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Caregiver speech and children's use of nouns versus verbs: A comparison of English, Italian, and Mandarin*

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ABSTRACT

This paper examines naturalistic samples of adult-to-child speech to determine if variations in the input are consistent with reported variations in the proportions of nouns and verbs in children's early vocabularies. It contrasts two PRO-DROP languages, Italian and Mandarin, with English. Naturalistic speech samples from six 2;0 English-, six 1;11 Italian-, and ten 1;10 Mandarin-speaking children and their caregivers were examined. Adult-to-child speech was coded for the type frequency, token frequency, utterance position, and morphological variation of nouns and verbs as well as the types and placements of syntactic subjects and the pragmatic focus of adult questions. Children's spontaneous productions of nouns and verbs and their responses to adult questions were also examined. The results suggest a pattern consistent with the children's spontaneous production data. Namely, the speech of English-speaking caregivers emphasized nouns over verbs, whereas that

of Mandarin-speaking caregivers emphasized verbs over nouns. The data from the Italian-speaking caregivers were more equivocal, though still noun-oriented, across these various input measures.

INTRODUCTION

Until very recently, the general consensus among researchers of language acquisition was that children are predisposed to learn nouns or object names before verbs or other types of predicates and thus acquire more nouns than verbs in their early vocabularies (Gentner, 1982). Gentner's (1982) initial analyses of children's early word use in six languages raised the possibility that this noun-first predisposition was universal. Indeed, recent in-depth studies in English (Goldfield, 1993; Shatz, 1994), Italian (Caselli *et al.*, 1995) and Hebrew (Dromi, 1987) have confirmed this bias through the use of either checklist or diary data. Moreover, Caselli *et al*. have argued that the Italian findings further support the notion that the 'noun bias' is a universal predisposition, rather than a result of children's input, because the formal linguistic structure of Italian (i.e. it is a pro-drop language) has the potential to emphasize verbs more than nouns.

However, recent data from Mandarin (Tardif, 1996) and Korean (Choi & Gopnik, 1995; Gopnik, Choi & Baumberger, 1996) have indicated that many children learning these languages use more verbs than nouns in their early spontaneous speech.[1] Tardif (1996) and Choi & Gopnik (1995) suggested that input factors are important determinants of the presence of a noun bias in children's early vocabularies in some languages as well as its absence in others. However, only a few studies have examined selected aspects of the input that children learning these languages actually receive (e.g. Goldfield, 1993; Tardif, 1993, 1996) and even fewer have compared input from different languages (see Gopnik *et al.*, 1996 for a comparison of English and Korean).

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[1] There are a number of different ways to measure the proportion of nouns and verbs in children's early vocabularies. Moreover, there are consistent differences across the various types of measures (spontaneous speech vs. maternal report) that result in systematic under- or over-estimation of the number of nouns in children's early vocabularies (Pine, 1992; Pine, Lieven & Rowland, 1996). Thus, although we acknowledge that measures of spontaneous speech production are a measure of vocabulary 'use' rather than vocabulary 'knowledge' *per se*, we will use the phrase 'children's vocabularies' to refer primarily to children's vocabularies as measured through production, with the understanding that this is but one type of measure. However, we also do not believe that maternal report data are necessarily closer or more accurate measures of children's vocabulary knowledge (see Pine *et al.*, 1996, for evidence to this effect). These too are proxy variables that are based on observation – in this case, the day-to-day observations of an attentive caregiver who sees the child in a large variety of different contexts but who also filters whatever she hears of the child's speech through her own understanding of what is relevant linguistic behaviour.

The present paper addresses the need for more detailed analyses of the specific input patterns that Mandarin-, English-, and Italian-speaking children receive. Specifically, we wished to determine: (i) if, indeed the formal structural differences in these languages (i.e. the pro-drop parameter and its consequences) are manifested in actual differences in the speech that is addressed to children; and (ii) if differences in the input that children are exposed to are consistent with variations in the proportions of nouns and verbs in children's vocabularies across these three languages. To address these issues, we coded comparable samples of adult-to-child speech in English, Italian, and Mandarin for variables that should be relevant to the differential emphasis on nouns and verbs across languages.

We begin by clarifying the senses in which input has been hypothesized to influence children's early vocabulary development. One way that input might influence child language relates to how individual caregivers within a speech community use nouns and verbs. That is, for any given language some caregivers may emphasize nouns more than verbs whereas others may emphasize verbs more than nouns, and these individual differences may be reflected in individual differences in their children's propensity towards using nouns or verbs. A second way to examine how input may influence child language is to consider the extent to which adult-to-child speech varies in its emphasis of nouns or verbs across different languages. As discussed by Tardif (1996) and by Choi & Gopnik (Choi & Gopnik, 1995; Gopnik *et al.*, 1996), the findings of a 'noun bias' are relatively consistent for English and many other languages but appear to differ for Mandarin and Korean. Thus, we may expect to find consistent differences across caregivers speaking different languages which are related to these language-specific patterns of vocabulary acquisition. Specifically, it may be something about Mandarin and Korean as languages and/or about the ways in which Mandarin- and Korean-speaking caregivers, as a group, speak to their children that emphasizes verbs relative to nouns.

There are multiple ways, therefore, to measure the effects of caregiver speech on children's vocabulary development and input effects in general (see Richards, 1994). However, because the current debate is whether there is an overall bias towards nouns or verbs across languages, the focus in this paper will be to search for mean patterns between languages for caregivers and for children. Our goal is not to make strong causal claims about our findings, but rather to discuss the actual patterns of input that occur in these languages with regard to whether or not such patterns are consistent with children's production data.

The particular languages that we examine are English, Italian, and Mandarin – English because of consistent reports of a noun bias, Italian because the adult language has been hypothesized (Hyams, 1986; Caselli *et al.*, 1995) to share several structural features with Mandarin (and Korean) and

yet there appears to be a noun-biased pattern in Italian-speaking children's early vocabulary development (Caselli *et al.*, 1995), and Mandarin because of the recently reported lack of a noun bias in Mandarin-speaking children (Tardif, 1996).

1. INPUT FACTORS HYPOTHESIZED TO BE RELEVANT TO CROSS-LINGUISTIC DIFFERENCES IN EARLY VOCABULARIES

How might languages differentially EMPHASIZE nouns versus verbs? Structurally, both Italian and Mandarin may emphasize verbs more than English by the very fact that they are pro-drop languages and English is not. In a pro-drop language, sentence subjects are often optional and thus are frequently omitted. Verbs, on the other hand, are rarely omitted in any of these languages and are certainly no more likely to be omitted in Italian or Mandarin as compared to English. In other words, pro-drop languages may emphasize verbs more than non-pro-drop languages simply because fewer noun phrases, and presumably fewer common nouns, are required for communication in these languages. Moreover, dropping the subject of a sentence in an SVO language (English, Italian, and Mandarin are all SVO languages) also means that the verb is more likely to occupy the salient sentence-initial position in a dropped-subject utterance, whereas a noun (or a pronoun) is more likely to occupy this position in a full subject utterance. Overall, then, null subject languages should have a higher proportion of verbs and have verbs appearing in sentence-initial positions more frequently than non-null subject languages.

However, even though Italian and Mandarin are both pro-drop languages, the structural features that contribute to, or are said to license, null subjects in these two languages are very different. Italian is a null-subject language with a very rich and completely uniform agreement morphology, whereas it is the complete lack of agreement morphology that licenses null subjects in Mandarin (Huang, 1989; Jaeggli & Safir, 1989).[2] This difference in how Italian and Mandarin both allow null subjects despite being on completely opposite poles of the morphological agreement spectrum has led Hyams (1987) to distinguish between two types of null subject languages (i.e. those that have their origin in the sentence-level AGR constituent versus null subjects that are bound to the discourse-level TOPIC). The positing of two different types of null subjects has implications for additional properties that make contradictory predictions about whether and how verbs might be emphasized in these two languages. On the one hand, in a rich agreement language like Italian which has several agreement features varying across syntactic contexts for verbs stems but not noun stems, verbs are more complex and more

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[2] According to this 'uniformity principle', null subjects are not licensed in English because the agreement morphology is relative sparse (but not completely lacking) and is therefore not uniform.

variable than common nouns (Gentner, 1982). In contrast, because there is no agreement morphology in Mandarin, verbs and nouns in Mandarin should not differ in their morphosyntactic complexity. Hence Italian, but not Mandarin, should favour learning common nouns earlier than verbs for reasons of morphological transparency alone. Moreover, as discussed by Huang (1989) and others (Hyams, 1987; Wang, Lillo-Martin, Best & Levitt, 1992), Mandarin, but not English or Italian, is frequently a 'null object' language as well, a fact that further privileges the occurrence of verbs in Mandarin. On the other hand, word order is more variable and there are clitics in Italian, but not Mandarin – two factors which Caselli *et al.* (1995) suggested may contribute to the appearance of verbs in the salient utterance-initial and utterance-final positions and foster early verb learning in Italian.

It is apparent, then, that simply being a pro-drop language is insufficient to predict all the properties that might affect the relative emphasis of common nouns and main verbs in adult-to-child speech. Our approach, therefore, is to investigate a variety of properties that are related to the structural features of English, Italian, and Mandarin, and to measure the input directly. We focus on four factors that may yield differential emphases on common nouns and main verbs across the three languages. These are: (1) frequency; (2) salience/utterance position; (3) morphological transparency; and (4) pragmatics of language use. Note that several of these factors borrow strongly from Gentner's (1982) discussion about potentially relevant input factors, although we come to different conclusions based on our analyses of actual input. The rationale and a brief literature review for each of these factors follows.

Frequency

Words that appear more frequently in the input should be learned earlier by children (Gentner, 1982). As mentioned above, Italian and Mandarin should contain proportionately fewer nouns and more verbs, relative to English, because subjects, which are primarily nouns and pronouns, can be ellipted rather freely in both of these languages but are required for most English sentences. Moreover, because Mandarin also allows relatively free ellipsis of objects given appropriate discourse contexts, naturalistic speech samples of Mandarin should contain proportionately even fewer nouns than Italian.

There are two ways to measure the frequency of nouns and verbs in adult-to-child speech. The first is to measure the number of DIFFERENT nouns (or verbs) that occur, i.e. the number of different vocabulary TYPES. The second method is to count the TOTAL number of nouns (or verbs) that occur, i.e. the number of vocabulary TOKENS. In general, when researchers have reported a noun bias in children's early vocabularies, they have reported a disproportionate number of noun types, relative to other types of words. However, in order to consider what the effects of INPUT on children's

539

vocabulary might be, we need measures of both types and tokens in adult-to-child speech.

Types. Goldfield (1993), reported that the 12 English-speaking mothers in her sample used more noun types than verb types while engaged in toy-play with their one-year-old toddlers. She also reported a significant correlation (about 0·5) between maternal noun types and the proportion of noun types in children's first 50-word vocabularies, as reported in diaries of the children's vocabulary development that the mothers kept. Thus, Goldfield concluded that mothers' use of a high number of noun types (relative to verb types) provided input that supported the noun bias in English-speaking toddlers' early vocabularies.

Gopnik *et al.* (1996) report a higher proportion of action verb types per utterance for Korean-speaking caregivers, relative to English-speaking caregivers, in speech to their language-learning toddlers in the laboratory. In addition, the English-speaking caregivers produced a higher proportion of object noun types per utterance than the Korean-speaking caregivers. Thus, Gopnik *et al.* (1996) suggested that the data are supportive of their claims about input having an effect on the proportions of nouns and verbs in children's early vocabularies.

Tokens. In her study, Goldfield (1993) reported that mothers used more verb tokens than noun tokens. This suggests that token frequency of nouns and verbs in the input does not account for the noun-biased pattern found in English-speaking children. However, it may contribute to individual differences among English-speaking children, or for the learning of one noun over another. Goldfield reported that the number of maternal noun tokens during toy play was significantly correlated (about 0·5) with the number of nouns in children's first 50 words. Moreover, Huttenlocher, Haight, Bryk, Seltzer & Lyons (1991), found that token frequency of individual object labels was highly correlated with the appearance of those items in children's early vocabularies.

In the Gopnik *et al.* (1996) study, the results for vocabulary tokens exactly parallel their findings for vocabulary types. Specifically, they found more object noun tokens per utterance for English-speaking caregivers and more action verb tokens per utterance for Korean-speaking caregivers. Thus, there appear to be cross-linguistic differences in both the number of word types and tokens that are classified as 'nouns' and 'verbs' in adult-to-child speech for Korean and English.

Salience/utterance position

Newport, Gleitman & Gleitman (1977) found that maternal use of yes/no questions was correlated with children's use of auxiliaries six months later. In keeping with Newport *et al.*'s hypothesis that the utterance-initial position

of English auxiliaries in yes/no questions was responsible for this effect, Richards & Robinson (1993), in a larger sample study, found that adults' inverted copula questions were correlated with increases in children's use of the copula over a period of six months. Placing an item in utterance-initial position, according to this view, is one way of increasing the salience of that item in adult-to-child speech. Extending Slobin's (1985) principles of paying attention to the beginnings and end of linguistic units, we conjecture that words appearing at both the beginnings and ends of utterances are salient, relative to words appearing in medial utterance positions.[3]

If languages differ on which form classes typically appear in these salient positions, then these form classes would be differentially emphasized (Gentner, 1982). As mentioned above, formal features of Italian such as word order variation and the relatively free ellipsis of subjects tend to result in the verb appearing at the beginning or end of an utterance more often than in English. Mandarin shares the pro-drop feature with Italian (Huang, 1989; Jaeggli & Safir, 1989), but is not as flexible with respect to word order. Moreover, since it allows frequent ellipsis of objects as well as subjects, it might also be hypothesized to include many verb-initial and verb-final utterances. English, in contrast, may have more nominals at the beginnings and ends of utterances because it allows little variation in word order and minimal dropping of nominal elements from the canonical SVO sentence structure.

In her study of English-speaking mothers, Goldfield reported that for multi-word utterances, nouns occurred more often in final position whereas verbs occurred most often in medial position. This would suggest that, relative to verbs, nouns were more salient in the child-directed speech of these English-speaking mothers.

However, the measure of salience Goldfield used is somewhat problematic if one defines salience in terms of what is easy to attend to in an ongoing stream of speech. Goldfield looked for the appearance of particular types of words and computed the probability with which these different types of words occurred in different utterance positions ('word-based' probability). This presupposes that the words can already be identified and divided into types (i.e. nouns and verbs), which is partly what this input factor is supposed to account for. We would argue that the more appropriate measure is to compute a probability across utterances: in other words, to examine the initial and final positions in an utterance and find out which words appeared there. We will refer to this way of measuring salience as the 'utterance-based probability' of nouns and verbs appearing in the salient positions and use this

[3] In Richards & Robinson's (1993) study, adult sentence-final copulas were not correlated with increases in children's copula use, but we do not feel that this datum by itself is enough to exclude the sentence final hypothesis from consideration in the present study.

measure as a basis for comparing the relative salience of nouns and verbs across adult-to-child utterances in the three languages.

Given the typological differences with respect to the allowance of null-subject utterances, the flexibility of word order, and the possibility of null-object utterances across the three languages, we expect to find more verbs in the salient utterance-initial and utterance-final positions for Italian and Mandarin than for English adult-to-child speech.

Morphological transparency/simplicity

Words that do not change their morphological form across inflectional paradigms should be easier to learn than words that do change their form (Gentner, 1982). Nonetheless, Gentner, arguing for a universal noun bias in early vocabulary development, reported that even though verbs are no more variant than nouns in Mandarin, Mandarin-speaking children still are noun-biased.[4]

Because more recent data suggest that Mandarin-speaking children are not noun-biased (Tardif, 1996), it is important to consider the morphological transparency hypothesis in terms of the actual input that children hear. If the input contains differences in the morphological transparency and these differences are consistent with differences in the acquisition of nouns and verbs across languages, then these aspects of morphological form could influence vocabulary development.

Relevant to this, Goldfield (1993) looked at the various grammatical inflections appearing with nouns and verbs and found that verbs were inflected much more often than nouns in the speech of her English-speaking mothers. However, Goldfield does not report any correlations between the relative difference in inflections and children's vocabulary data, nor do the previous examinations of Korean and Mandarin provide any further data on this issue. It remains to be seen, therefore, whether there are indeed such differences in the number and simplicity of morphological markings on nouns and verbs in the adult-to-child speech across the three languages studied here and whether they are consistent with the children's patterns of vocabulary development.

Looking at the typology alone, we find large differences in the number and 'transparency', as well as the consistency, of marking across Mandarin, English, and Italian. Mandarin verbs are marked only for aspect, with no subject-verb agreement whatsoever. Moreover, aspect in Mandarin is marked by a separate morpheme that does not change the stem in any way (e.g. *zai4*

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[4] The data that Gentner (1982) presents for Mandarin are based on retrospective maternal report for two Mandarin-speaking children from Erbaugh's (1982) dissertation sample of college-educated families in Taipei, Taiwan (M. S. Erbaugh, personal communication, 1 October 1996).

zou3 'continuous-ASP+go', *zou3 le* 'go+perfect-ASP).[5] In contrast, English verbs are marked (somewhat inconsistently) for person, number and tense, and the most frequently used verbs also tend to have irregular conjugations (Brown, 1973). Italian verbs are marked more consistently (and more regularly) for person, number and tense than English verbs. Moreover, they are also marked for gender and frequently contain object clitics. Thus, Italian verbs have the potential to appear in the greatest variety of forms.

All three languages contain markings for number. Mandarin, however, does this with a numeral-classifier compound that precedes the noun and again does not alter the noun stem itself (e.g. *yi4-zhi1 bi3*, 'one-CL pen'; *si4-liang4 che1*, 'four-CL car'). English and Italian both mark number (singular or plural) as an inflectional suffix on the noun stem. Additionally, Italian marks nouns for gender with gender-dependent declensions on the noun itself and markings on modifiers which precede the noun. All three languages also have diminutive, or 'baby-talk', forms (e.g. 'dog, 'doggie') that tend to apply to nouns much more than to verbs or other parts of speech. Since they involve changes in the superficial morphology of words, these diminutive forms were also included as 'morphological variations' in our comparisons across languages.

Given what we know of the typology, then, we expect that Mandarin input would contain almost no stem-altering marking and that there would be a negligible difference between nouns and verbs in this regard. Italian, in contrast, should have the largest difference between nouns and verbs and also have the greatest number of morphological inflections attached to the verb stem when compared to the other two languages. English should fall in between with more inflections on verbs, relative to nouns, but perhaps not as large a difference between nouns and verbs as Italian.

Pragmatics

Tardif (1996) suggested that another reason Mandarin-speaking children might not show the noun bias is because their caregivers may not be playing the same 'language learning game' as that played by middle class English-speaking mothers. It may be that English-speaking mothers are focused on objects and eliciting object labels from their children for a variety of sociocultural reasons that would not pertain to Chinese, Mandarin-speaking mothers.

Some evidence suggests that English-speaking mothers place a large emphasis on talk about objects and eliciting object labels from their children (Bridges, 1986; Goldfield, 1993). Goldfield (1993) found that 10 of the 12

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[5] Mandarin examples use the *Hanyu pinyin* romanization system with the numerals one to four to indicate tone on each syllable. Neutral tone is indicated by omitting a numeral at the end of the syllable.

mothers in her sample requested an object label on two or more occasions and that mothers prompted for nouns more frequently than they did for verbs when interacting with their twelve-month-olds in a toy–play situation. In their cross-linguistic study, Gopnik *et al*. (1996) found that English-speaking mothers focused more on objects and Korean-speaking mothers focused more on actions when given the same play situation in the laboratory. Thus, it appears that there are differences in the extent to which nouns and verbs are highlighted in caregiver-child interactions across various linguistic and cultural groups.

Another area in which pragmatics may influence the acquisition of vocabulary items is the use of particular interrogative forms in adult-to-child speech. English-speaking caregivers' use of interrogatives and of 'test questions' are correlated with children's acquisition of both syntax and vocabulary items in general (Furrow, Nelson & Benedict, 1979; Hoff-Ginsberg, 1986; Newport, Gleitman & Gleitman, 1977), as well as common nouns in particular (Heberle, Kaufman, Grego, Hirsh-Pasek & Golinkoff, 1994; Nelson, 1973). Cross-linguistically, Erbaugh (1992) claims that a 'quiz style of conversation' is frequent in adult-to-child speech in Mandarin and that it transcends social class. Whether these 'quiz' or 'test questions' are equally focused on common nouns in English and Mandarin, however, is an empirical question that we address.

Finally, English and Mandarin may differ with respect to the type of response expected to a question. For instance, if a mother is asking her child whether or not she wants more juice, an English-speaking mother would ask: [Do you] want [to drink] some more [juice]?' An acceptable, albeit abbreviated, child response would be 'More' or 'Juice' or simply 'Yes', but not 'want' and not 'to drink'. In Mandarin, the adult question would be '[*ni3*] *hai2 yao4 ma*?' ([you] still want QP?) or '*hai2 yao4 bu2 yao4 he1* [*guo3zhir1*]?' (still want not want drink-V [juice]?). In either case, an acceptable response would be '*yao4*' (want) or '*he1*' (drink-V), but not '*guo3zhir1*' (juice) and certainly not '*geng4 duo1*' (still more) – if anything, the notion of more would refer to more drinking, not more juice (i.e. '*hai2 yao4 he1*' – still want [to] drink-V).

If functionally similar question forms result in different types of responses by the children across these three languages, then one could argue that the pragmatics of RESPONDING to questions may differ across language and cultural groups. Thus, English- and Mandarin-speaking children may respond differently to functionally similar questions – English-speaking children may respond with nouns and Mandarin-speaking children may respond with verbs. Furthermore, it is possible that such a difference in responses may account for the differences in the English- and Mandarin-speaking children's vocabulary data. In order to address this issue, we do two things: first, we exclude any replies to questions that included repetitions of

544

words that were contained in the questions themselves from our measures of children's spontaneous vocabularies; secondly, we analyse the children's replies to questions (including such partial repetitions) to see whether or not children's replies to caregivers' questions are in fact different across these three languages.

2. DEFINITIONS OF NOUNS AND VERBS

Tardif (1996) discusses at length the issue of what to count as nouns and verbs in caregiver and child speech. Regardless of whether one counts common nouns and main verbs alone, or includes proper nouns in the noun category, the Mandarin-speaking children in her sample never showed evidence of a noun bias in their productive vocabularies. Similar results hold for object labels versus actions and object and people labels versus actions – the Mandarin-speaking children never showed evidence of a noun bias whereas English-speaking children almost always have more nouns (object labels) than verbs (action words) on any of these measures.

In the present paper, we follow Tardif's (1996) and others' (e.g. Nelson, Hampson & Kessler Shaw, 1993; Pine, 1992) recommendations about separating common nouns from proper names and main verbs from all other predicate terms. Thus, in our comparisons of English, Italian, and Mandarin, we examine the use of common nouns and main verbs across all three languages, as defined by the adult form class categories and the particular syntactic constructions in which they appear.

3. PREDICTIONS FOR MANDARIN, ENGLISH, AND ITALIAN

In sum, to examine various input factors and their possible relations both to formal structural features of the language and to the composition of children's early vocabularies, we systematically coded for the following factors in comparable samples of English, Italian, and Mandarin caregiver and child speech. We coded adult-to-child speech for: (i) the frequency of noun and verb types and tokens; (ii) the proportions of utterances that contain nouns and verbs in salient utterance-initial and utterance-final positions; (iii) the average number of inflections and other morphological variations on nouns and verbs; and (iv) the relative frequency and the pragmatic functions and focus of questions. In addition, we coded the children's speech in each language for: (i) the frequency of noun and verb types and tokens in wholly productive utterances (i.e. repetitions and quoted speech were excluded); and (ii) the types of responses that the children gave in reply to caregiver questions.

We predict that English will emphasize nouns relative to verbs on most of the input measures, whereas Mandarin will emphasize verbs relative to nouns. Moreover, we expect that the English-speaking children in this sample will spontaneously produce more nouns than verbs (both types and

545

tokens) and that they will respond to questions more often with a noun than with a verb. Mandarin-speaking caregivers and their children should show the opposite pattern.

Our predictions for Italian, however, are more tenuous. If Caselli *et al.* (1995) are correct in their analysis of the typological features of Italian and their relation to the actual input that children receive, then we would expect the Italian-speaking caregivers to emphasize verbs more than nouns, much like the Mandarin-speaking caregivers. Moreover, if these input factors are consistent with children's early vocabulary development, then we would expect the Italian-speaking children to produce more verbs than nouns in their productive speech samples. However, we have reports of a noun bias for both English- and Italian-speaking children (Caselli *et al.*, 1995), but no noun bias for Mandarin-speaking children (Tardif, 1996). The alternative possibilities are either that these input factors are not directly related to children's patterns of vocabulary development, or that perhaps Italian-speaking caregivers highlight nouns and not verbs, much like the English-speaking caregivers, despite the typological similarities in verb-emphasizing features that Italian shares with Mandarin. It is towards solving this apparent contradiction between the similarity of English and Italian child data on the one hand, and the apparent similarities of adult linguistic structure between Italian and Mandarin on the other, that we aim our analyses.

METHOD

Data in all three languages involved naturalistic records of interactions between the caregivers and toddlers in their own homes. The English data involve six children from a larger sample of 63 mother-child dyads from Wisconsin (Hoff-Ginsberg, 1991). The Italian transcripts were obtained from the Calambrone corpus (Cipriani *et al.*, 1989) and include six normally-developing children and their caregivers recorded in their Pisa homes. The Mandarin transcripts are from a sample of children studied by Tardif (1993) and involve 10 children and their Mandarin-speaking caregivers in Beijing, China.[6]

SUBJECTS AND PROCEDURE

English

Six mothers and their children, three boys and three girls, were selected from the Hoff-Ginsberg (1991) Time One sample. Three of these children had parents who were defined as 'upper middle class' (two boys, one girl), and three children had parents who were defined as 'working class' (one boy, two

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[6] The Mandarin transcripts have now been converted to CHAT format and are available on the CHILDES database, as is the Calambrone corpus (MacWhinney & Snow, 1990).

girls). The sample of children had originally been selected on the basis of the fact that they were not yet producing auxiliary verbs and thus their ages ranged from 1;8·18 to 2;6·24. The mean age for these children was 2;0·11, and the mean MLU was 1·23 (S.D. = 0·14). Two of the English-speaking children were first-borns whereas the other four children were later borns. The contexts of interaction were specified by the observer and included toy play, mealtime, and dressing contexts for each mother-child dyad, but the actual duration of the recordings in each activity context varied.

Italian

Six caregivers (mostly mothers plus other relatives who happened to be present) and their children, two boys and four girls, were included in the present analyses. Three of these children were first-borns (two girls, one boy) and three were second-borns (two girls, one boy), with parents who ranged in SES from middle-low to high, as described for the 'normal' sample of Pisa children in the Calambrone corpus in MacWhinney (1991, p. 293). The mean age of the Italian-speaking children was 1;10·29, and they ranged in age from 1;9·1 to 2;2·1. The mean MLU for these children was 1·99 (S.D. = 0·65), which was higher than the MLU for the English-speaking children, $t(10) = 2·45$, $p < 0·05$. The duration of visits also varied across these families and were shorter, on average, than either the English or the Mandarin recordings.

Mandarin

Ten children and their families, eight boys and two girls, participated. Of these, five children (four boys, one girl) had parents who were classified as 'intellectuals' (*zhishifenzi*: college-educated or above, professional and semi-professional occupations), and five children (four boys, one girl) had parents who were classified as 'workers' (*gongren*: no more than a high school education, manual or semi-skilled labourers). The mean age of the Mandarin-speaking children was 1;9·24 (range 1;9·3 to 1;10·28) at the time of the recordings to be reported on in this paper, and this was significantly younger than the English-speaking children, $t(14) = 2·31$, $p < 0·05$. The mean MLU for these children was 1·82 (S.D. = 0·60), which was higher than the mean MLU for the English- but not the Italian-speaking children, $t(14) = 2·12$, $p < 0·05$.

Children and caregivers in this corpus were recorded for one hour at each visit and chose their own activities after being told to 'do whatever [they] normally do' at that time of day. The actual activities of these families varied quite a bit and included both indoor and outdoor toy play, mealtimes, dressing, social interchanges, and occasional book reading episodes. As in the Italian families, it was very unusual for a child to ever spend long periods of

547

time alone with his or her mother as a primary caregiver (New, 1985; Tardif, 1993). Thus, the adult-to-child speech in the Mandarin and Italian transcripts are pooled over all the caregivers who appear in a transcript.

Coding

Transcripts in each language were coded for:

(i) All 'nominals' (common nouns, proper nouns, pronouns, interrogative pronouns, and numerals) and 'verbals' (main verbs, auxiliary and semi-auxiliary verbs) uttered by the caregiver and all nominals and verbals in the children's wholly productive utterances (i.e. repetitions and quoted speech were excluded).

(ii) Utterance-initial and utterance-final words were also coded for their form class category in order to obtain proportions of common nouns and main verbs in these utterance positions.

(iii) Utterance types and the placement of subjects within an utterance.

(iv) The pragmatic function and focus of adult-to-child interrogatives by first coding for whether the pragmatic function of the interrogative was a directive, real question, test question, verbal reflective question, action reflective question, tag, repair, prompt, or routine. Although these categories are not necessarily mutually exclusive, the tag element in all tag questions was treated as a separate utterance and the clause before the tag was coded as either a declarative, imperative, or interrogative, depending on the syntax. Then, the remaining interrogatives were coded into these mutually exclusive categories. In addition, test questions were coded for whether their focus was on a person or an object and then whether the focus was on an action, state, or property of the person or object, or whether it was simply a request for a person or object label. See Appendix for a complete list and examples of these categories.

(v) A subset of child utterances – children's replies to caregivers' questions – were coded separately as belonging to one of eight response types (proper names, common nouns, noun phrases, verb phrases, responses which contained both nouns and verbs, 'other' types of responses, or 'no response/ unintelligible').

RESULTS AND DISCUSSION

Children

The following results for children's vocabulary types and tokens are based on a count of wholly productive utterances only. Thus, repetitions, quoted speech, and even repetitions of portions of adult questions that could function as responses to those questions were excluded from these analyses, although the latter were analysed together with other replies to caregivers' questions and reported below.

548

Overall, the Mandarin-speaking children[7] produced more vocabulary tokens than the English- and Italian-speaking children, probably because they were recorded for longer periods of time (1 h vs. 30–45 min). In order to equate across samples, an analysis of covariance with adjusted means was performed with the total number of words produced as the covariate. However, it should be noted that the same general pattern of results occurs when the means are not adjusted. In the few cases where the results from these analyses were not identical, the adjusted means were more conservative. Thus, for the sake of simplicity, only the adjusted means will be reported in the following analyses.

In contrasting the children's productions of common nouns versus main verbs, we find significant language by form class interactions in a 3×2 ANCOVA for both the children's vocabulary types and their vocabulary tokens, Fs$(2, 32) = 3.61$ and 5.83, ps < 0.05 and 0.01, respectively. As can be seen from Table 1, the Mandarin-speaking children produced more verb

TABLE 1. *Adjusted means for children's productions of noun and verb vocabulary types and tokens in English, Italian, and Mandarin*

Form class	English	Italian	Mandarin
Types*			
Common nouns	21·6	22·9	11·9
Main verbs	14·4	16·6	18·7
Tokens†			
Common nouns	52·7	54·8	40·8
Main verbs	30·2	48·7	64·4

* Note that the mean standard error for these least squared adjusted means is 5·4.
† Note that the mean standard error for these least squared adjusted means is 11·6.

than noun types and tokens, $t(18) = 2.64$, $p < 0.05$ and $t(18) = 4.27$, $p < 0.005$, respectively, in a least squared means test. The differences between the mean number of nouns and verbs produced by the English- and the Italian-speaking children were smaller, less reliable, and statistically insignificant, although the trend was clearly for them to produce more nouns than verbs.

Looking across languages, we find that the Mandarin-speaking children also produced fewer noun types than the Italian-speaking children, $t(14) = 3.71$, $p < 0.001$. For vocabulary tokens, the Mandarin results differed from both the English and the Italian results. Specifically, the Mandarin-speaking children produced more verbs than both the English- and the Italian-speaking children, ts$(14) = 2.68$ and 2.48, respectively, ps < 0.05. In addition,

[7] Note that the data from the Mandarin-speaking children are the same as those reported in Tardif (1996). The data from the English- and Italian-speaking children represent new analyses as do the data from all three groups of caregivers.

TABLE 2. *Adjusted means for caregiver's productions of noun and verb vocabulary types and tokens in English, Italian, and Mandarin*

Form class	English	Italian	Mandarin
Types			
Common nouns	48·6	81·3	45·1
Main verbs	49·6	57·0	80·2
Tokens			
Common nouns	162·9	220·6	129·6
Main verbs	341·0	408·5	521·9

they produced fewer common noun tokens than the Italian-speaking children, $t(14) = 2·20$, $p < 0·05$.

In sum, these spontaneous speech data corroborate the previous diary and checklist data: English- and Italian-speaking children tend to produce more nouns than verbs in their early vocabularies, although the differences were not as statistically reliable in this small sample as we might have expected them to be. However, the Mandarin results clearly differed from this pattern: Mandarin-speaking children produced more verbs than nouns. This difference across languages CANNOT be due to differences in the methods for sampling children's vocabularies, since we have used spontaneous measures for all three languages and included the same types of words in our definition of nouns and verbs for these English, Italian, and Mandarin early speech samples. Moreover, the differences between English and Mandarin cannot be accounted for by differences in the children's MLU, since the results for the Italian-speaking children, who had the highest mean MLU, parallel those for the English-speaking children, who had the lowest mean MLU.

Adults

Recall that our interest in examining adult-to-child input for these three languages was to determine whether there are quantifiable differences in various input factors across the three languages corresponding to differences in the extent to which children's early vocabularies can be described as noun-biased. Thus, we present results for each of the three languages across several different input measures. Since there is an overall difference in the number of utterances produced across the three samples, with the English- ($M = 629·7$, S.D. $= 165·8$) and Mandarin-speaking caregivers ($M = 678·2$, S.D. $= 250·6$) producing more utterances, on average, than the Italian-speaking caregivers ($M = 270·8$), adjusted mean scores will be used throughout.

Frequency (*types*)

As shown in Table 2, English-speaking caregivers produced roughly equal numbers of noun and verb types, whereas Mandarin-speaking caregivers

produced more verb types than noun types, $t(18) = 5.35$, $p < 0.0001$. There was a tendency for the Italian-speaking caregivers to produce more noun than verb types, but this difference was not statistically significant. Given that the total number of adult vocabulary tokens also differed across languages, a 3×2 ANCOVA was performed with the mean number of noun and verb vocabulary types adjusted for overall difference in the number of words produced. When adjusting for the total number of words, we find a significant main effect for form class (common noun versus main verb), $F(1, 32) = 7.27$, $p < 0.05$, but not for language and no significant interaction between the two.

Comparing across languages, as shown in Table 2, the Italian-speaking caregivers produced more noun types than either the English- or the Mandarin-speaking caregivers, $t(10) = 2.87$, $p < 0.01$ and $t(14) = 3.22$, $p < 0.005$, respectively. Moreover, the Mandarin-speaking caregivers produced more verb types than either the English- or the Italian-speaking caregivers, ts$(14) = 4.50$ and 2.06, ps < 0.0001 and 0.05, respectively.

Frequency (*tokens*)

Unlike the data for vocabulary types, caregivers in all three languages produced more verb tokens than noun tokens, as can be seen in Table 2. Moreover, this was true for every single caregiver in each language group even though there were still differences across languages in the magnitude of this noun-verb difference, as was evidenced by the existence of a significant interaction between language and form class in a 3×2 ANCOVA adjusted for overall vocabulary tokens, $F(2, 32) = 4.78$, $p < 0.05$. Nonetheless, the caregivers in each language produced significantly more verb tokens than noun tokens, $t(10) = 7.38$, $t(10) = 3.76$, and $t(18) = 17.40$, for English, Italian, and Mandarin, respectively, ps < 0.001 or better. Again, however, Mandarin-speaking caregivers produced fewer noun tokens than the Italian-speaking caregivers, $t(14) = 2.35$, $p < 0.05$, but more verb tokens than either the English- or the Italian-speaking caregivers, ts$(14) = 7.75$ and 2.93, ps < 0.0001 and 0.01, respectively. The differences between the English- and Italian-speaking caregivers again failed to reach significance.

It should be noted that these data are in complete accordance with others' findings on the relative difference between nouns and verbs in spontaneous speech. Goldfield's (1993) study confirms that English adult-to-child speech contains more verb tokens than noun tokens. Moreover, Choi & Gopnik (1995) also find cross-linguistic differences in the extent of disparities between noun and verb frequencies.

Salience/utterance position

In all three languages, verbs appeared at the beginnings of utterances much more frequently that did common nouns. That is, roughly one-quarter of

551

adult-to-child utterances in English ($M = 0.25$, S.D. $= 0.08$), Italian ($M = 0.26$, S.D. $= 0.04$), and Mandarin ($M = 0.28$, S.D. $= 0.05$) began with a verb. In contrast, only 1–3 per cent of all utterances in these languages began with a noun. In a 3×2 ANCOVA adjusting for overall differences in the number of words produced, there was a very large effect for form class, $F(1, 32) = 112.20$, $p < 0.0001$, with the differences between the probability of nouns appearing at the beginnings significantly lower than verbs for all three languages, $t(10) = 6.77$, $t(10) = 4.19$, and $t(18) = 8.50$, for English, Italian, and Mandarin, respectively, $ps < 0.0005$ or better.

The differences across languages are striking, however, when we compare the probabilities that verbs and nouns appeared in utterance-final position, as can be seen in Figure 1. In an analysis of covariance, a strong language by
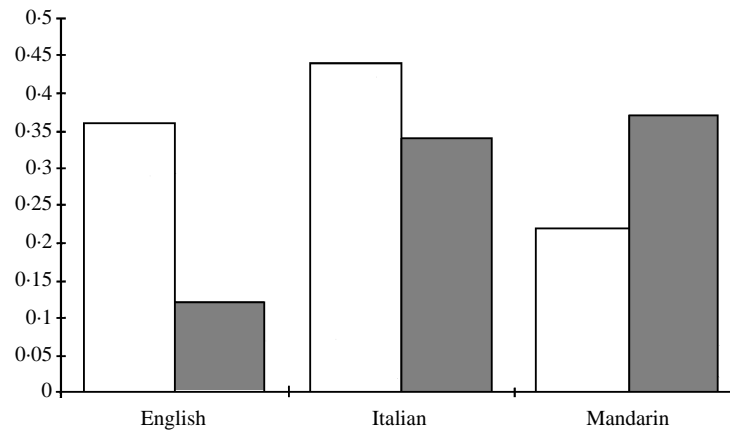

Fig. 1. Mean probabilities of utterances ending in nouns (□) vs. verbs (▦) in adult-to-child speech for English, Italian and Mandarin.

form class interaction was found, $F(2, 32) = 12.99$, $p < 0.0001$. Again, the English data suggest a pattern which emphasizes nouns, $t(10) = 5.46$, $p < 0.0001$, whereas utterances in Mandarin end in verbs more often than they end in nouns, $t(18) = 3.91$, $p < 0.0005$. In Italian, the differences were not significant, although slightly more utterances ended in nouns than in verbs. Comparisons between the adjusted utterance-based probabilities for nouns and verbs across languages revealed that English and Italian utterances ended in nouns significantly more often than did Mandarin utterances, $ts(14) = 3.10$, and 3.69, respectively, $ps < 0.005$. However, Italian and Mandarin utterances ended in verbs significantly more often than English utterances, $t(10) = 6.96$ and $t(14) = 6.55$, respectively, $ps < 0.0001$.

Thus, if one wishes to consider the beginnings and endings of utterances as salient for the child, then Mandarin highlights verbs in adult-to-child

language. In contrast, English highlights nouns, whereas Italian is more equally balanced between the two. Contrary to simple predictions from the fact that Italian and Mandarin are pro-drop languages and English is not, neither Italian nor Mandarin input highlighted verbs by showing more deletion of common nouns in the sentence-initial subject position than English. Instead, the contrast came from what appeared in sentence-final position. The fact that Mandarin allows relatively free ellipsis of objects as well as subjects may have contributed to the large proportion of main verbs appearing in utterance-final position in Mandarin. In English and Italian, objects were more likely to be present (and not pronominalized), hence the differences in common nouns in sentence-final position. Finally, the relatively freer word order in Italian, when contrasted with a stricter word order in English, may have contributed to the differences between English and Italian. Both of these findings are consistent with a more detailed analysis of the structural features of these languages.

Morphological variation

Looking at the number of morphological variations that appear on each noun and verb stem as our measure of morphological complexity, we found, first, that all three languages differ with respect to the complexity of nouns relative to verbs. However, as can be seen from Table 3, the direction of this effect

TABLE 3. *Adjusted mean numbers of different morphological forms for nouns and verbs in English, Italian, and Mandarin adult-to-child speech**

Form class	English	Italian	Mandarin
Common nouns	1·07	1·33	1·23
Main verbs	1·52	2·21	1·06

* Note that the mean standard error for these least squared adjusted means is 0·08.

differed dramatically across languages, and there was a significant interaction between language and form class, $F(2, 32) = 12·28$, $p < 0·0001$. Specifically, both English and Italian showed greater complexity for verbs than for nouns, as predicted from the fact that they are both languages with an inflectional morphology and that verbs are inflected for more different features than nouns, $ts(10) = 10·15$ and $9·48$, respectively, $ps < 0·0001$. Somewhat surprisingly, however, Mandarin also shows a difference in morphological complexity for noun and verbs, but in the opposite direction; there were more morphological variations for Mandarin nouns than there were for verbs, $t(18) = 3·99$, $p < 0·0005$.

Why should this occur in a non-inflectional language? We suggest that it is the fact that we included ALL morphological variations, changes that were a result of both inflectional and derivational processes, and that it is the large

553

number of diminutive forms used on nouns (e.g. for 'maoɪ', meaning 'cat', 'maoɪmaoɪ', 'maoɪmiɪ'), relative to verbs, in Mandarin that accounts for this difference. In contrast, although both English and Italian also have diminutive forms for nouns (e.g. 'kitty', 'kitty-cat') and use them extensively in adult-to-child speech, the differences in inflectional morphology between nouns and verbs push the difference in the opposite direction, with verbs appearing in a larger number of different forms than nouns.

There were also large differences across languages in the number of morphological variations on both nouns and verbs. Specifically, English had fewer morphological variations on its nouns than either Italian, $t(10) = 3.63$, $p < 0.001$, or Mandarin, $t(14) = 3.68$, $p < 0.001$. English also had more variations on its verbs than Mandarin, $t(14) = 10.66$, $p < 0.0001$, but fewer variations than Italian, $t(10) = 9.45$, $p < 0.0001$. Overall, these cross-linguistic differences in morphological complexity again suggest a fundamental difference in the relative treatment of nouns and verbs across the three languages. Clear differences between English and Italian also emerged on this measure. Namely, there were more morphological markings for Italian verbs than for English verbs, suggesting that, for this measure, Italian verbs appear to be more complex than either English or Mandarin verbs.

Syntactic subjects in adult-to-child speech and the issue of pro-drop

Several of the previous measures, including our analyses of nouns and verbs in the salient utterance-initial position, were hypothesized to be related to the pro-drop contrast in English versus Italian and Mandarin. Now we look directly at the pro-drop feature and examine not only the relative prevalence of common nouns in utterance-initial position, but also the prevalence of dropped subjects and other types of nominals that appear in subject position in these three languages. For all of the following analyses, a maximum of 600 utterances were coded from each transcript (range 142–600).

As expected, both Italian- and Mandarin-speaking caregivers had a high proportion of utterances in which the syntactic subjects were omitted, or dropped, with no significant differences between the mean proportion of dropped subject utterances in Italian and Mandarin. Even English-speaking caregivers dropped the subjects on roughly 35 per cent of all utterances, as is shown in Figure 2. Although English-speaking caregivers did not drop subjects as frequently as Mandarin- or Italian-speaking caregivers, they produced slightly fewer full noun subjects than caregivers who speak either of these pro-drop languages. Instead, the English-speaking caregivers tended to produce utterances in which the subjects were pronouns. Thus, where Italian and Mandarin allow the subjects to be dropped, English allows subjects to be pronominalized (see also Schnur & Shatz, 1984; Fisher & Tokura, 1995).

Although caregivers speaking all three languages tended to drop the
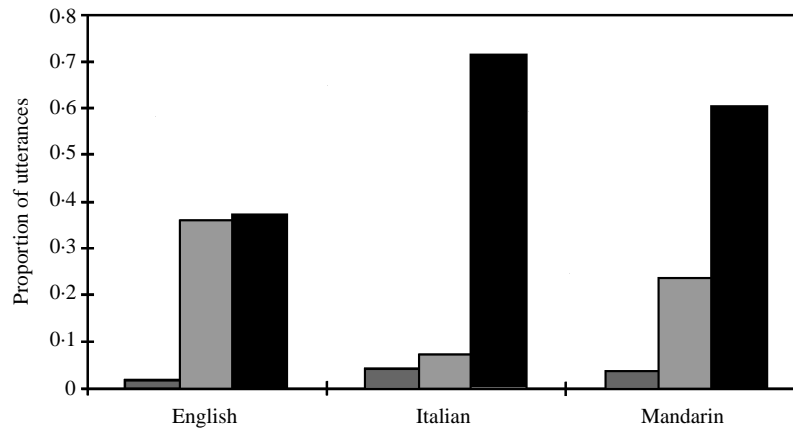
554

Fig. 2. Proportions of syntactic subjects by category in adult-to-child speech: ▨, p(Noun); ⊠, p(Pro); ■ p(Drop).

syntactic subject of an utterance in commands (from 75 to 96 per cent of the time), English-speaking caregivers were much less likely to drop the subject in interrogatives (14 per cent) or declarative statements (3 per cent). Italian- and Mandarin-speaking caregivers, however, dropped subjects in over half of their declaratives and interrogatives, as can be seen in Table 4.

A final point about the presence of pro-drop in naturalistic speech is that Mandarin uses many pronouns, even though it 'technically' does not have to. It probably uses more pronouns than Italian because Italian has verbs that are already marked for person and number, whereas this information is completely absent in Mandarin if the subject is dropped.

In sum, these data not only show how the existence of pro-drop results in some, but not all, of the predicted differences between English on the one hand and Italian and Mandarin on the other, but they also provide further evidence for how pro-drop is represented DIFFERENTLY in Italian and Mandarin. Italian has a rich inflectional paradigm and tends to drop subjects completely. Mandarin, however, has a relatively bare inflectional paradigm and thus drops subjects with high frequency but also includes many pronominalized-subject utterances.

Pragmatic functions and focus of interrogatives

Even when we equated across speakers for the total number of adult-to-child utterances, the Italian-speaking caregivers produced fewer interrogatives than did the English- or Mandarin-speaking caregivers, $F(2, 19) = 4·82$, $p < 0·05$, $t(10) = 2·77$ and $t(14) = 2·72$, respectively, ps $< 0·05$. Thus, the analyses of interrogative functions will be based on a proportion of each interrogative type as a function of the total number of interrogatives for each speaker.

TABLE 4. *Mean proportions of syntactic subjects by category for different utterance types in English, Italian, and Mandarin adult-to-child speech*

Language	Subject type	Commands	Declaratives	Interrogatives
English	Noun	0·003	0·041	0·007
	Pronoun	0·036	0·856	0·192
	Displaced pro†	0·000	0·010	0·586
	Dropped	0·934	0·034	0·143
Italian	Noun	0·000	0·068	0·064
	Pronoun	0·003	0·115	0·108
	Displaced pro	0·000	0·041	0·072
	Dropped	0·963	0·602	0·588
Mandarin	Noun	0·002	0·067	0·051
	Pronoun	0·189	0·229	0·302
	Displaced pro	0·010	0·016	0·020
	Dropped	0·750	0·538	0·535

† *Note to Table* 4. 'Displaced pro' refers to all pronominal subjects that are not in canonical subject position. An example would be an inverted subject in an English interrogative, such as 'Do you want some?'

When the interrogatives were coded for pragmatic function, we found a very clear language by interrogative type interaction, $F(8, 95) = 8·42$, $p < 0·0001$. In particular, there were large differences in the proportion of test questions that were asked. As can be seen from Table 5, a full 50 per cent of the Italian-speaking caregivers' interrogatives were coded as test questions, probing the child for information that the adult already knows. In contrast, only about one quarter of the Mandarin- and English-speaking caregivers' interrogatives could be considered test questions, and these proportions were significantly lower than the proportion of test questions asked by the Italian-speaking caregivers, $t(10) = 5·71$ and $t(14) = 5·41$, respectively, $ps < 0·0001$.[8] Instead, the Mandarin- and English-speakers had a relatively high proportion of real questions – interrogatives about information that the caregiver does not already have. In fact, real questions were the most frequent interrogative type for the English-speaking caregivers, whereas they were one of the least frequent types for the Italian-speaking caregivers. Finally, the Italian-speaking caregivers did not ask their children any tag questions, whereas the English- and Mandarin-speaking caregivers did ask some, and the difference

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[8] Despite the fact that the Mandarin- and English-speaking caregivers produced twice as many utterances and many more interrogatives, on average, than the Italian-speaking caregivers, the raw number of utterances coded as test questions was still higher for the Italian-speakers ($M = 48·5$, S.D. $= 17·6$) than for the Mandarin-speakers ($M = 36·6$, S.D. $= 20·6$) or English-speakers ($M = 33·0$, S.D. $= 18·4$), $t(14) = 5·21$, $t(10) = 5·21$, respectively, $p < 0·001$.

TABLE 5. *Mean proportions of interrogatives by pragmatic function for English-, Italian- and Mandarin-speaking caregivers*

Language	Directives	Real questions	Test questions	Action reflectives	Verbal reflectives	Tags
Mandarin	0·11	0·18	0·26	0·14	0·16	0·15
English	0·19	0·25	0·22	0·15	0·11	0·08
Italian	0·14	0·08	0·50	0·18	0·10	0·00

* Note that the mean standard error for these least squared adjusted means is 0·09.

between the Italian- and Mandarin-speaking caregivers' proportions of tag questions was significant, $t(14) = 3.52$, $p < 0.001$.

The difference in the number of tag questions that parents ask their children can be predicted from the fact that Italian is a richly inflected pro-drop language and, as such, should not have any copular tag questions (Hyams, 1986, 1989). However, the difference in test questions seems to be determined by more situational or cultural factors than by the linguistic structure of Italian.

A final set of issues concerns what information parents were trying to draw out of their children. Table 6 presents the mean proportions of test questions that focused on object actions and properties, object labels, person actions and properties, person labels, and past events as a function of the total number of test questions.

There was an interaction between language and the pragmatic focus of caregivers' test questions, $F(10, 114) = 3.95$, $p < 0.0001$. Mandarin-speaking caregivers asked more test questions about objects' labels than about their actions, $t(18) = 2.64$, $p < 0.01$. Similarly, they asked more questions about people's names than about what they were doing, $t(18) = 2.46$, $p < 0.05$. Moreover, the Mandarin-speaking caregivers asked significantly fewer test questions about the actions of objects than either the English- or the Italian-speaking caregivers, $ts(14) = 3.71$ and 2.13, $ps < 0.0005$ and < 0.05, respectively. They also asked significantly more questions about people's names than either the English- or the Italian-speaking caregivers, $ts(14) = 3.84$ and 3.00, respectively, $ps < 0.0005$.[9]

[9] Note that this trend is consistent across all question types, in that the Mandarin-speaking caregivers asked very few questions at all about actions and states. Moreover, when just 'action' questions are considered, the trend is even more obvious – only one action-oriented test question was asked across the entire sample of 10 Mandarin-speaking caregivers, whereas 10 action-oriented questions were asked across the sample of six English-speaking caregivers, and 36 action-oriented test questions were asked across the sample of six Italian-speaking caregivers.

557

TABLE 6. *Mean proportions of various question foci in English-, Italian- and Mandarin-speaking caregivers' test questions*

Language	Object actions and properties	Object labels	Person actions	Person labels	Past events
Mandarin					
Mean	0·18	0·29	0·16	0·33	0·04
S.D.	(0·15)	(0·22)	(0·09)	(0·27)	(0·09)
English					
Mean	0·47	0·36	0·03	0·03	0·11
S.D.	(0·23)	(0·30)	(0·05)	(0·03)	(0·14)
Italian					
Mean	0·28	0·39	0·19	0·10	0·05
S.D.	(0·12)	(0·15)	(0·15)	(0·10)	(0·08)

Whether these differences reflect underlying biases about the types of test questions one should pose and the interactions one should have with language-learning toddlers in these three cultures or whether they are reflective of differences in the circumstances under which the observations were made for these three samples is uncertain from these data. However, it is an issue worth considering in future studies and, again, is not something that would have been predicted from the formal structure of these three languages. The fact that the Mandarin-speaking caregivers would focus more on labels rather than actions in their test questions does not support the general trend towards emphasizing verbs in Mandarin adult-to-child speech.

Children's responses to adult interrogatives

Because there were significant differences across languages and large variations in the number of interrogatives that individual caregivers asked of their children, the following analyses all include the total number of adult interrogatives as a covariate. Moreover, we use proportional measures of the children's response types as a function of the total number of responses to adult interrogatives, rather than the raw number of responses, in order to address issues of variation in responsivity of individual children.

Across all three languages, the most common response to any type of interrogative was not a noun or a verb, or even a noun or verb phrase. Instead, it was some sort of 'other' response which included such things as 'yes' and 'no', interjections to this effect, adjectives, and other responses, $F(6, 112) = 3·08$, $p < 0·01$ for a 3×7 ANCOVA comparing across seven response types (proper names, common nouns, noun phrases, verbs, verb phrases, 'other' types of responses, and responses that included both nouns and verbs) for the three languages. There were no differences, however,

between nouns and verbs, noun phrases and verb phrases, or even a combined measure of all noun versus all verb responses for interrogatives in general. For real questions, such as 'Want more juice?', the most common response was also 'other' and there were no significant differences between noun and verb responses, either within or across the three languages. Thus, the present data do not support the hypothesis that Mandarin-speaking children's relatively high frequency of verbs in spontaneous speech is due solely to their using verbs in response to adult-to-child questions such as '*yao4 bu2 yao4 he1*' ('want-not-want to drink')? First, when these types of repetitions were excluded from our measures of their productive vocabularies, the Mandarin-speaking children showed no evidence of a noun bias. Secondly, even when these types of responses were included and we examined their responses to adult questions, the Mandarin-speaking children were no more likely to use verbs than the English- or Italian-speaking children, even though the structure of many common interrogatives in Mandarin would appear to privilege a verb response.

For test questions, nouns emerged as the dominant response type across all three languages. Looking at the proportion of responses that involved nouns versus verbs and excluding all responses that included both types of words or other categories, we found a significant main effect for form class in a 3×2 ANCOVA, controlling for the total number of test questions asked, $F(1, 30) = 5.62$, $p < 0.05$. Specifically, there were significantly more noun responses than verb responses, and these differences were significant for the English- and Italian-speaking children (English Noun $M = 0.35$ vs. Verb $M = 0.04$; Italian Noun $M = 0.52$ vs. Verb $M = 0.12$, MSE $= 0.20$ for the adjusted mean proportions), $ts(10) = 2.56$ and 3.19, $ps < 0.01$ and 0.005, respectively. The Mandarin-speaking children also tended to produce more nouns ($M = 0.24$) than verbs ($M = 0.08$), although this difference failed to reach significance in a post-hoc test of the difference between these means.

There were no language by form class interactions, regardless of whether just nouns and verbs or noun phrases and verb phrases were compared, providing no evidence for the suggestion that test questions prompt different responses across the three languages. Thus, although there are indeed differences in the types of questions that adults ask their children in English, Italian, and Mandarin, there do not appear to be any obvious differences in children's responses GIVEN a particular pragmatic question focus. In sum, the differences in the proportions of nouns and verbs in children's early vocabularies cannot be accounted for by a simple appeal to differences in the children's responses to adult-to-child questions. Mandarin-speaking children, like English- and Italian-speaking children, hear many test questions about objects and respond to those questions largely with nouns and object labels, rather than verbs. In their replies to other types of questions, they also do not differ from English- or Italian-speaking children. Instead, it is in their

spontaneous productive speech that they differ. However, whether or not the Mandarin-speaking children actually learn more verbs because their language provides them with a convenient frame for responding to questions with a simple verb is an entirely separate matter that was not dealt with in the present analyses.

GENERAL DISCUSSION

Table 7 presents a summary of the findings from the measures examined in this study. Clearly, English, Italian, and Mandarin adult-to-child speech differ on a number of dimensions. In particular, they differ with respect to the relative frequency of noun and verb types and tokens, the frequency with which nouns and verbs appear at the end of an utterance, the number of morphological markings on noun and verb stems, and, finally, the pragmatic focus of test questions. Moreover, all but one (*viz.* pragmatic focus) of these differences are in directions that are congruent with differences in the proportions of nouns and verbs in children's early spontaneous productions in these languages.

Specifically, English adult-to-child speech tends to emphasize nouns (by placing them in utterance-final position, having fewer morphological markings on noun stems, and asking questions about objects), whereas Mandarin tends to emphasize verbs (by producing verb types and tokens much more frequently than noun types and tokens, placing verbs in utterance-final position, and having fewer morphological variations on verbs than nouns). Italian falls, to some extent, in between. On the one hand, Italian utterances, like those in Mandarin, are more likely end in verbs than are English adult-to-child utterances. On the other hand, unlike Mandarin, Italian shows no difference in the probability that nouns or verbs will appear at the end of an utterance. Moreover, like English, Italian emphasizes nouns by having fewer morphological markings on nouns than verbs, by having a large number of test questions about objects, and by showing no disproportionate frequencies for verb types or tokens as seen in Mandarin. Thus, even though Caselli *et al.*, (1995) have suggested that Italian should emphasize verbs, the actual input that children hear does not accord with these predictions. Instead, Italian-speaking children hear an overall pattern of linguistic input that looks more like English than like Mandarin. Thus, it is not too surprising that Italian-speaking children, like English-speaking children, tend to have a predominance of nouns, and not verbs, in their early vocabularies.[10]

[10] Again, we note that neither the pattern of adult-to-child speech nor the children's vocabulary data can be accounted for by the initial differences in the children's MLU, since the English- and Italian-speaking children are furthest apart in terms of MLU, but closest in terms of both the input and the children's vocabulary data.

TABLE 7. *Summary of findings on the relative emphasis of nouns and verbs in adult-to-child speech for English, Italian, and Mandarin*

Measures	English	Italian	Mandarin
Frequency			
(I) Types	$N = V$	$N = V$	$\mathbf{N < V}$
			Mandarin > E, It
(II) Tokens	$N < V$	$N < V$	$\mathbf{N < V}$
			$M >$ It, Eng
Salience			
(II) Endings	$N > V$	$N = V$	$N < V$
Morphological complexity			
(III) Form variety	$N > V$	$N > V$	$N < V$
Question response	$N > V$	$N > V$	$N \geqslant V$

* Note that each of the ' > ' or ' < ' symbols represents a significant difference between nouns and verbs for that language. The direction of the symbols represents which form class, nouns or verbs, is EMPHASIZED, and not necessarily the directions of the raw scores. Significant differences across languages are represented by bold-faced symbols.

What, then, are the relations between the structural characteristics and the properties of adult-to-child speech in these languages? It might seem from our presentation of the Italian results, above, that there is a minimal relation between the formal structure of these languages and the tendency to emphasize nouns and verbs in the input. In fact, we believe that our results demonstrate exactly the opposite. That is, Italian and Mandarin are both pro-drop languages, but for different reasons. It is this difference in HOW they both license null subject utterances that is responsible for the differences we see in the input (i.e. Italian because of its rich and complete agreement paradigms, and Mandarin because of its total lack of agreement). Moreover, the fact that English and Italian are both inflected languages, but Italian is more completely inflected, also accounts for difference in the relative complexity of verbs between English and Italian.

There are two aspects of adult-to-child speech that are not accounted for, however, by the obvious structural features of these three languages. First, is the overwhelmingly disproportionate number of verb tokens in Mandarin, relative to both English and Italian. Perhaps the dropping of objects in Mandarin can account for some of this, but probably not all of it. Secondly, is the pragmatic focus of adult-to-child interrogatives. There is no reason, structurally, why English- and Italian-speaking caregivers would choose to focus their test questions on objects almost exclusively and Mandarin-speaking caregivers would choose to focus on objects no more often than they focused on questions about people. However, these results suggest that there may be broader cultural differences in caregivers' focus of interaction with their language-learning children.

561

Returning to the original motivations for the present study, when one tries to infer from these data whether there might be a direct and causal relationship between the input and children's use of nouns and verbs in their early spontaneous speech, we find mixed results. Of the four input factors that we examined, none is completely consistent with a pattern of noun and verb vocabulary learning that places English and Italian together with a tendency towards nouns and Mandarin in a separate category with roughly balanced tendencies towards both nouns and verbs. Nonetheless, our findings on these factors are consistent with the cross-linguistic patterns of vocabulary development. Each of them, as mentioned above, is suggestive of relevant relations between input and acquisition, although our study was not designed to address the question of which factors are either 'necessary' or 'sufficient' (Richards, 1994, p. 77) to account for the child data. Rather, it was designed to search for evidence for a feasibility argument concerning the structural influences of different languages.

Thus, our findings are informative for the general debate on whether input could have an effect on children's early vocabulary development, particularly with respect to the large proportions of nouns in many children's early vocabularies. They suggest that there are several specific factors in the input which must be taken into account. No one factor in the input determines, precisely, the proportions of nouns and verbs in children's early vocabularies, nor are input factors combined likely to determine these proportions fully. Rather, the effects are likely to be complex and may not be parallel for children learning different languages or at different stages of vocabulary learning. Moreover, it is possible that something more subtle is involved: for instance, that all of these factors combined merely give the child an impression of which language is being learned and the relative role of nouns and verbs in that language.[11] But even this latter possibility is an argument that goes beyond predispositions.

The conclusion that we would draw from the present data is simply that input matters and that, when examined carefully, there appears to be little support for the argument that the input is inconsistent with the proportions of nouns and verbs in children's early vocabularies (cf. Gentner, 1982; Caselli *et al.*, 1995) – at least for the three languages that were investigated in the present study. Which of these and other input variables are MOST important or how, precisely, they may have their effects on child language remain topics for further cross-linguistic and individual-differences research with larger samples and under more controlled situations. Nonetheless, the present data suggest that the most productive question is no longer whether the noun bias exists or whether input can affect the noun bias, but rather how

[11] We thank an anonymous reviewer for suggesting this possibility.

children integrate both internal and external factors when learning their early words.

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APPENDIX

INTERROGATIVE CODING CATEGORIES (ADAPTED FROM MCDONALD & PIEN, 1982)

Directives (*action*, *label*, *phrase*, *attend*)

Can you push it?
Can you say 'bear'?
What do you say? (thank-you).
Hear the bells?

Real questions

Are you hungry?

Test questions

What's that? (object label).
What sound does a cat make? (object action).
Who's that? (person label).
Where's daddy? (person state).
How many wheels does it have? (object property).

Verbal reflective questions

Any expansions, repetitions, etc. that incorporate part or all of a child's utterance. (child says door).
Oh, do you want the door opened?

Action reflective questions – about ongoing activities (child, object, or other people)

Is he going byebye too? (commenting on child's action).

Tags

Isn't it?

565