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Surmounting the Tower of Babel: Monolingual and bilingual 2-year-olds' understanding of the nature of foreign language words

Krista Byers-Heinlein [a,*], Ke Heng Chen [b], Fei Xu [c]

[a] Department of Psychology, Concordia University, Montreal, Quebec H4B 1R6, Canada
[b] Department of Psychology, University of British Columbia, Vancouver, British Columbia V6T 1Z4, Canada
[c] Department of Psychology, University of California, Berkeley, Berkeley, CA 94720, USA

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ABSTRACT

Languages function as independent and distinct conventional systems, and so each language uses different words to label the same objects. This study investigated whether 2-year-old children recognize that speakers of their native language and speakers of a foreign language do not share the same knowledge. Two groups of children unfamiliar with Mandarin were tested: monolingual English-learning children ($n = 24$) and bilingual children learning English and another language ($n = 24$). An English speaker taught children the novel label *fep*. On English mutual exclusivity trials, the speaker asked for the referent of a novel label (*wug*) in the presence of the *fep* and a novel object. Both monolingual and bilingual children disambiguated the reference of the novel word using a mutual exclusivity strategy, choosing the novel object rather than the *fep*. On similar trials with a Mandarin speaker, children were asked to find the referent of a novel Mandarin label *kuò*. Monolinguals again chose the novel object rather than the object with the English label *fep*, even though the Mandarin speaker had no access to conventional English words. Bilinguals did not respond systematically to the Mandarin speaker, suggesting that they had enhanced understanding of the Mandarin speaker's ignorance of English words. The results indicate that monolingual children initially expect words to be conventionally shared across all speakers—native and foreign. Early bilingual experience facilitates children's discovery of the nature of foreign language words.

* Corresponding author.
E-mail address: k.byers@concordia.ca (K. Byers-Heinlein).

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Introduction

> And the whole earth was of one language, and of one speech. ... And they said, Go to, let us build us a city and a tower, whose top may reach unto heaven. ... And the Lord said, Behold, the people is one, and they have all one language; and this they begin to do; and now nothing will be restrained from them, which they have imagined to do. Go to, let us go down, and there confound their language, that they may not understand one another's speech. So the Lord scattered them abroad from thence upon the face of all the earth.
> —*Genesis 11:* 1, 4, 6–8

The biblical story of the Tower of Babel tells of a time when all people spoke a common language, allowing them to build a tower reaching to heaven. This hubristic act was punished, and thereafter the unity of human language was broken; different peoples could no longer speak to each other. This story provides a starting point for considering how young children understand the nature of language. Do young children realize that speakers of different languages do not use the same words to refer to the same things, or do they initially behave consistently with a pre-Babel world where all speakers share the same knowledge of words? What kind of experience might help children to understand that native language speakers and foreign language speakers do not share the same language knowledge? The current study investigated young children's understanding of this aspect of foreign languages and asked whether early bilingualism advances children's understanding that different languages constitute distinct systems of communication.

The conventionality of language

The relation between words and their referents is for the most part arbitrary (Saussure, 1916/1983). Thus, to communicate successfully, speakers must assume that words form a conventional communicative system that links sound with meaning. Clark (1993) defined the notion of the conventionality of language as follows: "For certain meanings, there is a form that speakers expect to be used in the language community" (p. 67). Intertwined in this definition are two related points, namely that (a) speakers of the same language share knowledge of words in that language, but (b) speakers of different languages do not share word knowledge (e.g., a Mandarin speaker is ignorant of English-language words). The vast majority of children's early interactions are with individuals speaking what will become their native language. Consequently, an assumption that speakers share word meanings could assist children in learning new words.

There is considerable evidence that even young children understand this first facet of conventionality—that speakers of the same language share language knowledge. For example, infants expect a familiar label uttered by an unfamiliar speaker (e.g., *shoe*) to refer to its conventional referent (a shoe) (Golinkoff, Hirsh-Pasek, Cauley, & Gordon, 1987; Swingley, Pinto, & Fernald, 1998), expect novel labels to be conventional across different speakers (Buresh & Woodward, 2007; Graham, Stock, & Henderson, 2006; Henderson & Graham, 2005), and show surprise when interlocutors use false labels (Koenig & Echols, 2003).

What these studies do not address is whether children recognize that words from a foreign language belong to a distinct conventional system from native language words. One approach to this question has been to investigate children's ability to learn foreign language words. If children recognize that a foreign language is not part of their own conventional system, they might be less likely to learn these words. Empirical findings on this topic have been mixed. Some studies have found evidence of rapid foreign word learning by infants (Bijeljac-Babic, Nassurally, Havy, & Nazzi, 2009), whereas others have found that successful foreign word learning is modulated by language background (Akhtar, Menjivar, Hoicka, & Sabbagh, 2012) and vocabulary size (Koenig & Woodward, 2012). However, these studies cannot directly address whether children recognize that a foreign language is a distinct conventional system. Given their impressive word-learning skills, children could be successful whether or not they understand the nature of foreign language words (Koenig & Woodward, 2012). On the other hand, children could fail either because they reject foreign words

as not being from their own conventional system or simply because foreign words are unfamiliar sounding and harder to learn.

A different approach to this question is to assess how children interpret the meaning of novel words used by native and foreign speakers. Conventional knowledge can provide clues to a native language speaker's intended referent, but it cannot provide clues to a foreign language speaker's intended referent. For example, imagine attending a cooking class with two tools available: a spatula and an unfamiliar mallet-shaped object. Your English-speaking cooking teacher calls out "tenderizer," and you must choose the correct tool. Typically, both children and adults would infer that the teacher did not mean the spatula and that *tenderizer* probably refers to the mallet-shaped object. This phenomenon of inferring that a novel label refers to a novel object rather than a familiar object is often called *mutual exclusivity* (Markman & Wachtel, 1988; see also Merriman & Bowman, 1989, for their use of the related term *disambiguation*, and see Clark, 1988; Diesendruck & Markson, 2001, Golinkoff, Hirsh-Pasek, Bailey, & Wenger, 1992; and Mervis & Bertrand, 1994, for further discussions of the origins of this behavior). The speaker's use of the novel word *tenderizer* gives a clue as to the intended referent because the word *spatula* is a conventional English word shared across English speakers.

Imagine instead that you are in a Chinese cooking class, and a Mandarin-speaking teacher calls out "gūochǎn." Here, your knowledge of the English word *spatula* does not give any clues as to the meaning of *gūochǎn.* Although you do not know an English word for the mallet-shaped object, this is no longer relevant because the teacher is not privy to English conventional labels. The teacher could equally be referring to either object. In this case, *gūochǎn* is the Mandarin word for spatula, so using mutual exclusivity would lead to an error. Individuals with insight into the nature of foreign language words should show systematic behavior with a native language speaker, assuming that a novel label refers to the object without an obvious name, but should not show systematic behavior with a foreign language speaker. Using an analogous procedure in an experimental context, mutual exclusivity tasks with a foreign language speaker can probe children's understanding of the nature of foreign language words.

To our knowledge, no previous studies have used a foreign speaker mutual exclusivity task to examine children's understanding of conventionality. However, in a related study, 3- to 7-year-old English-learning children were tested by two experimenters: one a native language speaker and one a bilingual who spoke children's native language and a foreign language (Au & Glusman, 1990). The English experimenter taught children the English label *mido* for a toy. The Spanish–English bilingual experimenter also interacted with children in English but asked children in English to find the referent of a novel label *theri*, which she explained was Spanish. Appropriately, children responded at chance and did not use mutual exclusivity in this situation (see also Haryu, 1998, for a related finding, and Diesendruck, 2005, for similar work that tested bilinguals in their two native languages). However, because the second experimenter was a Spanish–English bilingual, and testing was done only in English, it is difficult to draw strong conclusions about children's understanding of the nature of foreign languages. Furthermore, because children in this study were 3 to 7 years old, these results cannot speak to the earlier developmental roots of conventionality. As discussed above, young children readily assume that native language object labels are conventionality shared by native language speakers. This raises the possibility that, at least initially, children overextend extend this robust assumption of conventionality to speakers of foreign languages. However, no studies have empirically tested how younger children respond to monolingual foreign language speakers.

The current study

The goal of the current study was to determine whether young children (aged 24 months) understand that different languages constitute distinct conventional systems and to explore how experience contributes to mature conventional reasoning. Our approach was to test two distinct groups of 24-month-olds: monolinguals and bilinguals.

Bilingual children provide an interesting test case for the role of experience because they regularly use two different conventional systems in their everyday lives. Bilinguals readily discriminate their languages during infancy (Bosch & Sebastián-Gallés, 2001; Byers-Heinlein, Burns, & Werker, 2010) and later can modulate the use of their own languages to match the language used by a monolingual interlocutor (Genesee, Boivin, & Nicoladis, 1996). In this latter study, French–English bilingual

children's utterances were transcribed when speaking with their mothers (who used one language) and when speaking with a monolingual stranger (who used the other language). The proportion of French versus English children produced changed depending on their interlocutor, suggesting that they were sensitive to each language as a conventional system that is used by some individuals but not by others.

Bilingual children also show enhanced metalinguistic awareness, including an understanding of the arbitrariness of native language words (for reviews, see Akhtar & Menjivar, 2012, and Bialystok, 2001). Furthermore, bilingual children show a sophisticated understanding about how their own two languages are used. In Au and Glusman's (1990) study, 3- to 6-year-old Spanish–English bilinguals tested by a bilingual experimenter did not use words from one language to disambiguate the referent of a novel label in their other language. In another study, 3-year-old Hebrew–English bilingual children were taught a novel label for an object in English and then were asked by a puppet for the referent of a novel Hebrew word (Diesendruck, 2005). When the puppet was bilingual, children responded as if the puppet knew the English word used by the experimenter, but they did not do so when the puppet was a monolingual Hebrew speaker or was bilingual but absent when the experimenter labeled the object. Together, these two studies further suggest that bilinguals have some recognition of their own two languages as being distinct conventional systems. Bilinguals' flexible reasoning about their own languages, together with their enhanced metalinguistic awareness, might help them to develop a more sophisticated understanding of the nature of foreign language words.

The current study used a mutual exclusivity task involving a native language speaker and a foreign language speaker, analogous to the cooking class example described above. Our study differs from earlier work (Au & Glusman, 1990; Diesendruck, 2005) in several important ways. First, we tested 24-month-old children to investigate the early roots of children's reasoning about foreign languages. Second, children interacted only with monolingual speakers rather than with bilingual speakers. Third, children were not given explicit instruction about the language used by each speaker, but instead they encountered each language naturalistically. Fourth, task demands for native language and foreign language trials were equated by using isolated words rather than embedding words in a sentence. Fifth, a foreign language unfamiliar to both monolinguals and bilinguals was used.

We tested two specific predictions: (a) that monolingual 24-month-olds would not be sensitive to the nature of foreign language words and would use mutual exclusivity in selecting a referent requested by a foreign language speaker and (b) that bilingualism would accelerate children's understanding of the nature of foreign language words and, thus, 24-month-old bilinguals would not use mutual exclusivity in selecting a referent requested by a foreign language speaker.

Method

Participants

A sample of 48 2-year-old children took part in the study, recruited primarily when infants were born at a local maternity hospital. Of the total sample, 24 children (half girls and half boys) were from monolingual English-learning backgrounds (M_{age} = 24 months 17 days, range = 23 months 12 days to 26 months 7 days), and 24 children (half girls and half boys) were from bilingual backgrounds (M_{age} = 24 months 28 days, range = 23 months 16 days to 25 months 29 days). Monolingual children had no systematic exposure to any non-English language. Bilingual children were learning English and an additional language from birth: Cantonese (n = 10), German (n = 3), Spanish (n = 3), French (n = 2), and 1 each of Catalan, Hungarian, Ilocano, Japanese, Korean, and Portuguese. Although Mandarin and Cantonese are both Chinese languages, they are mutually unintelligible, and Cantonese speakers perceive Mandarin as foreign in the same way as English speakers perceive a related language such as German as foreign (see Ramsey, 1987, for a further comparison of Chinese languages). Thus, Mandarin was a foreign language for all children who participated in the study.

Bilinguals' language experience was measured using the Language Exposure Questionnaire (Bosch & Sebastián-Gallés, 2001). Bilinguals heard English 50% of the time on average (range = 28–74%) and heard their other language 49% of the time on average (range = 26–72%). In addition, 2 children heard a small amount of a third non-Mandarin language (<15%). An additional 16 children were tested but

Block	Experimenter	Trial type	Label	Sample object pair	Sample target	Number of trials
1	English	Familiar	e.g. **dog**			4
		Taught	**fep**			2
		English mutual exclusivity	**wug**			2
2	Mandarin	Mandarin conventionality	**kuò**			4
3	English	Taught	**fep**			2
		English mutual exclusivity	**wug**			2

Fig. 1. Delineation of trial types and trial order.

excluded from the analyses because of refusal to complete the procedure (2 monolinguals and 8 bilinguals[1]), side bias in object selection (responding on the same side for at least 90% of completed trials; 1 monolingual and 2 bilinguals), failure to make a clear choice on the majority of experimental trials (1 monolingual), experimenter error (1 monolingual), and suspected hearing impairment (1 bilingual).

Children's English productive vocabularies were measured using the MacArthur–Bates Communicative Development Inventories: Words and Sentences (CDI; Fenson, Marchman, Thal, Dale, & Bates, 2007). Estimates were not obtained for bilingual children's vocabularies in their other language due to a lack of appropriate versions of the CDI in some of the children's languages and the difficulty of comparing CDI scores across different languages (Pearson, 1998). Monolinguals had an average English vocabulary of 396 words (median = 429, *SD* = 147, range = 81–653). Bilinguals had an average English vocabulary of 282 words (median = 261, *SD* = 146, range = 75–524). A larger vocabulary size for monolinguals was unsurprising given that the measure of bilinguals' vocabulary size did not include the words they knew in their non-English language.

Materials

Four familiar toys (a dog, a car, a shoe, and a book) and 3 novel toys (see Fig. 1) were used in the study. All objects were distinct and easily graspable. In addition, a bell box that made a ringing sound when an object was placed inside was used to encourage children to make an explicit choice on each trial. Children's responses were recorded via a camcorder located in the corner of the testing room.

Procedure

Design overview

Children were tested in a two-experimenter paradigm (e.g., Graham et al., 2006). The first experimenter was a female native English speaker who was of European heritage. The second experimenter

[1] It should be noted that a greater proportion of the bilinguals (8/36) than of the monolinguals (2/28) tested refused to complete the procedure, a difference that was marginally significant, $\chi^2(1, N = 64) = 2.72$, $p = .099$. We return to this point in the Discussion.

was an ethnically Chinese native Mandarin speaker. During testing, the two experimenters were never in the room at the same time. Mandarin was chosen as the foreign language of testing because its phonotactics and phonology are highly distinct from English. Furthermore, the Mandarin speaker was of a different ethnicity than the English speaker, providing a visual cue that the two might be from different language communities.

Each of the three novel stimulus toys was assigned an experimental role, and roles were counterbalanced across children. The first toy was labeled by the English experimenter with the novel English label *fep*. The second toy served as a target to test whether children would use the English experimenter's knowledge of the taught label to disambiguate the meaning of the novel English label *wug* using mutual exclusivity (English mutual exclusivity trials). In parallel trials, the third toy was used to test whether children would disambiguate the meaning of the novel Mandarin label *kuò* using mutual exclusivity (Mandarin conventionality trials). If children have a mature understanding of the nature of foreign language words, they should not use a mutual exclusivity strategy in this situation because the Mandarin speaker does not know the conventional English words. Use of mutual exclusivity with the Mandarin speaker would imply that children do not understand the nature of foreign language words.

In studies of this type, children's understanding of a speaker's intentions are measured by their response to a speaker's request for an object. Typically, requests are made using conventional carrier phrases (e.g. "Can you give me the shoe?"). However, the current study compared children's responses to an English experimenter and to a Mandarin experimenter. Using carrier phrases would introduce a confound because English carrier phrases would be more familiar and understandable compared with Mandarin carrier phrases. Furthermore, it might be hard for children to identify the word intended to label the object in a Mandarin sentence. Thus, in the current study, children were trained to retrieve an object after hearing an isolated object label (e.g., "Dog! Dog!"). All trials that investigated children's use of mutual exclusivity with the English speaker and with the Mandarin speaker used isolated object labels.

Warm-up

On arrival, both experimenters greeted children and their parents in a brief warm-up period during which the parents completed the consent form. Only the English experimenter spoke to the children and parents, whereas the Mandarin experimenter remained silent but smiled at and played with the children. She avoided any behavior that would indicate that she understood English. By doing so, children became acquainted with the Mandarin experimenter without being cued before the beginning of the study as to what language she spoke. Furthermore, because some aspects of the warm-up phase could not be tightly controlled across children (e.g., the duration of the warm-up period depended on how many questions parents asked), this ensured that each child's exposure to the Mandarin experimenter's language was controlled because it occurred only during the experimental phase.

Block 1: English

Children were told by the English experimenter that they were going to play a game and were taken into an adjacent testing room. The Mandarin experimenter stayed behind. Children were seated on a small chair at a rectangular table directly across from the English experimenter. The English experimenter placed the three novel objects on the table without naming them and encouraged children to play freely with them until each object had been handled. After putting those objects away, she displayed the four familiar objects and named each of them twice (e.g., "Here's a little dog. That's a nice dog!"). She then put the bell box on the table and showed children how to make a noise by placing an object inside. Children were encouraged to play with the box until they were familiar with its function and would readily put objects inside, at which point the experimenter put all materials away.

During the teaching phase of the study, the English experimenter taught a label to children for one of the novel objects (*fep*) and familiarized children with the other two novel objects to make them similarly salient. The objects were presented one at a time. The labeled object was named five times with the novel label (i.e., "Do you know what this is? It's a *fep*! Can you say *fep*? Yeah, it's called a *fep*! Do you like the *fep*? Wow, a *fep*!"). Each of the unlabeled objects was also commented on five times (i.e., "Do you see this? Here it is! Can you see it? Yeah, look at this one! Do you like this one? Wow!").

The English experimenter began the test phase of Block 1 with 4 familiar label trials that taught children to put a requested object into the bell box. During these trials, children were presented with two objects (e.g., a car and a shoe) placed on either side of the bell box and were asked to put one of them inside (e.g., "Where's the car? Can you put the car inside?"). This procedure was repeated four times with different pairings of the familiar objects, such that each of the objects was the target once and the distracter once. In half of the trials the target was on the right, and in the other half the target was on the left (counterbalanced across children). For the first 3 familiar object trials only, the target object's label was embedded in a carrier phrase in order to familiarize children with the experimental task. After the first 3 familiar object trials, object requests on all trials with either experimenter were made by speaking the label twice in isolation (e.g., "Shoe! Shoe!") and repeated with a carrier phrase only if children did not respond.

Following familiar label trials, the experimenter initiated 2 taught label trials and 2 English mutual exclusivity trials. These same trials were repeated again in Block 3 (described below) as a check that children had not forgotten the label. In taught label trials, the experimenter presented children with the object that had been labeled *fep* and one of the unlabeled objects and then asked for the *fep* (e.g., "Fep! Fep!"). In English mutual exclusivity trials, the experimenter used the same two objects (i.e., the *fep* and the same unlabeled object as was used in taught label trials), but this time she used the novel word *wug* (e.g., "Wug! Wug!"). The 4 trials were presented in a consistent order across children (*fep–wug–wug–fep*). The side of the first target object was counterbalanced across children, and within children the side of the target was switched after completing one of each trial type. After finishing the trials, the English experimenter told children that her friend wanted to come play the same game, and she left the room.

Block 2: Mandarin

The Mandarin experimenter entered the room, greeted children in Mandarin, and sat down at the table across from the children. She retrieved the three novel objects, put them on the table, and both verbally and nonverbally encouraged children to play with the objects until all three were handled. After removing the novel objects, she brought out the four familiar objects and the bell box. She showed children that she knew how to play the game by putting the objects into the bell box while chatting with children naturalistically as if she were playing with Mandarin-speaking children. She clearly named each object in Mandarin, both in full sentences and in isolation. The ostensive naming of these objects gave children clear cues that she was using labels that were not conventional in English (i.e., they were foreign language labels). The entire sequence lasted several minutes, during which the experimenter spoke in Mandarin almost constantly, providing children with ample information about her language. Once children became comfortable in playing with her and would readily put objects into the bell box (i.e., children had put each of the familiar objects into the bell box once), she put the familiar objects away.

She then tested children on Mandarin conventionality trials in a procedure that was similar to that of English mutual exclusivity trials. Children were presented with a pair of novel objects: the one that had been previously given the English label *fep* and the third unlabeled object that had not yet been used in test trials with the English experimenter. Children were asked to find the referent for the novel Mandarin label *kuò*. As with the English experimenter, the Mandarin experimenter requested the target using a repeated isolated word (i.e., "Kuò! Kuò!") to emphasize the target label so that children would not become confused by a Mandarin sentence. Children were tested four times on this trial type so that the number of trials across each trial type would be equal. The side of presentation of the first trial was counterbalanced across children, and the side of presentation of the two objects was switched after 2 trials. After finishing the Mandarin conventionality trials, the Mandarin experimenter explained in Mandarin that her friend wanted to come back and play again.

Block 3: English

The English experimenter came in again to repeat 2 learned label trials and 2 English mutual exclusivity trials. These trials were identical to the last 4 trials of Block 1 except that the side of presentation of the objects was reversed.

Results

Coding and analysis

For each trial type, one candidate object was designated the target and the other was designated the distracter (see also Table 1). For familiar label trials, the target was the object named by the conventional label used in that trial. For taught label trials, the target was the object that the English experimenter had previously labeled with the word *fep*. For both English mutual exclusivity trials and Mandarin conventionality trials, one candidate object was the object that had previously been labeled *fep*, whereas the other was one of the previously unlabeled objects. For both of these trial types, the target was considered the previously unlabeled object, in other words, the object that would reflect a choice based on mutual exclusivity. However, it should be noted that for the Mandarin conventionality trials, consistent choice of the object designated the target would reflect a failure to understand that Mandarin speakers do not know conventional English labels.

Coding of children's responses was done by reviewing the videotapes with the sound turned off so that coders would be blind to the side of the target. Coders identified the object that children placed in the box first. If children refused to complete the trial, or if objects were placed in the box simultaneously, the trial was coded as missing. The total percentages of missing trials were 2% (0% monolingual and 4% bilinguals) for familiar label trials, 5% (5% monolinguals and 5% bilinguals) for taught label trials, 6% (3% monolinguals and 9% bilinguals) for English mutual exclusivity trials, and 13% (11% monolinguals and 15% bilinguals) for Mandarin conventionality trials.

Preliminary analyses examined whether the data fit the assumptions necessary for the use of parametric statistical techniques such as *t*-tests and analysis of variance (ANOVA). Shapiro–Wilk tests performed separately for monolinguals and bilinguals on each trial type indicated significant nonnormality for both groups across all conditions (*p*s < .05). Because the data showed a strong violation of the normality assumption, nonparametric chi-square tests using an online calculator (Preacher, 2001) were used to test experimental hypotheses because these do not require an assumption of normality. To ensure adequate cell frequencies, children were grouped for each trial type according to their performance on the majority of trials completed. Children were categorized as target choosers if they chose the target more often than the distracter (i.e., chose the target on 3/4 or 4/4 trials). Conversely, children were categorized as distracter choosers if they chose the distracter more often than the target (i.e., on 3/4 or 4/4 trials). Children who chose the target and the distracter equally often (i.e.,

Table 1
Number of children following each strategy across different trial types.

Group	Inconsistent responders	Target choosers	Distracter choosers	*p*
		Familiar label trials (Target: named object)		
Monolinguals	4	20	0	n/a
Bilinguals	3	21	0	n/a
		Taught label trials (Target: object previously labeled fep)		
Monolinguals	4	17	3	.0017*
Bilinguals	2	16	6	.033*
		English mutual exclusivity trials (Target: previously unlabeled object)		
Monolinguals	10	13	1	.0013**
Bilinguals	5	16	3	.028*
		Mandarin conventionality trials (Target: previously unlabeled object)		
Monolinguals	8	13	3	.021*
Bilinguals	9	6	9	.60

Note. Reported *p* values are for two-tailed comparisons between target choosers and distracter choosers. On trial types where no children were classified as distracter choosers, p-values are marked as n/a (not applicable) as no statistical comparison was necessary. The orthogonal comparison of inconsistent responders to consistent responders (target choosers and distracter choosers) was not significant in any condition (*p*s > .1).

* $p < .05$.

** $p < .01$.

chose the target twice and the distracter twice across 4 trials) were categorized as inconsistent responders. Frequencies of each response type for the monolingual and bilingual groups are detailed in Table 1. Analyses compared obtained frequencies with the distribution of children across response types that would be expected if children responded randomly on each trial. Because there were 4 trials of each type, applying the binomial distribution yielded the null hypothesis that 31.25% of children would be categorized as target choosers, 31.25% of children would be categorized as distracter choosers, and 37.5% of children would be categorized as inconsistent responders.[2]

Familiar label trials

Familiar label trials were analyzed to examine whether children could perform the basic task of selecting a named object. An omnibus chi-square test showed that the distribution of children across patterns of response was different from chance for both the monolingual group, $\chi^2(2, N = 24) = 31.10$, $p < .001$, $\varphi = 1.14$, and the bilingual group, $\chi^2(2, N = 24) = 35.80$, $p < .001$, $\varphi = 1.22$. To pinpoint the locus of the effect, follow-up analyses compared the number of target choosers with the number of distracter choosers in each group. Under the null hypothesis, an equal number of children should fall into these two categories. However, for both monolinguals and bilinguals, the majority of children were target choosers and no children were distracter choosers. Thus, a statistical comparison of these two response types was not necessary. The results from the familiar label trials indicated that both monolinguals and bilinguals could perform the basic experimental task successfully.

Taught label trials

Taught label trials were analyzed to verify that children had learned the label *fep*. Preliminary analyses compared children's performance on taught label trials that occurred early in testing (those in Block 1) with those that occurred later in testing (those in Block 3). There was no evidence that either monolingual or bilingual children's performance changed over the course of testing, so trials of the same type were collapsed across blocks. Omnibus chi-square analyses showed that the pattern of response of both monolingual children, $\chi^2(2, N = 24) = 17.51$, $p < .001$, $\varphi = .85$, and bilingual children, $\chi^2(2, N = 24) = 15.38$, $p < .001$, $\varphi = .80$, on the taught label trials was different from chance. A follow-up analysis showed that there were significantly more target choosers than distracter choosers for both monolinguals, $\chi^2(1, N = 20) = 9.80$, $p = .0017$, $\varphi = .70$, and bilinguals, $\chi^2(1, N = 22) = 4.55$, $p = .033$, $\varphi = .45$, indicating that children had learned and retained the English label *fep*. A direct comparison of target choosers and distracter choosers in the two groups showed no interaction between language background (monolingual vs. bilingual) and children's pattern of response, $\chi^2(1, N = 42) = 0.94$, $p = .33$, $\varphi = .15$, indicating that the groups showed equal learning of the taught label.[3]

English mutual exclusivity trials

The English mutual exclusivity trials tested whether children used mutual exclusivity to disambiguate the referent of a novel label used by a native language speaker. The omnibus analysis revealed that the pattern of response of both monolinguals, $\chi^2(2, N = 24) = 9.78$, $p = .0075$, $\varphi = .64$, and bilinguals, $\chi^2(2, N = 24) = 14.11$, $p < .001$, $\varphi = .77$, differed significantly from chance. In both the monolingual group, $\chi^2(1, N = 14) = 10.29$, $p = .0013$, $\varphi = .85$, and the bilingual group, $\chi^2(1, N = 19) = 8.90$, $p = .0028$, $\varphi = .68$, there were significantly more target choosers than distracter choosers, indicating that both groups used a mutual exclusivity strategy in response to a novel label from a native language speaker.

[2] These probabilities are close approximations but not exact because data from a small number of trials was missing.

[3] Although the main comparison of interest was between target choosers and distracter choosers, a second interesting and orthagonal comparison was whether monolinguals and bilinguals differed in their propensity to respond consistently (i.e., be either target choosers or distracter choosers) versus inconsistently (i.e., be inconsistent responders). However, chi-square analyses comparing consistent responders with inconsistent responders did not show a significant difference between monolinguals and bilinguals on any of the four trial types ($ps > .10$). This indicated that inconsistent responders did not drive the monolingual–bilingual difference.

A comparison between the two groups in the number of target choosers versus distracter choosers indicated no significant interaction between language background and children's pattern of response, $\chi^2(1, N = 33) = 0.57$, $p = .45$, $\varphi = .12$, confirming that when the experimenter spoke English, the two groups were equally likely to give a mutual exclusivity response.

Mandarin conventionality trials

The main experimental hypotheses concerned children's performance on Mandarin conventionality trials. On these trials, systematic responding using mutual exclusivity would indicate a failure to recognize that foreign language speakers are ignorant of English object labels. Because this trial type was repeated four times in a row, preliminary analyses compared children's performance on the first 2 Mandarin conventionality trials with their performance on the second 2 such trials. There was no significant difference for either monolingual or bilingual children, so performance was averaged across the four trials as it was for the other trial types.

An omnibus chi-square analysis revealed that the monolinguals performed significantly different from chance, $\chi^2(2, N = 24) = 6.84$, $p = .032$, $\varphi = .53$. However, bilinguals' performance was not significantly different from chance, $\chi^2(2, N = 24) = 0.60$, $p = .74$, $\varphi = .16$. Follow-up analyses examined whether either group's pattern was characterized by mutual exclusivity. For the monolingual group, significantly more children were target choosers than distracter choosers, $\chi^2(1, N = 16) = 8.81$, $p = .021$, $\varphi = .74$, indicating that the monolingual children responded using mutual exclusivity. However, for the bilingual children, there were more distracter choosers than target choosers, although this difference was not statistically significant, $\chi^2(1, N = 15) = 0.60$, $p = .44$, $\varphi = -.20$. A direct comparison of target choosers and distracter choosers in the two groups confirmed a significant interaction between children's language background and their pattern of response, $\chi^2(1, N = 31) = 5.55$, $p = .018$, $\varphi = .42$. In sum, monolingual and bilingual children showed significantly different performance on the Mandarin conventionality trials; the monolinguals tended to use a mutual exclusivity strategy, whereas the bilinguals did not.

The final analyses investigated whether any individual differences among bilingual children affected their performance on Mandarin conventionality trials. Chi-square analyses based on group (for categorical variables) or median split (for continuous variables) showed no evidence that bilingual children's performance differed as a function of their English vocabulary size (larger vs. smaller), language dominance (English dominant vs. non-English dominant), balance of exposure to each language (balanced vs. unbalanced), or whether they were from an ethnically Asian background (all $ps > .10$).

Discussion

Each of the world's languages forms a distinct conventional system of communication; different languages use different words to name the same referents. This study explored whether 2-year-old children understand the nature of foreign language words, specifically that native language speakers and foreign language speakers do not share conventional knowledge of object labels. Our paradigm exploited the mutual exclusivity phenomenon, whereby children tend to assume that a novel word refers to a novel object rather than one that already has a label. Monolingual English-learning children and bilingual children learning English and a second non-Mandarin language were taught an English label and then were tested on their use of mutual exclusivity with an English speaker and their (potentially erroneous) use of mutual exclusivity with a Mandarin speaker. Because none of the children was familiar with Mandarin, it was a foreign language to both groups.

Both monolingual and bilingual children correctly disambiguated the meaning of a novel word presented by the English speaker using a mutual exclusivity strategy. The critical test of children's understanding of the nature of foreign language words was their response to the Mandarin speaker in identical trials. Objectively, knowing what an English speaker calls a particular object cannot help to disambiguate the referent of a Mandarin word because Mandarin and English are independent conventional systems. However, in response to a novel Mandarin word, monolinguals again used a mutual exclusivity strategy, retrieving the object with no *English* label as the referent for the Mandarin word.

Even though the Mandarin speaker had no access to conventional English object labels, monolinguals used the same strategy as they had with the English speaker. This finding suggests that monolingual 2-year-old children fail to understand the nature of foreign languages as distinct conventional systems.

Bilingual children showed a very different pattern from monolingual children on trials with the Mandarin speaker; they did not show mutual exclusivity and instead performed at chance. This suggests that bilinguals were aware that the Mandarin speaker was ignorant of English object labels and interpreted her Mandarin label as being equally likely to refer to either object. This result cannot be attributed to differences in performing the basic experimental task. Although previous work has shown that monolinguals and bilinguals can differ in their use of mutual exclusivity (Bialystok, Barac, Blaye, & Poulin-Dubois, 2010; Byers-Heinlein & Werker, 2009, 2013; Davidson, Jergovic, Imami, & Theodos, 1997; Davidson & Tell, 2005; Houston-Price, Caloghiris, & Raviglione, 2010), monolinguals and bilinguals in the current study both used mutual exclusivity with the English speaker, and their behavior did not differ from each other. Furthermore, bilinguals' pattern of response did not vary as a function of their English vocabulary size, language dominance, balance of language exposure, or ethnic origin (Asian vs. non-Asian), ruling out the possibility that these individual differences drove the result. Thus, bilingual 2-year-olds behaved consistently with an understanding that English and Mandarin are distinct conventional systems. This result suggests that growing up bilingual promotes the understanding of the nature of foreign language words.

It should be noted that monolinguals and bilinguals did show some small differences in their overall willingness to perform the experimental task. The number of missing trials and overall attrition rate was somewhat higher for the bilinguals than for the monolinguals. On the one hand, any difference in attrition and trial completion rate should be taken into account when interpreting group differences. On the other hand, bilinguals had more missing trials than monolinguals on both English and Mandarin trials, but performance differences were seen only on Mandarin trials. Thus, although it is impossible from the current study to understand why bilinguals were somewhat less willing than monolinguals to perform the task, it is unlikely that this drove the monolingual–bilingual difference in using a mutual exclusivity strategy with the Mandarin speaker.

Combined with previous studies, the current results suggest that monolingual 2-year-olds have a very broad assumption about the conventionality of object labels, expecting labels to be shared by both native language and foreign language speakers. Such an assumption, although incorrect, is not necessarily problematic. Theoretical work on language acquisition has pointed out that, at least within the native language, an early assumption that different speakers share conventional language knowledge could be particularly important for getting language acquisition off the ground (Clark, 1993, 2007). By assuming that words are conventionally shared, children need not relearn how each speaker refers to each object but can infer a new speaker's knowledge based on that of previous interlocutors. As reviewed in the Introduction, there is strong evidence that children as young as 13 months assume that word meanings are shared by native language speakers (Buresh & Woodward, 2007; Graham et al., 2006; Henderson & Graham, 2005; Koenig & Echols, 2003; but see Buresh & Woodward, 2007, for a failure of 9-month-olds to extend linguistic information across individuals). This early assumption of conventionality is not all-encompassing because monolingual children do not expect desires (Graham et al., 2006), preferences (Henderson & Graham, 2005), facts (Diesendruck & Markson, 2001), or proper nouns (Diesendruck, 2005) to be conventionally shared across individuals. Thus, children do not operate under an all-or-none assumption of conventionality but in some cases can accurately adjust their expectations about what knowledge is shared across individuals.

Yet, our results suggest that 2-year-old monolinguals mistakenly behave as if foreign language speakers share knowledge of object labels with native language speakers. For monolingual children, the broad assumption that *all* individuals share conventional language knowledge is likely consistent with the majority of their experience. It might be quite seldom that monolingual children interact with foreign language speakers. Thus, a very broad assumption of the conventionality of words could prove to be quite effective for monolingual language acquisition. However, bilingual children regularly interact with individuals who are monolingual in each of their two native languages. Thus, these children might notice that language knowledge is not always conventionally shared (Diesendruck, 2005). Even without direct experience with foreign languages, bilinguals' regular experience with individuals whose conventional knowledge differs could facilitate the understanding of the nature of foreign

language words (Akhtar et al., 2012). This is consistent with other recent findings demonstrating that bilingual children are advanced relative to monolinguals in metalinguistic tasks such as understanding the nature of effective communication (Siegal, Iozzi, & Surian, 2009; Siegal et al., 2010) and in using speakers' nonverbal referential cues (Yow & Markman, 2011).

More broadly interpreted, bilingual children's experience that different interlocutors can possess different language knowledge could lead them to a more advanced appreciation of others' mental states. Sabbagh and Henderson (2007) proposed that early conventionality is founded on children's limited theory of mind skills. Young children seem to act as if their own knowledge states are shared by others (Wellman, Cross, & Watson, 2001). If young children assume that others share their knowledge, they may be unable to represent others as having linguistic knowledge different from their own, even in the explicit case tested here where an interlocutor spoke only Mandarin. Under Sabbagh and Henderson's (2007) proposal, children attain a true understanding of conventionality only later in development once they can represent others' mental states as being different from their own. If this is the case, it implies that the bilingual children in the current study, but not the monolingual children, might have been able to represent the notion that the Mandarin speaker was ignorant of conventional English words. This interpretation is consistent with studies showing that 3- and 4-year-old bilinguals outperform monolinguals on some theory of mind tasks (Goetz, 2003; Kovács, 2009). Future studies will be needed to directly test whether bilinguals' advantage in the current task is related to broader advantages in the representation of mental states.

Our results contrast with previous studies showing that, in many cases, monolinguals engage in systematically different behavior toward native language and foreign language speakers (Byers-Heinlein et al., 2010; Hoicka & Akhtar, 2011; Kinzler, Dupoux, & Spelke, 2007; Moon, Cooper, & Fifer, 1993; Shutts, Kinzler, McKee, & Spelke, 2009). In contrast, in the current study, monolinguals responded similarly toward the native speaker and the foreign speaker. One explanation is that previous studies focused on children's approach/avoidance behavior such as interest in listening to a foreign language or interacting with a foreign speaker, whereas we directly tested children's understanding of the nature of foreign languages as communicative systems. It may be that that although children can readily detect foreign language speakers, and often show wariness of these individuals, they initially lack an understanding of what it *means* to speak a foreign language.

The results reported here open up several avenues for future inquiry. The current study showed that bilingual 24-month-olds are sensitive to the notion that knowledge of object labels is conventional within a language but not across different languages, but that same-aged monolinguals are not sensitive to this important distinction. This contrasts with previous research with older preschoolers (aged 3–7 years), which suggested that both monolinguals (Au & Glusman, 1990) and bilinguals (Au & Glusman, 1990; Diesendruck, 2005) can modulate their assumptions about an interlocutor's knowledge depending on the language used. Differences in methodology notwithstanding (e.g., use of a monolingual foreign language interlocutor vs. a bilingual interlocutor), this could suggest that monolingual children's understanding of conventionality undergoes important development during the preschool years (see also Haryu, 1998). Future studies should test children at both younger and older ages in the same paradigm to more precisely examine the developmental trajectory of this monolingual–bilingual difference.

Research is also needed to pinpoint how monolinguals eventually come to understand the nature of foreign language words. Although here we have highlighted the role of bilingual experience, it is likely that a variety of experiences can promote this understanding. For example, one previous study of foreign label learning found an advantage for children who were exposed to a second language, but it did not find an advantage for fluently bilingual children (Akhtar et al., 2012). It is an open question how language-exposed children would perform in the current paradigm. Future research could also combine foreign word learning and mutual exclusivity paradigms. For example, if children were taught a label in a foreign language, would they use this knowledge in a mutual exclusivity task with a native language speaker?[4] Finally, in our study, the two experimenters both spoke different languages and were of different ethnicities. Future research could investigate whether children use ethnicity as a cue

[4] We thank an anonymous reviewer for this suggestion.

to an individual's language knowledge and how this is modulated by the fact that ethnicity is not always a reliable indicator of language knowledge.[5]

To conclude, this study has found that 2-year-old monolingual English-learning children do not recognize the nature of foreign language words and incorrectly behave as if a foreign language speaker is privy to conventional English words. This is consistent with two-stage theories of the development of conventionality; children are initially unable to represent others' knowledge as different from their own, and only later do they develop a true understanding of conventionality that takes into account others' mental states (Sabbagh & Henderson, 2007). As a consequence, young monolingual children behave as if word meanings are conventionally shared by all individuals whether or not they speak the same language. Even though very young children prefer native language speakers to foreign language speakers, they do not necessarily understand what it *means* to speak a foreign language. Bilingual children, who regularly encounter and interact with individuals who speak different languages, show a more sophisticated understanding of the nature of foreign language words. The current research provides the first direct evidence that early bilingual experience helps children to understand the conventional nature of language.

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References

Akhtar, N., & Menjivar, J. A. (2012). Cognitive and linguistic correlates of early exposure to more than one language. In J. B. Benson (Ed.). *Advances in child development and behavior* (Vol. 42, pp. 41–78). San Diego: Academic Press.

Akhtar, N., Menjivar, J., Hoicka, E., & Sabbagh, M. A. (2012). Learning foreign labels from a foreign speaker: The role of (limited) exposure to a second language. *Journal of Child Language, 39*, 1135–1149.

Au, T. K., & Glusman, M. (1990). The principle of mutual exclusivity in word learning: To honor or not to honor? *Child Development, 61*, 1474–1490.

Bialystok, E. (2001). Metalinguistic aspects of bilingual processing. *Annual Review of Applied Linguistics, 21*, 169–181.

Bialystok, E., Barac, R., Blaye, A., & Poulin-Dubois, D. (2010). Word mapping and executive functioning in young monolingual and bilingual children. *Journal of Cognition and Development, 11*, 485–508.

Bijeljac-Babic, R., Nassurally, K., Havy, M., & Nazzi, T. (2009). Infants can rapidly learn words in a foreign language. *Infant Behavior & Development, 32*, 476–480.

Bosch, L., & Sebastián-Gallés, N. (2001). Early language differentiation in bilingual infants. In J. Cenoz & F. Genesee (Eds.), *Trends in bilingual acquisition* (pp. 71–93). Amsterdam: John Benjamins.

Buresh, J. S., & Woodward, A. L. (2007). Infants track action goals within and across agents. *Cognition, 104*, 287–314.

Byers-Heinlein, K., Burns, T. F., & Werker, J. F. (2010). The roots of bilingualism in newborns. *Psychological Science, 21*, 343–348.

Byers-Heinlein, K., & Werker, J. F. (2009). Monolingual, bilingual, trilingual: Infants' language experience influences the development of a word learning heuristic. *Developmental Science, 12*, 815–823.

Byers-Heinlein, K., & Werker, J. F. (2013). Lexicon structure and the disambiguation of novel words: Evidence from bilingual infants. *Cognition, 128*, 407–416.

Clark, E. V. (1988). On the logic of contrast. *Journal of Child Language, 15*, 317–335.

Clark, E. V. (1993). *The lexicon in acquisition*. New York: Cambridge University Press.

Clark, E. V. (2007). Conventionality and contrast in language acquisition. In M. Sabbagh & C. Kalish (Eds.), *Right thinking: The development of conventionality* (New Directions in Child and Adolescent Development, No. 115, pp. 11–23). San Francisco: Jossey–Bass.

Davidson, D., Jergovic, D., Imami, Z., & Theodos, V. (1997). Monolingual and bilingual children's use of the mutual exclusivity constraint. *Journal of Child Language, 24*, 3–24.

Davidson, D., & Tell, D. (2005). Monolingual and bilingual children's use of mutual exclusivity in the naming of whole objects. *Journal of Experimental Child Psychology, 92*, 25–45.

Diesendruck, G. (2005). The principles of conventionality and contrast in word learning: An empirical examination. *Developmental Psychology, 41*, 451–463.

Diesendruck, G., & Markson, L. (2001). Children's avoidance of lexical overlap: A pragmatic account. *Developmental Psychology, 37*, 630–641.

[5] It is important to note that children in this study were tested in Vancouver, British Columbia, Canada, where 52% of the population are members of visible minorities (Statistics Canada, 2007). These individuals speak a variety of native languages, including English. Some children, particularly in the bilingual group, had family members who were of two different ethnicities. Most children likely had exposure to individuals of different ethnicities in day care and/or in the community. We did not systematically measure this aspect of children's environments, so it is an open question whether this influenced our results.

Fenson, L., Marchman, V. A., Thal, D., Dale, P. S., & Bates, E. (2007). *MacArthur–Bates Communicative Development Inventories (CDIs)* (2nd ed.). Baltimore, MD: Paul H. Brookes.
Genesee, F., Boivin, I., & Nicoladis, E. (1996). Talking with strangers: A study of bilingual children's communicative competence. *Applied Psycholinguistics, 17*, 427–442.
Goetz, P. J. (2003). The effects of bilingualism on theory of mind development. *Bilingualism: Language and Cognition, 6*, 1–15.
Golinkoff, R. M., Hirsh-Pasek, K., Bailey, L. M., & Wenger, N. R. (1992). Young children and adults use lexical principles to learn new nouns. *Journal of Developmental Psychology, 28*, 99–108.
Golinkoff, R. M., Hirsh-Pasek, K., Cauley, K. M., & Gordon, L. (1987). The eyes have it: Lexical and syntactic comprehension in a new paradigm. *Journal of Child Language, 14*, 23–45.
Graham, S. A., Stock, H., & Henderson, A. M. E. (2006). Nineteen-month-olds' understanding of the conventionality of object labels versus desires. *Infancy, 9*, 341–350.
Haryu, E. (1998). Effects of knowledge about cross-language equivalents on children's use of mutual exclusivity in interpreting novel labels. *Japanese Psychological Research, 40*, 82–91.
Henderson, A. M. E., & Graham, S. A. (2005). Two-year-olds' appreciation of the shared nature of novel object labels. *Journal of Cognition and Development, 6*, 381–402.
Hoicka, E., & Akhtar, N. (2011). Preschoolers joke with jokers, but correct foreigners. *Developmental Science, 14*, 848–858.
Houston-Price, C., Caloghiris, Z., & Raviglione, E. (2010). Language experience shapes the development of the mutual exclusivity bias. *Infancy, 15*, 125–150.
Kinzler, K. D., Dupoux, E., & Spelke, E. S. (2007). The native language of social cognition. *Proceedings of the National Academy of Sciences of the United States of America, 104*, 12577–12580.
Koenig, M. A., & Echols, C. H. (2003). Infants' understanding of false labeling events: The referential roles of words and the speakers who use them. *Cognition, 87*, 179–208.
Koenig, M., & Woodward, A. L. (2012). Toddlers learn words in a foreign language: The role of native vocabulary knowledge. *Journal of Child Language, 39*, 322–337.
Kovács, Á. M. (2009). Early bilingualism enhances mechanisms of false-belief reasoning. *Developmental Science, 12*, 48–54.
Markman, E. M., & Wachtel, G. F. (1988). Children's use of mutual exclusivity to constrain the meanings of words. *Cognitive Psychology, 20*, 121–157.
Merriman, W. E., & Bowman, L. L. (1989). The mutual exclusivity bias in children's word learning. *Monographs of the Society for Research in Child Development, 54*(3–4, Serial No. 220).
Mervis, C. B., & Bertrand, J. (1994). Acquisition of the novel name–nameless category (N3C) principle. *Child Development, 65*, 1646–1662.
Moon, C., Cooper, R. P., & Fifer, W. P. (1993). Two-day-olds prefer their native language. *Infant Behavior and Development, 16*, 495–500.
Pearson, B. Z. (1998). Assessing lexical development in bilingual babies and toddlers. *International Journal of Bilingualism, 2*, 347–372.
Preacher, K. J. (2001). *Calculation for the chi-square test: An interactive calculation tool for chi-square tests of goodness of fit and independence* [computer software]. Available from: <http://quantpsy.org>.
Ramsey, R. S. (1987). *The languages of China*. Princeton, NJ: Princeton University Press.
Sabbagh, M. A., & Henderson, A. M. E. (2007). How an appreciation of conventionality shapes early word learning. *New Directions for Child and Adolescent Development, 115*, 25–38.
Saussure, F. (1983). *Course in general linguistics*. La Salle, IL: Open Court. (Original work published in 1916).
Shutts, K., Kinzler, K. D., McKee, C. B., & Spelke, E. S. (2009). Social information guides infants' selection of foods. *Journal of Cognition and Development, 10*, 1–17.
Siegal, M., Iozzi, L., & Surian, L. (2009). Bilingualism and conversational understanding in young children. *Cognition, 110*, 115–122.
Siegal, M., Surian, L., Matsuo, A., Geraci, A., Iozzi, L., Okumura, Y., et al (2010). Bilingualism accentuates children's conversational understanding. *PLoS One, 5*(2), e9004.
Statistics Canada. (2007). *2006 Community profiles: Vancouver, British Columbia* (Catalogue No. 92-591-XWE). Retrieved September 18, 2013, from: <http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/index.cfm?Lang=E>.
Swingley, D., Pinto, J. P., & Fernald, A. (1998). Assessing the speed and accuracy of word recognition in infants. In C. Rovee-Collier, L. P. Lipsitt, & H. Hayne (Eds.), *Advances in infancy research* (pp. 257–277). Norwood, NJ: Ablex.
Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development, 72*, 655–684.
Yow, W. Q., & Markman, E. M. (2011). Young bilingual children's heightened sensitivity to referential cues. *Journal of Cognition and Development, 12*, 12–31.