

Article

Information Structure and Word Order Preference in Child and Adult Speech of Mandarin Chinese

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Abstract: The acquisition of appropriate linguistic markers of information structure (IS), e.g., word order and specific lexical and syntactic constructions, is a rather late development. This study revisits the debate on language-general preferred word order in IS and examines the use of language-specific means to encode IS in Mandarin Chinese. An elicited production study of conjunct noun phrases (NPs) of new and old referents was conducted with native Mandarin-speaking children (N = 24, mean age 4;6) and adults (N = 25, mean age 26). (The age of children is conventionally notated as years;months). The result shows that adults differ significantly from children in preferring the “old-before-new” word order. This corroborates prior findings in other languages (e.g., German, English, Arabic) that adults prefer a language-general “old-before-new” IS, whereas children disprefer or show no preference for that order. Despite different word order preferences, Mandarin-speaking children and adults resemble each other in the lexical and syntactic forms to encode old and new referents: bare NPs dominate the conjunct NPs, and indefinite classifier NPs are used for both the old and the new referents, but when only one classifier phrase is produced, it is predominantly used to refer to the new referents, which suggests children’s early sensitivity to language-specific syntactic devices to mark IS.

Keywords: information structure; child language acquisition; Mandarin Chinese; word order

1. Introduction

Children acquire the core components of a language (e.g., phonology, morphology, and syntax) based on experience with the ambient language by the age of four or five years (e.g., Hoff 2009). However, their knowledge of information structure (IS)—adapting the production of language to the appropriate informational needs of the interlocutors and specific speech contexts—tends to lag behind (e.g., Höhle et al. 2016). An important dimension of IS or information packaging (Chafe 1976) involves a distinction between “old” or “given” information (recently activated information, e.g., a referent mentioned in previous discourse) versus “new” information (e.g., a referent introduced for the first time) (Birner and Ward 2006). Bock et al. (2004) suggest that speakers’ choice of ordering information that is old versus new in discourse is influenced by conceptual prominence, i.e., which information is activated and accessible at the time of speaking in discourse. However, they also reason that, paradoxically, conceptual prominence could also be associated with new information that involves novelty and change, leading it to be mentioned first.

Previous studies of adult language production show that adult speakers typically order old referents before mentioning new referents when communicating with their interlocutors (Arnold et al. 2000; Bock and Irwin 1980; Ferreira and Yoshita 2003). Research findings in child language are inconclusive, suggesting that children prefer “old before new” (Stephens 2010), “new before old” (Bates 1976; MacWhinney and Bates 1978), or exhibit no significant ordering preference (MacWhinney and Bates 1978). Research on the acquisition of IS is still comparatively scarce (Höhle et al. 2016), and little is known about when children acquiring different languages develop adult-like use of linguistic devices to encode old versus new information. Recent studies using an experimental paradigm of elicited conjunct NPs suggest an early cognitive or communicative tendency influencing children’s production crosslinguistically. Children exhibit a preference for the “new-before-old” order in languages such as German (Narasimhan and Dimroth 2008), Spanish (Ceja Tel Toro et al. 2016), and Arabic (Semsem and Chen 2019), in contrast to adult speakers of these languages who exhibit the opposite preference for “old-before-new” word order. However, an elicited production study of conjunct NPs in English-speaking children (mean age 4;4, age range 3;10–5;1) show that English-speaking children do not show a significant preference for the “new-before-old” word order; however, they are less likely to employ the “old-before-new” word order compared to adults (Chen and Narasimhan 2018). From a psycholinguistic perspective, the age-related differences may be explained in terms of the influence of different facets of conceptual prominence on word order in conjunct NPs: adults prefer to mention accessible, easily retrievable, information first, whereas children lack this preference and may even prefer to highlight novel information first.

This study revisits the preference for the “old-before-new” or “new-before-old” word order in IS and examines how it is manifested in the speech of child and adult speakers of Mandarin Chinese (henceforth Mandarin). If adult Mandarin speakers are guided by a language-general bias stemming from conceptual prominence—i.e., for mentioning old information before new in adult language production—they are predicted to prefer the “old-before-new” word order (e.g., Arnold et al. 2000; Bock and Irwin 1980; Ferreira and Yoshita 2003). Turning to acquisition, if the previously observed preference for the “new-before-old” word order in children is a language-independent bias influencing children’s production crosslinguistically, we would expect Mandarin children to exhibit a “new-before-old” preference (as was found in children acquiring German, Spanish, and Arabic). However, if children’s ordering preference is also influenced by the language-specific discourse properties of the target language, children acquiring Mandarin may be more similar to their adult counterparts in preferring to use the “old-before-new” word order. Mandarin has a canonical SVO (Subject-Verb-Object) word order, and word order variation is allowed to a certain extent (Li and Thompson 1981). Typologically, it is known as a discourse-prominent language with prevalence of topic-comment structure and a morphologically impoverished language that does not have overt morphological markers for old versus new information (Li and Thompson 1981). Information that is “old” is frequently omitted if retrievable from the speech context, e.g., arguments and adjuncts whose referents are “given” in the discourse-pragmatic context. Syntactic positioning has also been argued to reflect information structure. For example, information focus is typically located in the sentence final position (Xu 2004). Because topic is often correlated with old information and focus is correlated with new information (e.g., Von Steutterheim and Klein 2002), adult Mandarin speakers may be more likely to reserve the sentence-final position for new information and either omit old information or mention the information in sentence-initial position.

The developmental study of Mandarin, therefore, provides a new testing ground for the interplay between language-specific encoding of IS and cognitive or communicative biases for IS in adults and children. The findings will shed light on whether the “old-before-new” preference in adults and “new-before-old” preference in children is a universal pattern or whether information status influences word order differently in speakers of different ages and languages.

2. Materials and Methods

Against the theoretical and empirical background described above, our study specifically explores the nature of age effects on the linguistic encoding of IS, namely, word ordering preferences, by asking: how do monolingual Mandarin-speaking children and adults order “old” and “new” referents in conjunct NPs? Conjunct NPs (e.g., a book and a flower) were chosen, as they are simple to produce and allow for information status to be manipulated in noun phrases that do not otherwise differ in topicality or semantic or grammatical role.

The specific research questions that we are examining are the following:

1. How are “old” and “new” referents ordered in conjunct NPs in the speech of Mandarin-speaking children and adults?
2. Is the “old-before-new” order a natural preference in adult language crosslinguistically?
3. Is the “new-before-old” preference a cognitive bias in child language, or is it modulated by the possibility for pragmatically driven word order variation in the target language?

2.1. Participants

An elicited production study of conjunct NPs was conducted, following the paradigm adapted from [Narasimhan and Dimroth \(2008\)](#). Two groups of native Mandarin speakers, 25 adults (mean age 26, age range 19–32, 11 females) and 24 children (mean age 4;6, age range 4;0–5;5, 13 females) were recruited and participated in the elicitation task in China.

2.2. Stimuli

The stimuli were composed of a total of 30 trials, including 4 warm-ups, 12 target trials, and 14 filler trials. The trials consisted of colored pictures of commonly encountered inanimate objects presented singly or in pairs on slides on a laptop. The pictures of the object pairs in the 12 target trials were matched in color and size. To avoid potential spatial bias that might affect the ordering of the nouns, the object pairs in all the trials appeared simultaneously and moved randomly across the laptop screen, and the spatial locations of the initial occurrence of the two objects (old versus new) were also counterbalanced.

The 12 target pairs of objects and their Mandarin labels are shown in [Table 1](#). The names of the objects in the target trials (i.e., 24 target nouns) were matched on the number of syllables and frequency of use based on two longitudinal child-caregiver corpora (children’s age range: 1;4–3;4), including the Tong corpus ([Deng and Yip 2018](#)) and Beijing corpus ([Tardif 1996](#)) in the CHILDES database ([MacWhinney 2000](#)). The target nouns were also checked against the word list in the Mandarin Early Vocabulary Inventory ([Hao et al. 2008](#)) to ensure that they occur as part of the early productive vocabulary of monolingual Mandarin-learning children. The names of the target objects were also controlled for phonological (e.g., syllable weight) and semantic similarities. To control for any effects of the salience of individual objects, the object introduced first in each target pair (i.e., the “old” referent) was counterbalanced across subjects (i.e., object 1 presented first versus object 2 presented first). The target and filler stimuli, the test trials, and the presentation order of the test trials were randomized and counterbalanced into four different orders, and participants were randomly assigned to one of the orders.

Table 1. Labels for target object pairs in stimuli.

	Object Label 1			Object Label 2		
1	书	<i>shu</i>	“book”	花	<i>hua</i>	“flower”
2	钟	<i>zhong</i>	“clock”	碗	<i>wan</i>	“bowl”
3	气球	<i>qiqiu</i>	“balloon”	蜡笔	<i>labi</i>	“crayon”
4	杯子	<i>beizi</i>	“cup”	鞋子	<i>xiezi</i>	“shoe”
5	钥匙	<i>yaoshi</i>	“key”	扣子	<i>kouzi</i>	“button”
6	帽子	<i>maozi</i>	“hat”	鸡蛋	<i>jidan</i>	“egg”
7	饼干	<i>binggan</i>	“cookie”	瓶子	<i>pingzi</i>	“bottle”
8	树	<i>shu</i>	“tree”	床	<i>chuang</i>	“bed”
9	桌子	<i>zhuozi</i>	“table”	勺子	<i>shaozi</i>	“spoon”
10	汽车	<i>qiche</i>	“car”	椅子	<i>yizi</i>	“chair”
11	苹果	<i>pingguo</i>	“apple”	铅笔	<i>qianbi</i>	“pencil”
12	盘子	<i>panzi</i>	“plate”	衬衫	<i>chenshan</i>	“shirt”

Labels for the target objects are shown in Chinese characters and Pinyin, the official Romanized transcription of Chinese characters, followed by English translations in quotation marks.

2.3. Procedure

Each participant watched the stimuli one by one in a slide show on a laptop individually in a quiet room with an experimenter. The experimenter played the slide show and thus was able to see the laptop screen. Within each of the 12 target pairs, one of the objects was presented first; the participant had to name the object that he/she had seen; and the experimenter repeated once the name of the object that the participant provided (the “old” referent). Then, the second object (the “new” referent) appeared simultaneously with the first object in the following slide. The participant was asked what he/she had seen on the screen. With the child participants, this procedure was slightly adapted in a child-friendly manner to keep them engaged. The experimenter introduced a stuffed animal at the beginning of the task, a toy teddy bear, who could not see the slide and wanted to know what the child had seen on the screen. Each child was first invited to make friends with the teddy bear by patting it. Then, she or he (henceforth “she”) was asked if she would like to help the teddy bear learn what she had seen. All the children agreed. All the elicitation sessions were audio recorded.¹

2.4. Data Treatment

The participants’ responses to the target trials were transcribed in simplified Chinese characters following the Codes for the Human Analysis of Transcripts (CHAT) convention (MacWhinney 2000) and coded for the ordering of the referents: (1) n/o: new referent before old; (2) o/n: old referent before new; and (3) missing responses. The total number of target responses was 551, including 300 (12 target trials × 25 adults) from the adults and 251 from the children, excluding 37 missing responses from the 288 expected responses (12 target trials × 24 children) due to PowerPoint failure during the experiment.

¹ Although the children were asked to provide information about what they saw on the computer screen to the teddy bear toy who could not see the screen, they did share visual access to the screen with the experimenter. Informal observations of the children during the experiment indicate that most children tended to look at the experimenter when describing what they saw on the screen and did not often pay attention to, or interact with, the teddy bear. The same procedure with a toy teddy bear was employed with the English-learning children (Chen and Narasimhan 2018). But in the study of German-learning children (Narasimhan and Dimroth 2008), upon which the current study is based, the interactional situation differed from the present study and the study with children acquiring English. In that study, the child and adult participants also shared access to the screen with one experimenter as in the current study. But they interacted mainly with a second experimenter who could not see the screen and who engaged the participant by matching the participant’s description (e.g., apple and spoon) with the corresponding picture (from a set of pictures they had available). Despite these differences, the information status of the referents was similar in all three studies in terms of newness in the discourse: the first object of the paired objects in each target trial is discourse-old (labeled and repeated prior to presentation of the target trial containing the pair of objects) and the second object is discourse-new for the participants as well as the experimenters with whom the participants interacted.

3. Results

3.1. Word Order Preference

Figure 1 presents the mean proportions of the “old-before-new” and the “new-before-old” word orders in the adult and the child speech, respectively. The adults showed an overall preference for the “old-before-new” word order: 82.33% “old-before-new” responses in contrast to 17.67% “new-before-old”. The children, on the other hand, showed a reduced preference for the “old-before-new” order (mean proportion 55.07%) and a much higher use of the “new-before-old” order (mean proportion 44.93%) than the adults.

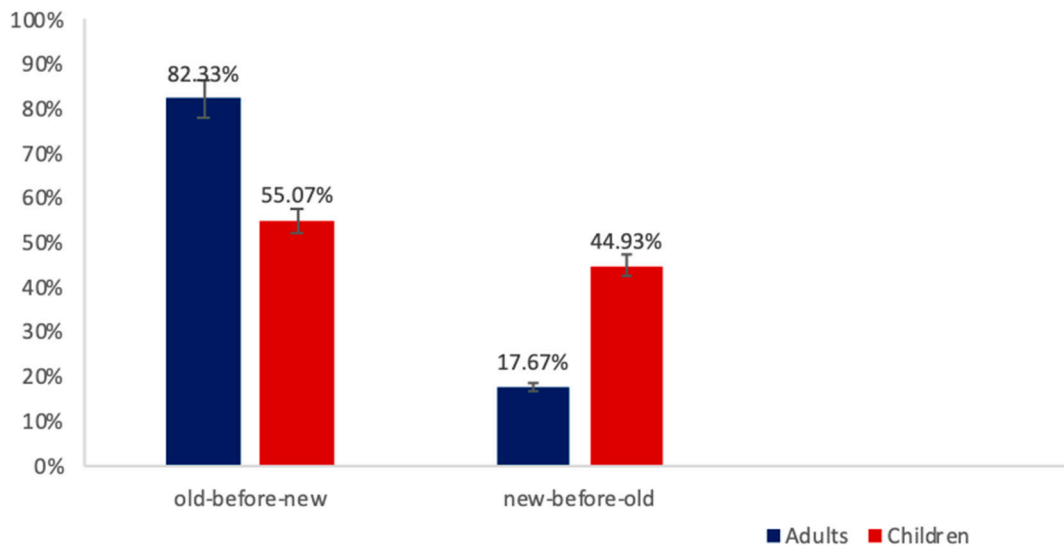


Figure 1. Mean proportions of the “old-before-new” and the “new-before-old” responses in Mandarin child and adult speech.

The adults also showed less variation in word order preference than the children. As shown in Figure 2, the majority, 88% (22 out of 25) of the adults, preferred the “old-before-new” order (with percentages of “old-before-new” response rates ranging from 67% to 100%), and 68% (17 out of 25) of them predominantly used the “old-before-new” (with percentages of “old-before-new” rates ranging between 83% and 100%). In contrast, the children exhibited much greater variation in their responses. As shown in Figure 3, children’s percentages of “old-before-new” responses varied between 25% and 100%. Further, 58% (14 out of 24) of the children exhibited a low preference for the “old-before-new” order (with percentages of “old-before-new” responses ranging between 25% and 44%), 29% (7 out of 24) of the children preferred the “old-before-new” order (with percentages of “old-before-new” responses ranging between 78% and 100%), and 13% (3 out of 24) of the children were at chance level.

Even given the individual variation among children, there may be some developmental trends. For instance, older children may be more likely to employ the adult-like “old-before-new” word order compared with younger children. A further examination of the results shows only partial support for this possibility. The seven children who preferred the “old-before-new” order (i.e., children 18–24 in Figure 3) were relatively older, mean age 4;7 (age range 4;4–5;4), and the youngest five children (four 4;0-year-olds and one 4;1-year-old) showed a low preference (mean proportion 38.9%) for the “old-before-new” word order. However, some of the older children (e.g., children 3, 5, 9, 13, and 14, age 5;0 and above) did not prefer the “old-before-new” word order, whereas some younger children (e.g., children 19, age 4;4) preferred that word order (see Figure 3).

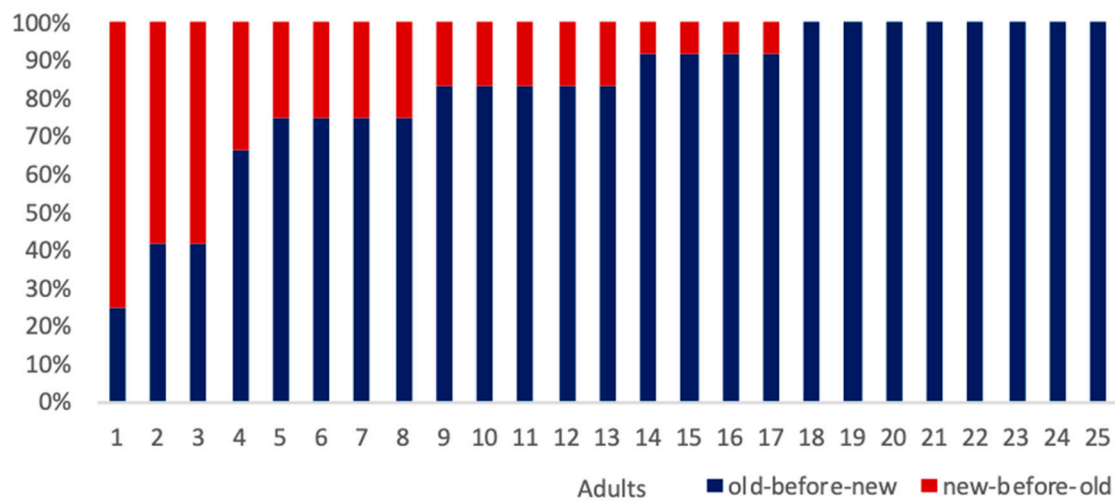


Figure 2. Mean proportions of “old-before-new” and “new-before-old” responses by adult.

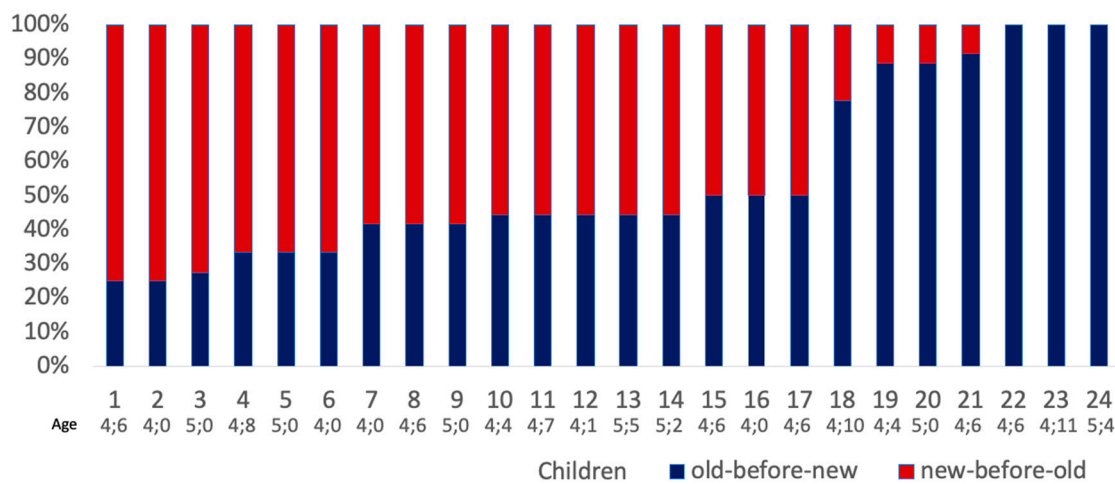


Figure 3. Mean proportions of “old-before-new” and “new-before-old” responses by child.

The descriptive results above reveal a strong and consistent preference for the “old-before-new” order in Mandarin adult speech, but a much weaker and varied preference in the child speech. In order to examine whether the children and the adults differed significantly in their responses, a logistic regression analysis was conducted with age as the predictor variable and word order as the outcome variable. The results show a significant effect of age: children were significantly less likely to use the “old-before-new” word order than were adults (82.33% versus 55.07%, $\beta = 1.371, p < 0.000$; see Table 2). A chi-square test further reveals that the children did not show a preference for the “new-before-old” either because the preference for either word order does not differ from chance ($X^2(20, N = 251) = 26.455, p = 0.151$).

Table 2. Effects of age on the choice of “old-new” versus “new-old” order in children and adults.

	Estimate	Std. Error	Z Value	p Value
(intercept)	0.354	0.168	4.469	0.035 *
Age: child	1.371	0.198	47.806	0.000 ***

(Asterisk is used conventionally to indicate degree of significance: * means $p \leq 0.05$; ** means $p \leq 0.01$; and *** means $p \leq 0.001$).

As our study is essentially a free naming/description task, both the adults and the children exhibited variation in their responses from the expected target forms (e.g., 一朵花和一本书, *yi duo hua*

he yi ben shu, “one CLF flower and one CLF book” (CLF = classifier) or 书和紫色的花, *shu he zise de hua*, “book and purple flower” instead of the target noun forms 书和花, *shu he hua*, “book and flower”). Prior studies show that word order is influenced by factors other than information status, including the “weight” or length of noun phrases. In many languages, noun phrases that are longer (e.g., they contain more words or syllables) tend to be placed last, e.g., the “heavy NP shift” in English (Arnold et al. 2000). Here, we performed a post-hoc analysis to investigate whether the second nominal in the conjunct NP tends to be heavier than the first nominal, and whether information status interacts with the weight of noun phrases in influencing ordering preferences. To address this question, the number of the syllables for each of the NPs in the conjunct NPs were extracted by the Computerized Language ANalysis (CLAN) program (MacWhinney 2000) and categorized by the combinations of syllable numbers in the first and the second NPs (e.g., syllable1 + 1, syllable2 + 1, etc.).

The results show that the number of syllables of each nominal in the conjunct NPs range widely from 1 to as high as 11. However, 84% of the adults’ and 85% of the children’s conjunct NPs were composed of words with only one or two syllables, and complex NPs or multisyllabic nouns with more than 3 syllables were infrequent in both the child and the adult speech. The comparison of the weight of the first and the second nominals shows that the majority of the nominals in the conjunct NPs had the same weight (i.e., contain the same number of syllables) for both the children (58.17%) and the adults (68.33%). Further, two-syllable words were the most frequent for the children (69.23%) and the adults (61.64%) in the set of conjunct NPs with equally weighed noun phrases. This pattern suggests that the length of the referents does not affect the ordering of the nouns or NPs in the majority of the conjunct NPs.

We further looked into the conjunct NPs that have nominals with unequal weights. Figure 4 summarizes the mean proportions of conjunct NPs with a longer first nominal (HL = heavy-light) and a longer second nominal (LH = light-heavy) in the “old-before-new” versus “new-before-old” word orders in the child and the adult speech, respectively. It shows that the adults used HL and LH similarly frequently for the “old-before-new” (81.82% versus 80.39%) and the “new-before-old” (18.18% versus 19.61%) orders. A similar pattern was found in the child speech: 48.15% HL and 58.82% LH in the “old-before-new” order, and 51.85% HL and 41.18% LH in the “new-before-old” order. To summarize, the weight of the nominals in the conjunct NPs does not appear to affect the ordering of the old and the new referents in the child and the adult speech, as indicated by (1) the dominance of equal-weight nouns or NPs and (2) the similar frequency distribution of heavier or lighter first nouns or NPs in the “old-before-new” and the “new-before-old” orders (see Figure 4).

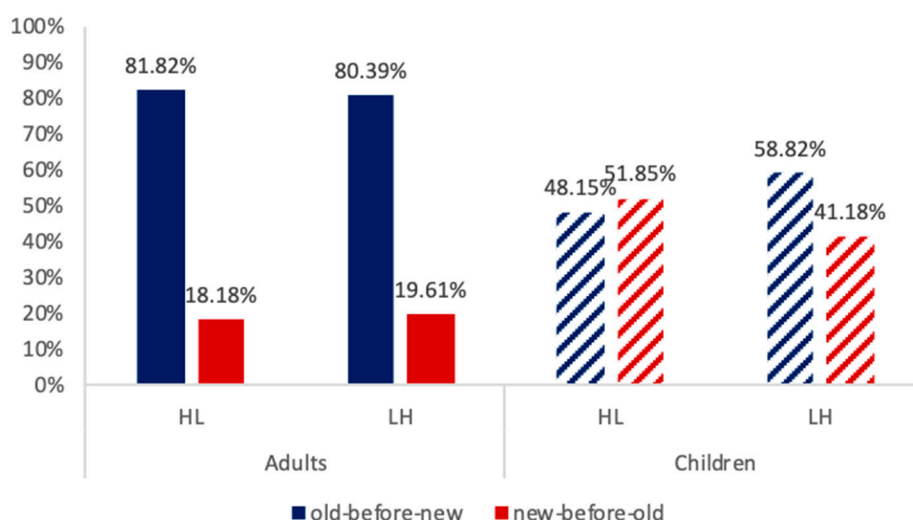


Figure 4. Mean proportions of heavy-light (HL) and LH (light-heavy) conjunct NPs by information structure (IS) in child and adult speech. (HL = first nominal with a heavier weight than the second noun or NP; LH = second nominal with a heavier weight than the first noun or NP).

3.2. Lexical and Syntactic Features of the Conjunct NPs

We further analyzed the lexical and syntactic features of the conjunct NPs to see if adults and children use lexical or syntactic means other than word order to distinguish between old and new referents in the conjunct NPs. All the nominals for the 12 target trials (300 from the adults and 251 from the children) were further coded for the response types based on the actual forms produced in the adult and the child speech: (1) bare nouns (both nouns are bare, e.g., 书和花, *shu he hua*, “book and flower”), (2) classifier NP (at least one of the two NPs involve a classifier, e.g., 一本书和花 *yi ben shu he hua*, “one CLF book and flower”), (3) NP with a modifier (at least one of the NPs involves a modifier such as an adjective, 红书和花, *hongshu he hua*, “red book and flower”), and (4) nominalized verb phrase (VP) using the nominalizer (NOM) 的 *de* “*de*” (e.g., 喝水的 *he shui de*, “drink-water-NOM” (glass for drinking water)). Classifier phrases were placed in a separate category, as they represent a Mandarin-specific syntactic construction for nominal referents. All the classifier NPs contain a numerical (i.e., one) followed by a classifier and a noun (e.g., 一本书, *yi ben shu*, “one CLF book”, 一朵花, *yi duo hua*, “one CLF flower”) in the child and the adult speech. The weight/length of all the NPs were also coded and measured by number of syllables. The CLAN program (MacWhinney 2000) was used to extract the mean length of utterance (MLU) of the conjunct NPs and the number of different response types.

The children’s conjunct NPs (MLU = 4.68, SD = 2.43) were on average about one morpheme/character longer than those of the adults (MLU = 3.78, SD = 1.1), but an independent-samples t-test shows that the difference was not significant ($t(47) = 1.656, p = 0.1$). Figure 5 shows the mean proportions of different types of the conjunct NPs. Both the children and the adults were similar in the overall frequency in the use of different types of NPs: bare nouns were dominant in the child and the adult speech (64.14% versus 73.67%), followed by classifier NPs (27.89% versus 17.33%) and modifier NPs (7.18% versus 8.66%), whereas the nominalized NPs were minimal (0.8% in the child speech). The dominance of bare NPs suggests that neither the adults nor the children tended to mark the old and the new referents differentially in nominal forms.

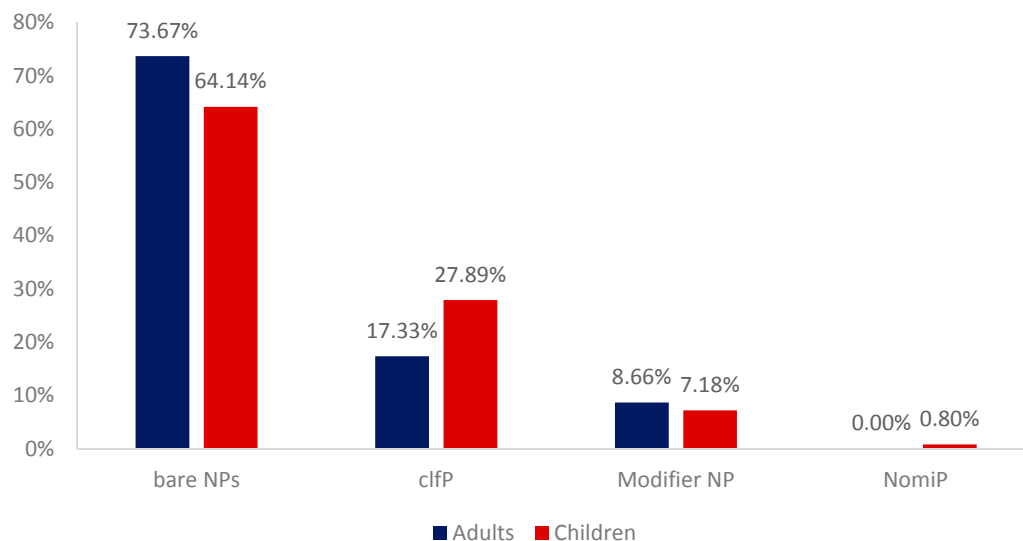


Figure 5. Mean proportions of the types of conjunct NPs in child and adult speech. (clfp = classifier phrase; NomiP = nominalized verb phrase).

A further examination of the classifier NPs also reveals remarkable similarities between the children and the adults. The general classifier 个 *ge* was used mostly frequently among all the different classifiers for both the children (75%) and the adults (55%). A variety of sortal classifiers were used by both the children (8 types) and the adults (13 types). The majority of the conjunct NPs with classifiers contained two classifier NPs for both the children (61.34%) and the adults (63.46%), which suggests

that a classifier was not used distinctively for IS in the conjunct NPs with two classifier phrases (see Figure 6). However, when the conjunct NP contains only one classifier phrase, both the adults and the children tended to use it to refer to the new referent (31.47% and 30.71%) in contrast to the use on the old referents (7.14% and 7.69%), indicated by the second and the third pairs of bars in Figure 6. Such a pattern suggests a very subtle differentiated use of indefinite classifier phrases to indicate new referents.

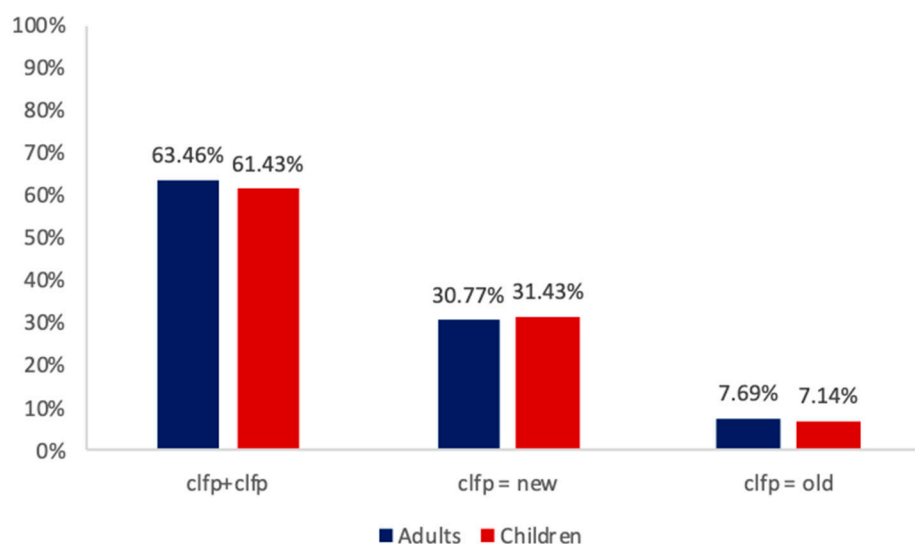


Figure 6. Mean proportions classifier NPs in conjunct NPs by IS in child and adult speech. (clfp = classifier phrase).

4. Discussion

The current study investigated how labels for “old” and “new” referents are ordered in conjunct NPs in the speech of Mandarin-speaking adults and children: “old-before-new” or “new-before-old”. We conjectured that the two types of patterns reflect different aspects of the influence of conceptual prominence on word order, accessibility, and novelty. We asked if prior research demonstrating an “old-before-new” preference in adult language and a “new-before-old” preference in child language are language-independent preferences crosslinguistically, or whether these patterns could be modulated by the role of discourse-pragmatically motivated word order variations in the target language.

Our results offer further evidence from Mandarin for the robust “old-before-new” word order preference in adult language: Mandarin-speaking adults produced the “old-before-new” order dominantly and consistently in the conjunct NPs, congruent with the “old-before-new” preference documented in adult speakers of German, English, and Arabic using a similar task of elicited production of conjunct NPs (Chen and Narasimhan 2018; De Ruiter et al. 2018; Narasimhan and Dimroth 2008; Semsem and Chen 2019).²

However, the “old-before-new” preference is not a global preference; it is modulated by age. Mandarin-speaking four-year-olds differed from their adult counterparts in exhibiting no such preference. Nor did they employ the “new-before-old” order at rates significantly above chance, similar to the findings in children acquiring English (Chen and Narasimhan 2018), but unlike the patterns

² The study of Spanish speakers, using a similar task of elicited production of conjunct NPs (Ceja Tel Toro et al. 2016), had a wide age range (from 31 to 72 years) of adult bilingual Spanish speakers in a small sample (12 speakers in total), who were living in the USA with varied length of residence (3 to 46 years) and varied proficiency in English. The younger Spanish adults (31 to 40 years) showed a higher mean proportion of the “old-before-new” word order, but the older adult Spanish speakers (42–70 years) did not. Individual variation was also found among the older and the younger speakers. It is possible that variation within adult age and bilingualism plays some role in the choice of word order for IS. It is thus unclear if monolingual Spanish adult speakers may also show a preference for the “old-before-new” word order in conjunct NPs.

found in children learning German, Spanish, or Arabic who exhibit a significant “new-before-old” preference (Ceja Tel Toro et al. 2016; Narasimhan and Dimroth 2008; Semsem and Chen 2019). The crosslinguistic differences may arise from multiple sources.

We conjecture that children acquiring any language are likely to find novel referents more salient than old referents. However, it is possible that children acquiring a relatively rigid word order language, such as English (Callies 2009), are less likely to reorder noun phrases based on their information status, even though adult speakers of English are willing to do so when producing conjunct NPs. On the other hand, children acquiring Mandarin are exposed to grammatical patterns that are frequently motivated by discourse-pragmatic considerations in constructions other than conjunct NPs alone. In particular, they may be frequently exposed to the use of the “old-before-new” order in the input. Even though no studies have analyzed the distribution of the “old-before-new” word order at sentence and discourse levels in naturalistic longitudinal children-directed speech in Mandarin, the topic-prominent property of Mandarin predicts that children are likely to hear the “old-before-new” order frequently in the input. Subject NPs in Mandarin are usually definite, referring to old information, and object position tends to be reserved for an indefinite NP that is new information (Hole 2012). Topics (typically old information) tend to occur in sentence-initial positions (Li and Thompson 1981), and focused elements (typically new information) are placed in sentence final position (Xu 2004). If a cognitive bias to produce the “new-before-old” order is in competition with an input-driven “old-before-new” preference, children may produce both patterns frequently, giving rise to the overall non-significant patterns in children’s production in the present study. Although German, Spanish, and Arabic are also languages with relatively less rigid word order, pragmatically driven word order variation (“old-before-new”) may be a less frequent phenomenon in these languages relative to Mandarin. Hence, although adults produce the “old-before-new” pattern, children acquiring these languages may be more strongly influenced by the cognitive salience of novel information than pragmatically based word order patterns in the input compared to children acquiring Mandarin.

The absence of a preference for the “new-before-old” order in English and Mandarin child speech may also result from methodological differences across studies that relate to the communicative situation in which the experimental task was performed. In the present study, children interacted mainly with an experimenter, even though they were instructed to address their responses to a toy teddy bear who could not see the screen. However, in the study by Narasimhan and Dimroth (2008), children acquiring German addressed a second experimenter who could not see the screen during the experiment and had to select a picture that matched the description of the experimental stimuli produced by the child. The study of children acquiring Arabic (Semsem and Chen 2019) was similar to the study of the children acquiring German in that it involved an adult confederate who had to repeat what the child described. However, no picture-matching was employed as was the case in the German study. Nevertheless Arabic-speaking children preferred the “new-before-old” order just like the German-speaking children. In both studies, the children were engaged in a more communicative interaction as compared with the procedure used in the English study (Chen and Narasimhan 2018) and the current study, where children simply described what they saw on the computer screen to the experimenter (or a teddy bear). This methodological difference (i.e., less communicative contexts) may have contributed to children’s sensitivity to the informational needs of the addressee and thus the less frequent production of the “new-before-old” order.

Individual variation may be another confounding factor. As our results show (cf. Figure 3), the mean proportion of the “new-before-old” order is 44.93%, ranging from 0% to 75%; 25% of the children exhibited a preference for the “new-before-old” order (67%–75% of their responses), 30% of the children exhibited a preference for the “old-before-new” order (78%–100% of their responses), and 45% of the children were at chance level. Age variation among the sampled children may have also contributed to the results. Our results show an emerging developmental trend in Mandarin children from age 4;0 to 5;5. The younger children (4;0–4;1) tended to use the “new-before-old” order more frequently, and the older children (4;10–5;5) employed the “old-before-new” order more frequently but with

considerable individual variation. A clearer developmental trajectory has been found in the study of Arabic speakers (Semsem and Chen 2019), where two groups of children (four- and six-year-olds) were compared: there was a significant increase in the use of the “old-before-new” order in the speech of the six-year-olds (mean age 6;4) than the four-year-olds (mean age 4;7), even though the six-year-olds still differed from the adults in using significantly less “old-before-new” word order. Dimroth and Narasimhan (2012) found that German-learning children exhibited adult-like word order preference by around nine years of age whereas five-year-olds still patterned like three-year-olds in preferring the “new-before-old” order (Narasimhan and Dimroth 2008). Hence the shift towards the “old-before-new” pattern occurs sometime between five and nine years of age in children acquiring German. These developmental trajectories suggest that it may take time for children to develop adult-like word order strategy to adapt to the IS needs.

Our study also reveals remarkable similarities between Mandarin children and adults in using language-specific lexical and syntactic means to express old and new referents in conjunct NPs. Bare noun forms dominate the production of both the old and the new referents. However, when an indefinite classifier phrase is used in the conjunct NP, it is typically used to refer to the new referent. Thus, young Mandarin-speaking children, similar to adults, use indefinite classifier phrases to mark IS in a subtle manner. Mandarin-speaking children also resemble adults in producing nouns or NPs with similar weight in the majority of their conjunct NPs. Even when the nouns or NPs in the conjunct NPs varied in weight, both the children and the adults used heavy or light nouns or NPs similarly as the first or the second referent in the “old-before-new” and the “new-before-old” orders.

5. Conclusions

This study revisits the debate on language-independent preferred word order in IS and the use of language-specific means to encode IS in Mandarin. Our results from the elicited production of conjunct NPs of new and old referents show that Mandarin-speaking adults differ significantly from children in preferring the “old-before-new” word order. This finding corroborates prior research of monolingual adult speakers of English, German, and Arabic, supporting that adults prefer a language-general “old-before-new” IS, whereas children (e.g., learning German, Spanish, or Arabic) disprefer or show no preference for that order (e.g., in English or Mandarin). The difference between children and adults in all the languages studied thus far nicely captures the paradoxical role of conceptual prominence in influencing speakers’ choice of word order for IS as discussed in Bock et al. (2004). Our results reveal that adults are more likely to place first the old/given referent that is activated and accessible at the time of speaking, whereas children tend not to be similarly motivated, preferring (in some languages) to place first the new referent that involves novelty and change. Children and adults thus exhibit different biases in arranging the order of new versus old information for IS, at least in conjunct NPs. The preference for the given-before-new word order has been argued to hold true crosslinguistically to account for word variation for IS (Neeleman and Koot 2016), and it is ultimately “an effect of a general cognitive principle according to which integration of new information is easier if framed within old information” (Neeleman and Koot 2016, p. 401, see also Clark and Haviland 1977). Young children (around the age of 4;6) are therefore still in the process of developing the discourse-pragmatic sensitivity and competence to facilitate the integration of new information in an adult-like manner. This development may be gradual and subject to extensive individual variation (e.g., age of acquisition, gender, influence of a second language, and other potential random variables). Further, it may be also sensitive to the communicative contexts in which utterances are produced (e.g., in terms of shared information between the speaker and addressee) as well as language-specific patterns in the input: the lack of a significant preference to order “new” information first in Mandarin-learning children may arise from exposure to relatively frequent “old-before-new” patterns in the ambient language. Despite different word order preferences, Mandarin-speaking children and adults resemble each other in their lexical and syntactic forms to encode old and new referents: bare NPs dominate the conjunct NPs, and indefinite classifier NPs are used for both the old and new referents, but when only one

classifier phrase is produced, the classifier NP is predominantly used to refer to the new referents, which suggests children's early sensitivity to language-specific syntactic devices to mark IS. Future research should examine large samples of Mandarin-learning children at different ages to explore how individual differences (e.g., age, gender, lexical and syntactic proficiency, etc.) and communicative contexts may affect the use of word order to mark IS, and when Mandarin-learning children become adult-like in adapting word order for the need of IS.

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