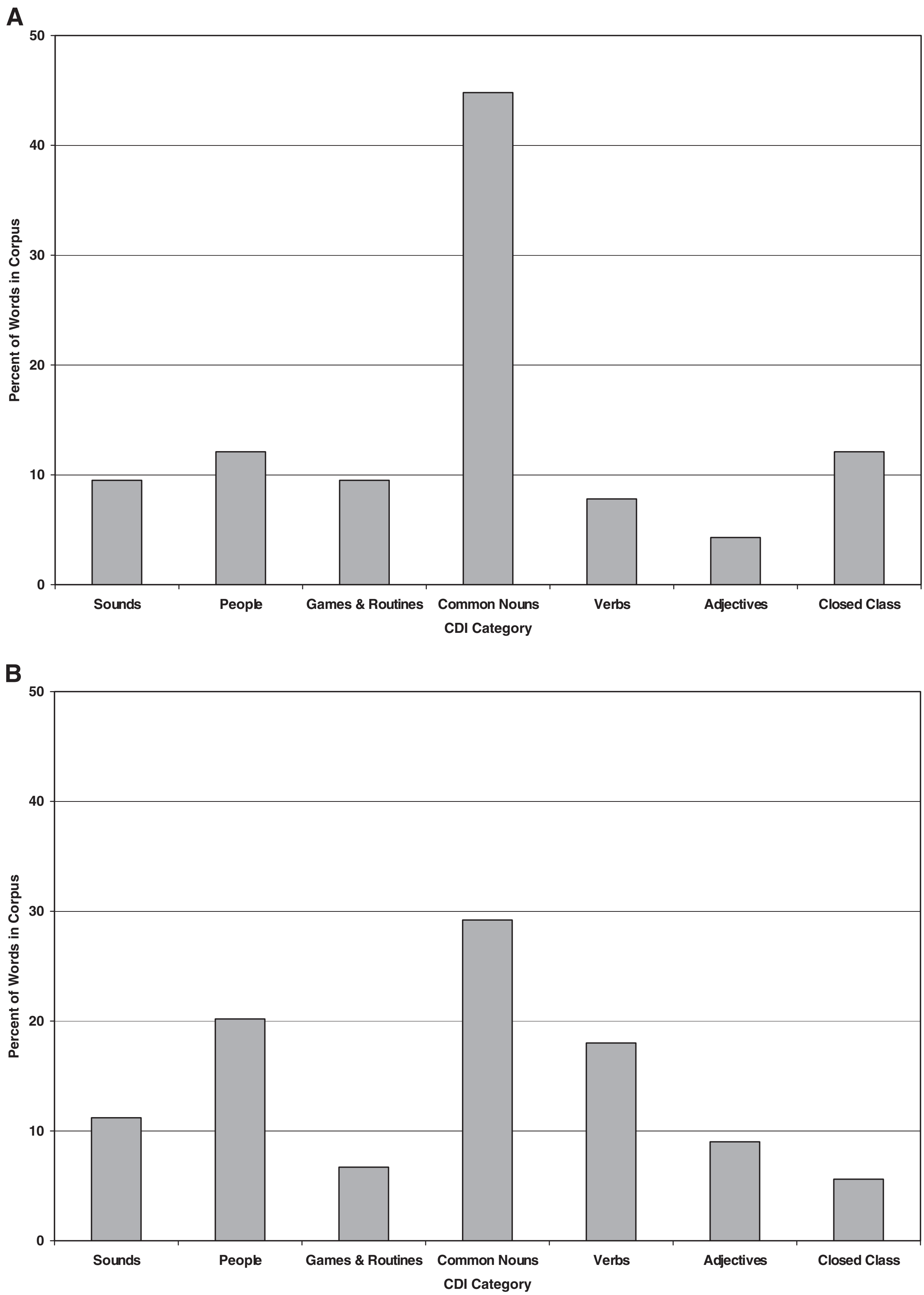

Figure 3. A: Proportions of words in corpus for U.S. children with 1 to 10 words, by MacArthur-Bates Communicative Development Inventories (CDI) category. B: Proportions of words in corpus for Beijing children with 1 to 10 words, by CDI category. C: Proportions of words in corpus for Hong Kong children with 1 to 10 words, by CDI category.

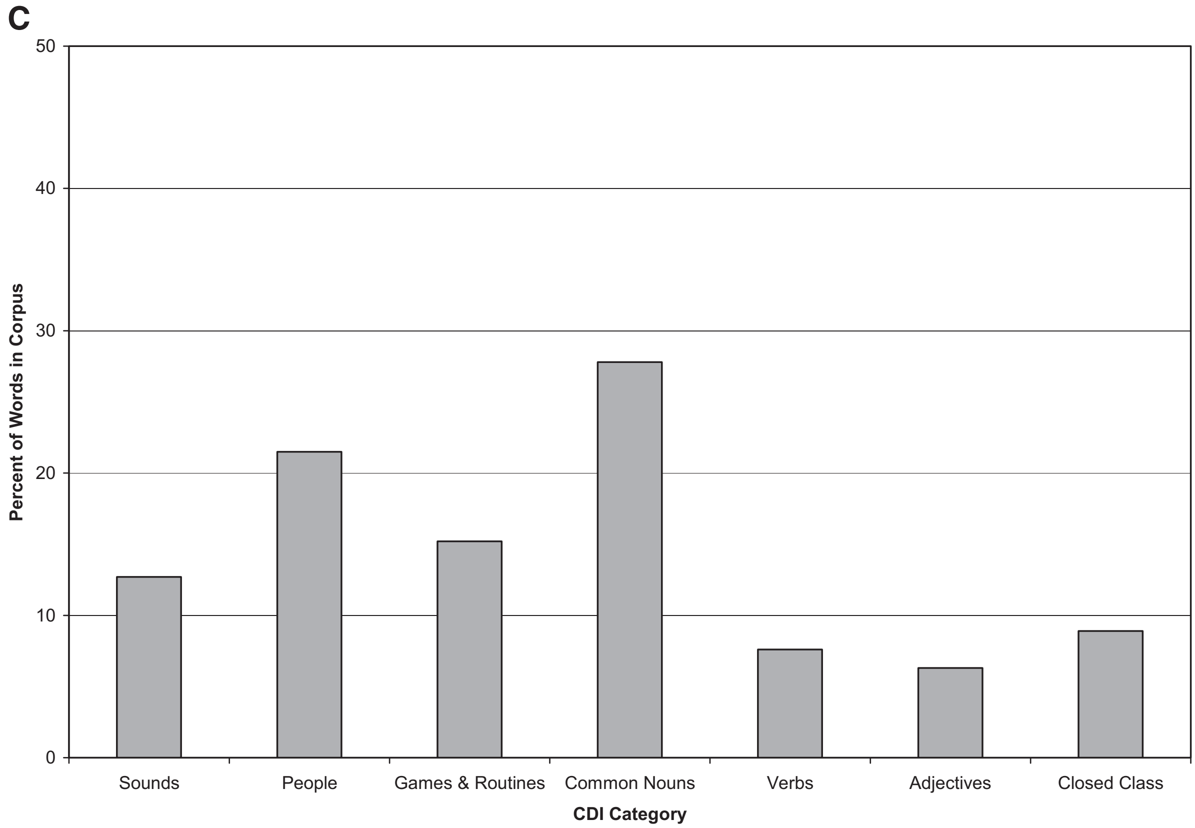

Figure 3. (continued)

second OR that compared the Beijing and Hong Kong samples directly. In this case, ORs of less than one indicate that the U.S. children were more likely to produce a particular word type, whereas ORs of greater than one indicate that the Hong Kong (HK) or Beijing (BJ) children were more likely to produce the word type. For children with 1–3 words, both the Putonghua- and Cantonese-speaking children were up to 20 times less likely to produce common object nouns than the English-speaking children ($OR_{BJ} = 0.05$, 95% confidence interval [CI] = 0.02–0.15; $OR_{HK} = 0.13$, CI = 0.06–0.28, both $ps < .0001$) but did not differ from each other. For children with 4–6 and 7–10 words, all groups were significantly different with the U.S. children most likely to produce common object nouns, followed by Hong Kong children, and the Beijing children least likely to produce common object nouns (for 4–6 words: $OR_{BJ} = 0.16$, CI = 0.10–0.28, $OR_{HK} = 0.31$, CI = 0.21–0.46, both $ps < .0001$, $OR_{BJ\ vs.\ HK} = 5.71$, $p < .05$; for 7–10 words: $OR_{BJ} = 0.20$, CI = 0.14–0.30, $OR_{HK} = 0.55$, CI = 0.40–0.76, $OR_{BJ\ vs.\ HK} = 26.33$, all $ps < .0001$). The pattern for verbs, however, was different again, as can be seen in Figure 2. Specifically, both groups of Chinese-speaking children were more likely to produce verbs than the English-speaking children at all vocabulary sizes in this range (for 1–3 words: $OR_{BJ} = 9.51$, CI = 1.23–73.62, $OR_{HK} = 8.19$, CI = 1.04–64.19, both $ps < .05$; for 4–6 words: $OR_{BJ} = 7.97$, CI = 3.23–19.68, $OR_{HK} = 6.90$, CI = 2.79–17.05, both $ps < .0001$; and for 7–10 words: $OR_{BJ} = 13.66$, CI = 5.40–34.55, $OR_{HK} = 8.11$, CI = 3.13–21.02, both $ps < .0001$, $OR_{BJ\ vs.\ HK} = 6.73$, $p < .01$). Moreover, the Putonghua- and Cantonese-speaking children did not differ in their probabilities of producing a verb for two of the three vocabulary ranges examined. What is most dramatic about these results is that there is between a 10- and 20-fold difference between Putonghua- and English-speaking children's tendencies to have just a single object word in a 1- to 3-word vocabulary or a single action word in a 7- to 10-word vocabulary. The extent of these differences and their consistency across studies, across definitions of *noun* and *verb* (see Tardif, 1996; Tardif, Shatz, & Naigles, 1997), and across analytic strategies is phenomenal and worthy of explanation.

What About Individual Words?

It remains possible, however, that our analyses are clouding the cross-linguistic comparison and may be masking even greater differences or potential similarities since we have grouped words into categories, rather than examining the particular words that children say. Looking at the actual words produced by the highest number of children in each language, we find that 6 of the top 20 words were shared across all three languages. Moreover, as can be seen from Table 4, two additional words were common across English and Cantonese, one additional word was common across English and Putonghua, and seven more were common across Putonghua and Cantonese. Thus, despite the dramatic differences in the number and probability of producing words that are classified as objects or actions, there are also similarities in the individual words that appear in children's vocabularies, with roughly half of the top 20 words shared across beginning speakers of English and Chinese. Nonetheless, even in these top 20 words, there were only three people terms and four animal terms (plus three animal sounds) for the English sample, whereas there were eight and nine people terms and no animal terms (plus zero and one animal sounds) for the Cantonese and Putonghua sample, respectively. Although it is possible that these differences could have been a result of family structure and pet ownership, it is as unlikely that U.S. children had ducks living in their immediate families as the Beijing children had older brothers and sisters, yet these terms were produced by enough children to warrant their inclusion in the top 20 words produced.

Corpus Coding Across Languages

In addition to coding individual children's productions and the top words produced by children within each sample, we also coded the entire corpus of words for children reported to produce between 1 and 10 words in each language. First, we simply counted the number of words produced by one or more children that fell into each CDI category.

As can be seen in Figure 3, and somewhat justifying their relative prominence on the respective CDI forms, there were more common nouns in the corpus than any other word type, and this was true across all three languages, but more obvious for English (45% of corpus and 53% of CDI words) than for Putonghua (29% of corpus and 46% of CDI words) or Cantonese (28% of corpus and 47% of CDI words). Consistent with the more elaborated kinship term system in Chinese, people terms also made up relatively large proportions of the Putonghua (20% of corpus and 6% of CDI words) and Cantonese corpora (21% of corpus and 6% of CDI words) but not English (13% of corpus and 5% of CDI words). In fact, in English, people terms were no more numerous than closed class terms. In addition, there were relatively few terms for sounds despite their widespread prevalence in individual English- and Cantonese-speaking children's vocabularies.

Nonetheless, the cross-linguistic differences in this corpus of words that children were reported to produce tended to parallel the cross-linguistic trends observed from individual children's data and from consideration of the top 20 words. Specifically, the proportion of verbs in the Putonghua corpus was more than double that in the English corpus. The relative proportions of nouns and people terms also followed the patterns observed in individual children's data, with common nouns more prevalent in English and people terms more prevalent in Putonghua. Interestingly, Cantonese again showed an intermediate pattern. Evidence of cross-linguistic differences in word types across languages was confirmed by a chi-squared analysis, $\chi^2(12, N = 284) = 21.70$, $p < .05$. Finally, differences in the dispersion of word types for individual children speaking these different languages were paralleled by a relatively greater number of word types reported (116) in the English corpus (despite a smaller sample size) than in either Putonghua (89) or Cantonese (79).

Next, we coded each word in the corpus into specific categories within each of the following major categories: common nouns (animals, objects—motion capable, objects—manipulable, objects—nonmanipulable, object category terms), people terms (proper names, kinship terms, category terms such as *girl* or *boy*), verbs (action, communication, perception/mental state), descriptive words (manner, state, property), and other (deictics, games, place terms, directional prepositions, routines, sound effects, other closed class). Note that most words did not change their status from the CDI category to this coding system, but there were some important exceptions. For example, several of the sounds were actually animal sounds (e.g., "woof") that very young children tend to use in a referential way to label animals (e.g., dogs) in their everyday environments. In this coding system, we scored these sounds as animals and considered them to be common nouns rather than simply sound effects. For people terms, because the CDI category includes a number of different types of labels for people, we divided terms more finely examining proper names versus kinship terms and other types of labels for people separately. Finally, because we were assigning items to categories and needed these item assignments to be identical across languages, rather than coding individual children's data, it did not make sense to compute traditional reliability statistics. Instead, to ensure reliable and valid coding across the three languages, two trilingual coders (one native English speaker, one native Cantonese speaker) independently coded all three languages and then discussed any disagreements. In addition, once the words in all three languages were coded, they then checked the coding of direct translations to ensure that they were assigned the same categories across languages.

Again, with the exception of people terms, $\chi^2(6, N = 54) = 16.02$, $p < .05$, there were minimal differences across cultures for subtypes of words within each category. For example, the most common type of nouns in all three languages were manipulable objects (from 36% to 48% of all nouns) and animals (from 31% to 36% of all nouns), the most common types of verbs were action verbs (from 70% to 90% of all verbs), the most common descriptive terms were state adjectives and adverbs (e.g., *hot*, *slow*, accounting for 50%–80% of all descriptive terms), and the most common other terms were everyday routines such as *hi* and *bye* (40%–55% of all other terms). Thus, although the total number of words in each category differs across languages, we found that the types of words within each category are very similar. The exception was that for people terms, both the Beijing ($n = 14$, 74%) and Hong Kong ($n = 9$, 53%) samples had a higher proportion of specific kinship terms than the U.S. sample ($n = 6$, 33%). In addition, the Hong Kong sample had a higher proportion of proper names (also specific references) than the other two samples ($n = 8$, 47% for Hong Kong vs. $n = 4$, 21% and $n = 5$, 28% for Beijing and U.S., respectively), whereas the U.S. sample had a higher proportion of general classificatory terms ($n = 4$, 22% for U.S. vs. $n = 0$ for Hong Kong and $n = 1$, 5% for Beijing) for people (e.g., *girl*, *boy*). Although it is probable that naming conventions are responsible for these differences, it is important to note that both the quantity and the types of terms produced for people appear to differ across these language and cultural groups.

Discussion

Many commonalities exist across children and across languages in children's first 10 words, but these are not straightforward. Most surprising is that the more specific the coding, the stronger the similarities. Examining individual words, 6 of the top 20 words appeared in all three languages, with further overlaps between any two of the languages. Also, within almost all of the categories we examined (except people), there were strong similarities in the types of words that appeared. Thus, although one cannot make generalities at the level of word class (e.g., children learn nouns or verbs), one can make generalities within word classes—children learn terms to describe people (whether kinship terms or individual names), concrete, manipulable object nouns, action verbs, and so on. In all three languages, the common nouns that children learned were manipulable objects that children encountered in their homes, or animals, rather than larger household objects or outside things, echoing Nelson (1973).

Nonetheless, at the level of word class, our data demonstrate that children go beyond universal constraints, at least as currently conceived. Rather than showing evidence of a universal bias for people, animal, and object words, children across cultures were consistently reported to produce people terms, but the prevalence of object and animal terms differed across cultures. Moreover, even within the category of people terms, Mandarin- and Cantonese-speaking children were reported to produce more different terms and more different types of people terms (kinship terms vs. names vs. classificatory categories). Although these data could theoretically be attributed to differences in household size, this is an unlikely explanation given that the Beijing families were primarily single-child nuclear families residing in very small urban residences (and 99% of the children had no older brothers or sisters in the household despite high frequencies of these terms as shown in Table 4), and the U.S. and Hong Kong household compositions were more similar to each other than the Hong Kong households were to the Beijing households. National census data (Census and Statistics Department, 2005; National Bureau of Statistics, 2006; U.S. Census Bureau, 2007) for each location also show similarities in actual household sizes across all three locations for families with children (3.2 in the United States in 1990, 2.8 in Beijing in 2004, and 3.1 in Hong Kong in 2001). Instead, we argue that the relative importance of naming practices, identity formation, and socialization routines in Chinese versus U.S. families are a more likely source of this difference (Sandel, 2002; Stafford, 1995). We suspect that similar cultural practices and preferences are also at work in producing the observed differences in object nouns and animal terms (e.g., the importance of the naming game; Bruner, 1975) and in the relative emphasis on actions over common object nouns (Lavin, Hall, & Waxman, 2006; Snedeker, Li, & Yuan, 2003). Again, one could argue that the differences in number of items per category (see Table 2) or differences in the way the questionnaire was administered (personal interviews in Beijing and Hong Kong versus mail-in for the United States) could have could have contributed to these differences. Although we do not deny this as a possibility, it is unlikely that these differences caused the extent of the differences we observed since the differences in questionnaire structure were minimal, particularly when compared in terms of the percentage of items on the questionnaire, and they do not match the differences in the extent to which caregivers reported differences in child speech. Finally, even if the differences we observed are not a result of differences in procedure or the items on the questionnaire, our data do not deny that universal principles may be at work in the ease by which (e.g., number of repetitions required, ways in which words and concepts are most easily mapped) different types of words are learned. Moreover, this analysis of the words that children are reported to produce may not also reflect the words that children comprehend, nor may they form an accurate picture of which aspects of these concepts children are mapping onto which labels.

Nonetheless, these data from over 900 children who are reported to produce from 1 to 10 words are consistent with and even more dramatic in showing cross-linguistic differences than naturalistic production data from English- versus Chinese-speaking children at later stages of vocabulary development (e.g., Tardif, 1996; Tardif et al., 1999), English versus Chinese caregiver speech (e.g., Tardif et al., 1997), and English versus Chinese caregivers' nonverbal cues (e.g., Lavin et al., 2006; Snedeker et al., 2003). Observing such cross-linguistic variation so early in large samples of children using comparable parent-report measures (CDIs) suggests a need to continue to investigate the role of parental input and cross-linguistic/cross-cultural variations in children's early word learning.

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