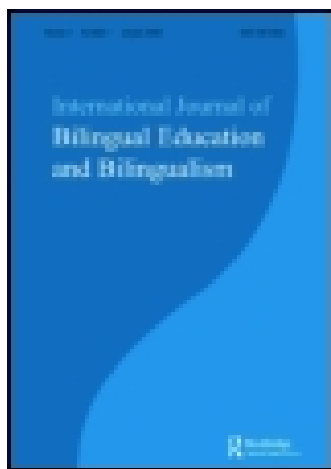


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Language use in a ‘one parent–one language’ Mandarin–English bilingual family: noun versus verb use and language mixing compared to maternal perception

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Via naturalistic observations, parent interview, and direct assessments, we examined language proficiency, language use, and differentiation of a 3-year, 4-month-old bilingual child exposed to Mandarin and English via the ‘one parent-one language’ principle. Although noun versus verb dominance has been explored across verb-based (Mandarin) and noun-based (English) languages in a between-subjects manner with monolinguals, it has not been explored within bilingual children learning both languages from birth. Three 15-minute sessions were recorded in the home: child–mother Mandarin interaction, child–father English interaction, and two parent–child bilingual interactions. The child was dominant in Mandarin according to number of words used, mean length of utterance, and receptive vocabulary. The child used the two languages discriminately depending on the interactive contexts. However, the languages used by all three members of the family contained more language mixing than was perceived by the mother during the interview. About 5% of the mother and child speech involved language mixing (use of the nontarget language), and the rate of nontarget language use in child–father interaction was 9%. Although maternal and paternal language input to the child were similar in terms of noun/verb usage, the child used proportionately more verbs than nouns during child–mother Mandarin interaction and used more nouns than verbs in child–father English interaction.

Keywords: bilingualism; one parent–one language; nouns; verbs; language mixing

With developments in globalization, cross-cultural marriage is becoming increasingly common (Logan-Terry 2008). In cross-cultural families, parents often come from different language backgrounds, which makes it possible to provide a bilingual language environment for children within families. In these families’ home environments, children have the opportunity to acquire two (or more) different languages simultaneously from birth, a phenomenon that has been called bilingual first-language acquisition (De Houwer 2009).

Although there are clearly multiple pathways and strategies for ensuring that one’s child becomes bilingual, one popular strategy among parents is the ‘one parent–one language’ principle. The one parent–one language (OPOL) principle was first put forward by Ronjat (1913), who raised his son as a French–German bilingual. Simply stated, the idea is that parents might help emerging bilingual children keep their two languages straight if one parent maintains exclusive use of one language in all dialogs with the child

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and the other parent exclusively uses the other language with the child (Bain and Yu 1980; Barron-Hauwaert 2004). In cross-cultural, bilingual families in communities where there is one clear dominant societal language (such as in the United States and Japan), although parents' native languages may be different, they may share the common or societal language in the community, which can be called the majority language for the family, and the other language spoken less frequently in the community can be considered the minority language for the family (De Houwer 2007, 2009; Yamamoto 2001). Yamamoto (2001) interviewed a small number of Japanese–English interlingual families in Japan and identified three types of parental input patterns to the child: (1) both parents spoke both the minority and the majority language to the child in varying degrees at home; (2) both parents spoke the majority language and one parent also spoke a minority language to the child; and (3) one parent used only the majority language and the other parent used only the minority language to the child (similar to OPOL). Yamamoto reported that child use of the minority language was greatest in pattern '1' followed by pattern '2' and then '3' families. Parental language input patterns in the home clearly influence children's acquisition of both languages, but most especially for the minority language when the opportunity to use that language is largely restricted to interactions with the one parent who speaks it (De Houwer 2007). For OPOL families, the success of child bilingualism as an outcome varies in relation to children's bilingual language exposure (Kasuya 1998). So the quality and consistency of interactions between the minority language–speaking parent and the child is often a crucial variable in determining the success of OPOL approaches for raising bilingual children (Döpke 1992a, 1992b).

Döpke (1992a) observed six, first-born children growing up with German and English during the children's third year of life and recorded naturalistic audio data from daily interactions. This author analyzed to what extent 'successful' families following the OPOL principle (ones whose children became active bilinguals) differed from families who took the same approach but whose children never developed an active command of the minority language. Döpke (1992a) found that consistency of parents' language choice, parents' insistence on the OPOL principle, fathers' involvement, and parents' responsiveness all affected children's bilingual development. The findings also support the notion that raising one's children bilingually according to the OPOL principle involves great effort on the part of the minority language–speaking parent. Barron-Hauwaert (2004) questioned families from 21 different countries who completed a questionnaire about the OPOL approach (93 couples and 156 children). As a mother of three trilingual children, teacher, and linguist, she considered several methods of developing bilingualism and the results showed that families can support and increase bilingualism through planned strategies such as the OPOL approach. Logan-Terry (2008) similarly reviewed Japanese mothers in the Australian context and demonstrated that the quality of interactions between the minority language–speaking parent and the child was crucial for fostering childhood bilingualism.

Bilingual children show early sensitivity to differences between their languages: syntactically, lexically, and phonologically (Nicoladis and Genesee 1996). Agreement is established among researchers in the field that bilingual children whose parents adopt the OPOL principle are capable of using their two languages discriminately, depending on the context or the interlocutor (De Houwer 1990; Deuchar and Quay 1999; Döpke 1992a; Genesee, Nicoladis, and Paradis 1995; Lanza 1992; Nicoladis and Genesee 1996). Lanza (1992) investigated the language mixing of a bilingual child from the age of 2;0 to 2;7 and monthly recordings showed that the child did differentiate her language use and could code switch in contextually sensitive ways when interacting with her parents.

Genesee, Nicoladis, and Paradis (1995) collected data from five French–English bilingual children aged 1;10 to 2;2 years old in two different language interactions (each child interacted with his or her English-speaking mother and with his or her French-speaking father). They found that children used more English with their mothers than their fathers, and more French with their fathers than their mothers, and suggested that children's language mixing was related to both the child's language dominance and the parents' rate of language mixing. Meng and Miyamoto (2012) similarly found that parental discourse strategy and child's language dominance both account for the overall ratio of child's output language mixing, in a toddler between the age of 2;1 and 3;0. Numerous other studies (Juan-Garau and Pérez-Vidal 2001; Kasuya 1998; Nakamura and Quay 2012; Taeschner 1983; Yamamoto 2001) have shown children's early sensitivity to parents' differential language choices, with parental language use having a direct bearing on children's level of language mixing and use of the minority language.

Mishina-Mori (2011) longitudinally observed two Japanese/English bilingual children around the age of two and their parents and examined the impacts of quantitative and qualitative aspects of parental input on the language choices of the bilingual children. They found that consistency in parent's language choice does not guarantee the child's constant use of the target language; however, the way parents respond to children's use of the nontarget language (the language different from the interlocutor's language choice) contributes significantly to the child's successful use of the target languages with different interlocutors. Parents' strict and selective language responding (positive response to children's use of the target language and negative or no response to children's nontarget language) reinforces children's bilingual use and language differentiation. Mishina-Mori (2011) concluded that input consistency needs to be reinforced by parental discourse strategies regarding language mixing in children.

To our knowledge, only two studies have examined Mandarin-English bilingual first-language acquisition and the focus of those is on specific aspects of the child's lexical and syntactic development rather than parent language-use patterns and language mixing. Qi, di Biase, and Campbell (2006) traced the developmental paths from nominal to pronominal reference in a Mandarin-English bilingual child from age 1;7 to 4;0. They found that the child followed distinct routes in his two languages and adopted an analytic (bottom-up) approach in Mandarin but a synthetic (top-down) approach in English. Qi (2011) investigated the language development of a child exposed to Mandarin and English from birth in an immigrant family in Australia from the age of 19 months to 4 years with a focus on the child's use of pronouns and person identification strategies in the context of his early lexical and syntactic skills in his two languages.

In the current study, we observed a Mandarin-English OPOL bilingual family where the mother speaks Mandarin and the father speaks only English, and recorded their language use during mother–child interaction, father–child interaction, and triadic two parent–child bilingual interaction. We analyzed the proportion of target and nontarget language use among all three interlocutors (mother, father, and 3-year-old child). The child is expected to use more Mandarin with the Mandarin-speaking mother (the target/preferred language for that bilingual interlocutor) and more English with the English-speaking father (the target/preferred language for that monolingual interlocutor). We also compared the actual observed language-use patterns in the family to the mothers' perception of the extent to which family language rules are generally followed in the home using data obtained in a separate interview and questionnaire.

Nouns versus verbs

Languages vary greatly in their syntactic and lexical features, and children becoming bilingual simultaneously need to differentiate the two language systems. One feature on which languages vary is how much they appear to be noun focused or verb focused (Kauschke, Lee, and Pae 2007). For example, English, German, and Turkish are noun-based languages because nouns are very common and certain sentence structure and grammatical features in sentences hinge upon nouns, whereas other languages such as Korean, Japanese, and Mandarin are more based on verbs (Imai et al. 2006 2008; Kauschke, Lee, and Pae 2007; Schelletter 2002; Scott 2006). Because most of the early language development research was conducted on noun-based languages like German, English, and French, it was observed, and presumed to be universal, that nouns are generally learned before verbs (Gentner 1982). However, some researchers (Arunachalam et al. 2013; Choi and Gopnik 1995; Gopnik and Choi 1995; Imai et al. 2006 2008; Lee and Davis 2001; Tardif, Gelman, and Xu 1999) later found that in languages such as Mandarin, Korean, and Japanese, verbs and other relational words are more commonly used by young children than nouns, which challenged the hypothesis of the universal primacy of early nouns. Children's noun and verb acquisition and use can be two relatively independent processes and their processing appears to recruit different brain areas (Tan and Molfese 2009). Neuroimaging evidence also shows that for English and other Western languages, basic lexical categories such as nouns and verbs are represented in different brain circuits (Scott 2006). By contrast, research in China indicates overlapping brain regions for nouns and verbs (Yang, Tan, and Li 2011). Such cultural and language differences in parts of speech emphasized in the language also correlate with specific cognitive skills: American children are relatively good at classification earlier (a noun-based skill), whereas Chinese and Korean children are relatively good early on at means-ends relations (a verb-based skill) (Gentner 1982; Tardif 1996). However, Bornstein et al. (2004) investigated parent report of 20-month-old children's vocabularies in seven different linguistic communities (Argentina, Belgium, France, Israel, Italy, the Republic of Korea, and the United States) and found that in each language, children's vocabularies contained relatively greater proportions of nouns than other word classes. Noun prevalence in the vocabularies was significant in all these different languages groups, and there was no significant difference between Korean and the other languages. McDonough et al. (2011) also examined the difference between nouns and verb acquisition and explained that the advantage nouns have is not a function of grammatical form class but rather is related to a word's imageability.

Previous studies involving comparisons between monolingual children with one verb-based language to other monolingual children with a different noun-based language show differences in the sequence of word acquisition and word-use frequency between nouns and verbs among the different languages. Choi and Gopnik (1995) investigated children's early lexical development and found that compared to an English group, Korean children used verbs more productively and with appropriate and complex inflections. Tardif also found similar results in Mandarin-speaking children who produced more verbs or action words than nouns or object labels in their naturalistic speech (Tardif 1996; Tardif, Gelman, and Xu 1999). Imai and her colleagues (Imai et al. 2006, 2008) investigated English, Chinese, and Japanese children from 3- to 5-years old across six studies and found Japanese and Chinese children could map and extend novel verbs earlier and more readily than novel nouns compared to English-speaking children, who needed more arguments and clues.

To our knowledge, noun versus verb use within simultaneous bilingual children learning both a noun-based and a verb-based language at the same time (i.e., English and Mandarin), has not yet been examined. In the present study, we, therefore, also investigated the relative frequency of noun and verb use among all members of the observed OPOL family during different interactions to see if the pattern of noun versus verb use within a single bilingual child follows the same between-subjects pattern observed when comparing two languages groups. We predicted that the same bilingual child would use more verbs than nouns when speaking in Mandarin and more nouns than verbs when speaking in English.

Method

Participants

One English/Mandarin bilingual child and his parents participated in the study. The family was an acquaintance of the first author. The family lives in the United States, making English the societal language and Mandarin the minority language for the child. The mother in this family is a Chinese woman who immigrated to America 9 years prior to the study. She is a native speaker of Mandarin and is fluent in English. She obtained her Master's degree 6 years before the time of writing and was a stay-at home mother. The father is an English-monolingual American who does not speak Mandarin. He comprehends a few common words (i.e., yes, no, hi) in Mandarin from having repeatedly observed mother-child discourse over the years, but he does not speak in Mandarin. He has a Ph.D. degree in computer science and works full-time as a computer engineer with a comfortable income. The parents communicate with one another only in English. There is only one child in the family, Ben (pseudonym), who was 3 years and 4 months old at the time of participation. He was born in America and had never been to China.

A short interview was used to retrieve basic information about the family. It was reported that the parents decided to carefully practice the OPOL principle before the child's birth, with the mother only speaking Mandarin with the child (and therefore putting in most of the OPOL language effort) and the father only speaking English with the child. The family lives in a community where the majority of the residents are native English speakers, so they have very little contact with Chinese speakers in the neighborhood. According to mother's report, she does have some contacts with other Mandarin speakers in the United States, but these friends can and typically do speak English. Considering the father does not understand Mandarin, they use mostly English when the whole family is present and the child rarely has other opportunities to interact in Mandarin (other than with mom). The child does minimally participate in video calls with his grandparents in China, at most once a month, with typically very little language used by Ben during the calls. From the mother's report, the parents showed very positive attitudes toward bilingualism. They think bilingualism is an important ability and it will be an advantage for their child, not only in personal development but also for his academic and career development in the future. At home, the mother is a full-time caregiver. When the father comes home every day, he spends most of his time with the child in order to try to balance the input of the two languages. Ben does go to a preschool two days a week for 4–5 hours per day, which had only started recently when he turned 3 years old (i.e., 4 months ago), where he spends some time with English-speaking teachers and peers.

Procedure

Before the observations, the mother was asked to complete a questionnaire in Mandarin. The questionnaire was created to assess the mother's estimation of the proportional languages used by each family member. For example, for only mother-child conversations in daily life, what is the proportion of the mother's speech to the child that is Mandarin?

The child's receptive language ability was tested using the Peabody Picture Vocabulary Test (PPVT-III), a well-known, nationally normed, standardized test of receptive vocabulary (McKinlay 2011). The PPVT-III had two forms (IIIA and IIIB). The two forms were standardized and had the same level of reliability and validity (Ryan et al. 2009). In order to test the language proficiency of both Mandarin and English of the child, the original English version of IIIA form was translated to Mandarin, and then independently back-translated into English. This procedure was repeated until agreement between the initial and final English versions was considered satisfactory. All discrepancies were discussed and consensus was obtained by both the bilingual translators as is often done (Cheah et al. 2009).

The child was tested in Mandarin with form (IIIA) and in English with form (IIIB) separately. The two sections were tested at about the same time of the day on two different days (around 24 hours apart). A native Mandarin speaker (first author) and a native English speaker worked as examiners for the two sections. Because we also examined child noun versus verb use in this paper, we checked to see whether the PPVT-III assessment items used were biased in terms of frequency on nouns versus verbs. They were no differences, with both the English and Mandarin versions having about 50/50% of the target word being a noun versus a verb. Thus, there appeared not to be language-based bias for nouns versus verbs in this particular assessment, but the issue of whether other standardized bilingual language assessments may advantage certain children from either noun- versus verb-based languages is an issue worthy of future consideration.

Observations and language samples in a quasi-naturalistic situation were collected to assess how languages were used for all three members of the family across different contexts. Three sessions were completed: (1) mother and child interaction, (2) father and child interaction, (3) mother, father, and child's triadic interaction. All the interactions were audio-recorded separately at their home. The recordings all took place in the child's bedroom, while doing various activities, such as book reading and playing with toys. During the interactions, only the child and one (or two) parents were left alone in the room. The experimenter stayed outside to avoid interference. The parents were asked to do what they normally do with their child so that the data would be similar to daily life. The determination of the child's intended interlocutor during the triadic interaction included consideration of the immediately previous turn taken by the adult and whether the child's speech appeared to be in response to (i.e., an answer) to the parents' previous utterance or question (questions were common). Other cues had to do with the speech matching in volume, tone, and prosody with the previous speaker. All three sessions were tested on the same day, at 10:00 am, 11:30 am, and 1:00 pm. Each session lasted for over 15 minutes. The valid records were orthographically transcribed by two bilingual native speakers of Mandarin reaching consensus from the first word the parent or child said until the recording reached exactly 15 minutes. The entire research sessions were audiotaped and then transcribed following the Codes for the Human Analysis of Transcripts (CHAT) (MacWhinney 2000).

Table 1. Results of PPVT-III vocabulary scores.

	Raw score	Standard score	Percentile rank	Age equivalent
English	25	85	16	1 year and 11 months
Mandarin	34	93	32	2 years and 9 months
Total conceptual	59	115	84	4 years and 7 months

Results

Language proficiency

The child's PPVT-III scores were compared to the normative monolingual scores for his age with each language. The child's raw, standard, and percentile equivalent scores for English, Mandarin, and a total conceptual score are listed in Table 1. His Mandarin appears to be better than his English (age equivalent 2 years and 9 months compared to 1 year and 11 months). From these results, we can see that the child's vocabulary within each language was slightly below typical levels for monolingual English or monolingual Mandarin speakers of his age. However, when combining both languages on the PPVT-III for a total conceptual vocabulary score, his standard score of 115 converts to a percentile rank of 84 and his normative monolingual English age equivalent was 4 years and 7 months, which is beyond his chronological age. Previous studies, both with older children often exposed to two language more sequentially (Hoff et al. 2012; Oller and Jarmulowicz 2008; Sheng et al. 2012) and with younger children exposed to two languages from birth (McLaughlin 1995; Nicoladis and Genesee 1997) have found that when receptive vocabulary in dual language learners is assessed, the number of English words they know is sometimes smaller than monolingual English-speaking children of the same chronological age; but if the number of unique second-language words that the bilingual child knows is included along with the number of English words, the resulting total conceptual vocabulary score is just as high or higher than that of monolingual children. However, differences between monolinguals and bilingual-exposed children from birth in receptive language skills are not always found, especially with well-designed studies that carefully match the groups on relevant demographic variables (De Houwer, Bornstein, and Putnick 2013).

Morpheme Mean Length of Utterance analysis in Mandarin and English

Morpheme MLU (Mean Length of Utterance based on morphemes or units of meaning rather than words – so 'picked' would count as two morphemes for 'pick' and 'ed' yet is one word) was used to evaluate the child's general linguistic level in both English and Mandarin (Fagan 2009; Parker and Brorson 2005; Yip and Matthews 2006). Morpheme MLUs were calculated for each language separately. Mandarin MLUs were calculated using all the child's utterances in the first session where the child interacted with his mother. English MLUs were calculated using all the child's utterances in the second session where the child interacted with his father.

Table 2 presents the number of utterances and the MLU of both English and Mandarin for the child in the mother-child and father-child sessions. Only target languages in both the sessions were counted. Mixing words, such as English used in the mother-child Mandarin interaction session, did not count in this analysis. As shown, the child used more Mandarin than English, which also matched the results of the PPVT-III.

Table 2. Number of utterances and morpheme MLU the child used in the mother–child Mandarin interaction session and father–child English interaction session.

Variable	Mandarin session	English session
Number of utterances	120	71
MLU	3.55	1.72

Note: Only target languages in both the sessions were counted. Mixing words, such as English used in the mother–child Mandarin interaction session, did not count in this analysis.

During the 15-minute interaction in the first session, the child used more utterances with his mother in Mandarin compared to the English utterances used during the father–child interaction. The mean length of Mandarin utterances in the mother–child session was also longer than the English speech in the second session. The results showed the current dominance of Mandarin in the child’s bilingual language skills.

Child and parent language interactions

As shown in Table 3, the child used a total of 42 unique (each word only counted once, so, for example, two ‘the’s in the transcript only count as one unique word) Chinese words/types, the mother used 62 unique Chinese words in the child–mother Mandarin interaction, and while the child only used 30 different English words, the father used 116 different English words. Comparing the number of different words used by the child and parent in each session, we see that both parents tended to use more words/types than the child, which is reasonable. However, the difference in the number of words/types used between the child and the parent in the child–father interaction was much greater than that seen in the child–mother interaction. The dominance of Mandarin in the child’s bilingual development is likely at play here.

Parents’ self-reported and actual language use

In this OPOL family, the parents showed clear positive attitudes and commitment toward the OPOL principle according to the interview. We interviewed the mother before the observation session and asked her to report family members’ language use in their daily life by a questionnaire. The questionnaire was created to investigate the percentage of different language use for each family member with each interlocutor. For example, the mother was asked to list what percentage of speech from her to Ben is in English and what percentage is in Mandarin. For the actual language used variables observed during the

Table 3. Number of unique words (types) the child and parent used in the mother–child Mandarin interaction session and father–child English interaction session.

	Participant	Total number of words
Child–mother Mandarin interaction	Child	42
	Mother	62
Child–father English interaction	Child	30
	Father	116

Note: Only target languages in both the sessions were counted. Mixing words, such as English used in the mother–child Mandarin interaction session, did not count in this analysis. Only unique words (types) were counted. Repeated words were only counted once.

Table 4. The comparison of percentage of language use for each family member between the mother's report and the data from observation.

Direction	Language	Mother's report in the questionnaire (%)	Observation (%)
<i>Two-person interaction</i>			
Mother to child	Mandarin	99	95.45
Child to mother	Mandarin	98	94.83
Father to child	English	100	100
Child to father	English	98	91.36
<i>Three-person interaction</i>			
Mother to child	Mandarin	99	88.5
Child to mother	Mandarin	97	89.7
Father to child	English	100	100
Child to father	English	96	62.96

recordings, we took the number of utterances in the target language by each individual divided by the total number of that person's utterances during the observational session. The results of the questionnaire are compared to the results of the observation in Table 4.

As shown in Table 4, we see that although the mother reported that 99% of her speech to the child was in Mandarin and that 98% of the child's speech to her was in Mandarin, observational results showed that only about 95% of the speech between her and her child was in Mandarin. During the triadic interaction involving the monolingual father, only about 89% of the speech between the mother and child was in Mandarin. During the father-child interaction in which 100% of the father's speech was English, 91% of the child's speech was in English. During triadic interaction, child speech addressed to the father was only about 63% in English. Thus, the consistency with which the parents and the child used the target language according to the family language rule was less than that expected by the mother in the interview and there were several instances of language mixing.

Language mixing

Here we provide a few examples of language mixing or the use of the nontarget language according to home language rules. Using the same method as used by Lanza (1992), mixing or mixed utterances in this study referred to nontarget language choice in a particular context (use of Mandarin to the English-speaking father or use of English to the Mandarin-speaking mother). Mixing utterances were defined as using the nontarget language, while nonmixing utterances were defined as using exclusively the preferred languages during an utterance. As reported already in Table 3, about 5% of the mother and child speech involved language mixing (use of the nontarget language) during their interaction. The rate of nontarget language use in the child-father interaction was higher at about 9%, which is interesting since the father's monolingual English to the child was 100% consistent. Parents' mixing utterances include responding to the child's nontarget language choice. In the examples below, the pseudonym of 'Ben' is used for the child. Example (1): child-mother interaction

Mother: 看妈妈这里，这个跑车是什么颜色啊? (Look here, what color is it?)

Child: Red.

Mother: 红色, 对不对呀! (Red, right?)

Child: 还有 Black. (And black.)

Mother: 对, 还有黑色, 真好看. (Yes, also black. It's so cool.)

Example (2): child–father interaction

Father: Hey Ben! Look! Let's do something else.

Child: 不要碰, 不要碰! (Don't touch, don't touch!)

Father: Let's start, ok?

Child: no! 不要碰! (Don't touch!)

Example (3): child–father interaction

Father: Hey Ben! Look here! What's this?

Child: Helicopter

Father: Are you sure it's helicopter?

Child: 噢, 不对!(Oh, no!), 是(It's) airplane

Father: Airplane, very good. How about this one?

Child: 这个 (This) ambulance

Father: Ambulance, very good. Where is the fire truck? Do we have a fire truck?

Child: 没有 (no)

Father: we don't have a fire truck?

Child: 没有 (no)

Father: are you sure?

Child: yes

Example (4): child–father interaction

Father: Ben, can you tell dad what letters they are? Are you ready? BenBen, look here! Tell dad what letter is this?

Child: 这个, 这个我可以玩. (This, I know how to play this.)

Father: Ok, look here! What's this? Look!

Child: en, en, bus.

Father: Bus, right! What letter is this? Ben look! What letter is this?

Child: B, 是(it's) B.

Father: very good! B is in the bus. Where is B over here? Take a B.

Child: 在这儿. (it's here.)

We can see from the first example, the child used English words to answer the mother's Mandarin question. From the second and fourth examples, we can see that the child used Mandarin when interacting with his English-speaking father. Although it is fairly rare for a bilingual child over the age of 3 years to respond to a known monolingual in the non target language, he was clearly dominant in Mandarin, which could explain his language choice if he could not recall the English word and filled it in Mandarin. In addition, the first and third examples both show how the child used two languages in one sentence/utterance.

Child language choice in triadic interaction

In the third session in this study, interactions between two parents and the child together were recorded. As shown in Table 5, the ratio of Mandarin that the mother used during the bilingual interaction was 88.5%, which was lower than that in the child-mother interaction. For the child's language choice in the bilingual context, Mandarin was more frequent than English. The following are some interesting examples of their interaction:

Table 5. Ratio of language choice in triadic interaction.

	Total utterances	Mandarin	Proportion Mandarin (%)	English	Proportion English (%)
Child	56	36	64.3	20	35.7
Mother	61	54	88.5	7	11.5
Father	53	0	0	53	100

Example (1):

Father: How about this one, Ben? Oh, someone sealed it. Kept it up and sealed it. I think I need scissors.

Child: You got it!

Father: I'll try.

Father: No, Ben. I need scissors. Ask mum for scissors, ok? We're gonna cut it. Thank you!
Can you ask mum if you can have the scissors?

Child: You have scissor?

Mother: 你讲中文好吗? (Can you speak in Mandarin?)

Child: 好吧。(Ok.)

Mother: 嗯, 你讲。(What do you want to say?)

Child: 你有...你有...剪刀吗? (Do you ... do you ... have scissors?)

Mother: 剪刀? 有啊, 你等一下。(Scissors? Yes, wait a second...)

Father: thank you, because I can't open it (to mother). Thank you Ben!

Example (2):

Father: Ok, Ben. I will read, ok? Ben, do you want me to read? Yes or no?

Child: Yeah, 嗯嗯嗯 (yes, yes, yes)

Father: where should we start? Here?

Child: Yeah, 嗯嗯 (yes, yes)

Father: Which book do you prefer? How about this one, look? I like this one.

Child: 它喷不出来, 喷不出来 (It doesn't work. It doesn't work)

Mother: 对, 它关在里面了, 喷不出来, 你先放好, 这个待会儿会自己掉下去, 你先听爸爸的, 爸爸给你念, 你也一起念 (Yes, it's in it, cannot get out. Let's just keep it like that. It will fall down by its own later. Come on! You listen to your dad first. Dad will read this for you. You can also read together.)

Child: 我不念好, 你念 (I don't know how to read. You read.) (The child was talking to the father in Mandarin)

Mother: He doesn't want to read. He asked you to read for him. (The mother was trying to translate.)

Father: Ok, tell me what do you want me to do, Ben? Can you tell me directly?

Child: Ok! 你读你读 (You read, you read)

Father: what would you like me to do Ben? Dad didn't understand you. Can you speak in English?

Child: you (read) read, you!

Example (3):

Father: Is it sunny or rainy?

Child: a rainy.

Father: yeah, it's rainy. And what's this?

Child: 雨伞 (umbrella)

Father: Mum, what's that?

Mother: Benben is right! Umbrella.

Father: Oh, umbrella! Good job, Ben!

Child: 哈哈, 雨伞 (Haha, umbrella!) 这个是什么呀, dady, oh不, mum? (what's this, daddy, oh no, mum?)

Mother: I don't know, go ask your dad!

Child: 这是什么呀 (what's this?), daddy, what's this?

Father: It's a little horn.

We can see from the first example, the child had the ability to use both languages appropriately, especially with specific reminders. In the second example, the child showed more preference of using Mandarin than English, which is also consistent with the results of the PPVT-III and morpheme MLU analysis. Overall, during the triadic interaction, which involved both parents and the child, the child's language choices were more mixed. The mother's use of Mandarin was not as consistent as during the one parent–one child interaction. She understandably appeared to have difficulty ignoring the child's English utterances at times. Also the mother did some needed translation between the child and father. It is notable that the parents' expectation for the child's language choice (at least in the examples but also in general in the home according to the maternal interview) appears to be that when all three family members are present, the child is supposed to go back and forth speaking Mandarin to his mother and English to his father even though the monolingual person present (the father) will not be able to understand. This is a stricter requirement than is found in some OPOL families. Many OPOL families consistently use one language during triadic interaction and only expect target language choices when the monolingual person is not present.

Verbs versus noun use

We also examined within-child noun and verb use for Mandarin and English. The number of verbs and nouns in both the child's and parents' utterances was counted for the first and second sessions separately. Table 6 shows these results with the relevant proportions provided for both parents and for Ben. First, it is important to note that the noun versus verb use by the adults was essentially the same across the two parents/languages, with

Table 6. Number of verbs and nouns used in the interactions for both the child and parents.

	Mother-child Mandarin interaction	Father-child English interaction
<i>Child</i>		
Nouns (ratio)	14 (14/42 = 33.3%)	18 (18/30 = 60%)
Verbs (ratio)	19 (19/42 = 45%)	5 (5/30 = 16.7%)
<i>Parent</i>		
Nouns (ratio)	21 (21/62 = 33.9%)	38 (38/116 = 32.8%)
Verbs (ratio)	24 (24/62 = 38.7%)	39 (39/116 = 33.6%)

Note: Only target languages (Mandarin words used in mother-child interaction session, English words used in father-child interaction session) in both the sessions were counted. Mixing words, such as English used in the mother-child Mandarin interaction session, are deleted in this analysis. Ratio in each part means the proportion of the specific kind of words used divided by all the words used by the participant.

33% of both the mom and dad's words being nouns. However, notable differences were observed in the child's speech by interlocutor/language. During child-mother interaction (target language = Mandarin), the child used verbs (19 of the 42 total words = 45% of words being verbs) which is more than his noun use (14/42 = 33%). During child-father interaction, however, Ben used many more nouns (18 of 30 words = 60% of his words being nouns) than verbs (5/30 = 17% verbs). Thus, for the emerging bilingual child in this OPOL family, nouns appear to be used more (learned more or earlier) in his English development, whereas verbs appear to be used more (learned more or earlier) in his Mandarin development. The results here are consistent with our hypotheses and prior between-subjects research, but this is the first time this has been shown within the same bilingual child depending on the language context. It is notable that the same noun versus verb differential was not observed among the adults' speech in either language, so there appears to be no difference in the frequency of noun/verb language input that he is receiving in his two languages from his parents.

Discussion

The current study focused on a child, aged 3 years and 4 months, in an OPOL bilingual family. The study included an interview and scale for the mother to analyze the language environment of the family, the PPVT-III to assess child language proficiency of both Mandarin and English, and naturalistic observations to assess how the bilingual child used/differentiated his two languages across different contexts.

Parental language input and child language performance

In this OPOL family, the child predominately used Mandarin during the observations. From the interview, we know that the mother is a full-time caregiver, who reported using Mandarin with the child from birth. Although the child is exposed to English when the father gets home from work and at preschool two days per week, the English communication time is limited compared to that of Mandarin.

According to the results of the PPVT-III, and confirmed with the child's word production in the observations, we could see the dominance of Mandarin in the child's bilingual language development. The PPVT-III scores for both languages individually had not yet reached monolingual norms for his age. However, Ben showed a higher total conceptual vocabulary score (combined number of unique words known in both the

languages) and the normative age equivalent of this score was 4 years and 7 months, beyond his current chronological age. This pattern is consistent with some previous research showing receptive vocabulary in each language for dual language learners (DLLs) to sometimes be behind monolingual norms, especially among older DLLs who may not have been exposed to both languages equally from birth (Hoff et al. 2012; Oller and Jarmulowicz 2008; Sheng et al. 2012). However, there is debate in the field about whether this is true for well-matched samples involving bilinguals exposed well to both languages from birth (De Houwer, Bornstein, and Putnick 2013; Honig and Xu 2012; McLaughlin 1995; Nicoladis and Genesee 1997).

One parent–one language

The OPOL idea is that parents might help emerging bilingual children keep their two languages straight if one parent maintains exclusive use of one language in all dialogs with the child and the other parent exclusively uses the other language with the child (Bain and Yu 1980). In the interview, the mother reported that they had been practicing the OPOL principle carefully since the child's birth, which meant that the mother tries to only speak Mandarin with the child, and the father only speaks English with the child, and they try to balance language input to the child by having a lot of father–child English interaction when the father is home. Even though the parents showed positive attitudes and strong commitment toward the principle, differences between the mother's perception/report and our observations were found. In the triadic interaction, the ratio of Mandarin that the mother actually used to the child was 88.5%, which was lower than her estimate and that used in the child–mother interaction (99%, 95.45%, respectively). The position of the minority language–speaking parent is very important for child language outcomes in bilingual families. As De Houwer (2007) found, differences in parental language input patterns at home correlate with differences in child minority language use and eventual proficiency. De Houwer (2007) found that the home input pattern where both parents use the minority language when they are all together and where at most one parent speaks the majority language has a high chance of success. However, in this bilingual environment where the mother speaks Mandarin and the father speaks only English, it is clearly hard to maintain the OPOL principle strictly and speaking only the minority language during triadic interaction is not possible. Goodz (1989) found that a large proportion of parents, even those committed to maintaining strict separation of language by parents, model linguistically mixed utterances for their children and that parents often underestimate their consistency in language use patterns. In the current study, we found that in this OPOL family, keeping parents' language choice pattern consistent and avoiding adult language mixing in family interaction are difficult and probably has an impact on the child's language choice and mixing in their bilingual language development (Döpke 1992a).

Previous studies (Barron-Hauwaert 2004; Döpke 1992a, 1992b; Mishina-Mori 2011; Olmedo 2005) found that parents' language input, consistency of parents' language choice, parents' responsiveness, and society language all impact children's bilingual development. Such studies discuss how important and successful the OPOL principle is in children's bilingual development by comparing OPOL children with other bilingual children and families without planned strategies. Other OPOL-focused studies (De Houwer 1990; Genesee, Nicoladis, and Paradis 1995; Lanza 1992; Logan-Terry 2008; Nicoladis and Genesee 1996) emphasize children's language outcomes in OPOL families, as well as parents' OPOL performance, language use, and success. In the present study,

we also found that carrying out the OPOL principle consistently and successfully, and balancing the two different language inputs within an OPOL family is difficult to do and appears to be related to the child's language choice and mixing. Interestingly, Ben does use much of the 'minority' language (Mandarin) in the home even though the OPOL family observed here would fall into Yamamoto's (2001) category (3) in terms of types of parental bilingual language input patterns, the type Yamamoto found to be associated with the least amount of child minority language use. Perhaps the frequency of Mandarin input, the young age of the child involved here, and the difference in methodology (parent interviews in Yamamoto and observations here) account for this finding.

Parental language choice patterns and the impacts on child's language mixing

Previous studies (De Houwer 1990; Döpke 1992a; Genesee, Nicoladis, and Paradis 1995; Lanza 1992, 2004; Mishina-Mori 2011) found that bilingual language inputs and parental language choice patterns affect the child's language choices during bilingual language development, and parents' language consistency (i.e., parents' OPOL performance/success) may also contribute to the child's language choice and mixing. In the current study, we found that the consistency of parents' language choice patterns is related to the child's use of the appropriate languages to speak with the different interlocutors. However, the relationship between parental language choice patterns and child's language mixing is also moderated by other factors. In the present study, the mother had 4.5% of language mixing during the interaction, which is much higher than that of the father (0%). However, the rate of child nontarget language choice in child–father interaction was higher than that in child–mother interaction. This result is consistent with Mishina-Mori's (2011) conclusion that consistency in a parent's language choice does not guarantee the child's constant use of the target language to the parent. Other factors that might affect child's language choice and mixing would involve parent's OPOL consistency and performance, other language inputs from schools and communities, and the child's language proficiency and language preferences.

In this case study, the child showed obvious dominance of Mandarin, which might be one reason why he showed higher rates of language mixing during the English interaction with his father, compared to that during the Mandarin interaction with his mother. Due to the limitation of English acquisition and development, the child used more Mandarin to express himself during interactions. In the child–mother interaction, however, the child still showed language mixing 5.17% of the time. There are several possible reasons. The mother is a Mandarin/English bilingual person. She was unable to ignore the child's English expressions in everyday life. So the response to the child's English utterances reinforced the child's language mixing to some extent, which also breaks the rule of the OPOL principle. Additionally, in this cross-cultural family, English is the majority language, which is used between the mother and father. The English environment would also affect the child's language development and mixing.

It is important to point out that there are many different ways of raising children bilingually and that it is not essential for parents to follow the OPOL principle. Scholars (Bain and Yu 1980; Barron-Hauwaert 2004; Döpke 1992a, 1992b; Logan-Terry 2008) put forward the OPOL principle as a reasonable strategy for parents to use to help ensure that the child receives sufficient input in the minority language at home, but there is no evidence that OPOL is actually necessary for raising children bilingually, or that not following OPOL leads to language confusion in the child. De Houwer (2007) suggests that parents who both informally use the majority language with some less consistent use

of a minority language with the child in the home might consider ‘upgrading’ to a OPOL strategy to give them a greater chance of successfully raising a bilingual child. Caldas (2006) indicates that the age of the child also matters in the extent to which parents’ language choices can impact children’s bilingual language outcomes since peers have a greater influence as children get older. There are, of course, multiple routes to bilingualism and plenty of successful cases of childhood bilingualism found without using the OPOL strategy (Olmedo 2005; Piller 2002, 2005).

Verbs and nouns

There were differences in the child’s use of verbs and nouns between Mandarin and English. Previous studies found that the acquisition sequence of nouns and verbs is different between different language systems. In some languages, such as Korean, Japanese, and Mandarin, verbs and other relational words are used earlier and more often than nouns; in English and other Western languages system, nouns are often learned before other words (Choi and Gopnik 1995; Gopnik and Choi 1995; Tardif 1996, although not always – see Bornstein et al. 2004). As we predicted, in the current case study, the proportion of verbs that the child used during the child–mother Mandarin interaction was larger than nouns, while the proportion of nouns that child used during the child–father English interaction was larger than verbs. This is especially notable because no differences in parental noun versus verb language input were found – so the child’s use/performance difference cannot be explained by the child’s exposure to differential types of parental language input. This is the first study to our knowledge that shows the same pattern within one child learning two different types of languages. Previous studies showing the same results comparing monolingual children between different languages typically attribute the results to the way that languages are structured and set up in the brain for learners of different (monolingual) first languages, namely, that it is a language effect (Crepaldi et al. 2013; Gopnik and Choi 1995; Pulvermuller et al. 1996; Scott 2006; Yang, Tan, and Li 2011). However, Ben’s performance here shows that noun versus verb dominance is specific to each language/context even within one bilingual child/brain, suggesting more of a context effect rather than a language effect. Future research should explore the issue of differential learning trajectories for nouns versus verbs in noun-based versus verb-based languages in simultaneous dual-language learners who are learning different combinations of languages. For example, is language development and structure different for bilinguals learning two noun-based languages (i. e., English and German), or two verb-based languages (i.e., Korean and Mandarin), compared to one of each type, as observed here (i.e., English and Mandarin)?

In the current exploratory study, we selected a single bilingual family that was following the OPOL principle well and observed their interaction among different family members with different language environments. Although our case study provides rich data and insight into language processes, it is limited by the relatively small amount of observations, time points, and language data collected. Future research should include more bilingual families, more longitudinal observations over time, and more diversity in terms of the types of language being learned simultaneously and with family language policies other than OPOL. Additional research is needed to understand how the diversity of early language use in multilingual families influences children’s bilingual language development.

Disclosure statement

No potential conflict of interest was reported by the authors.

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