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ABSTRACT

Bilingualism has been associated with a range of cognitive and language-related advantages, including the recognition that words can have different labels across languages. However, most previous research has failed to consider heterogeneity in the linguistic environments of children categorized as monolingual. Our study assessed the influence of non-native language experience on children's acceptance of labels in 2 languages. In a continuous measure of language exposure, parents reported the number of hours during which their children heard non-English languages from different sources. English-speaking 5-year-olds (N = 73) were presented with novel labels in English and Spanish for unfamiliar objects and were asked to endorse either or both labels. Children with greater exposure to non-English languages were more likely than less-exposed children to endorse both the English and Spanish labels. The findings suggest that monolingual children's willingness to learn non-native vocabulary can be enhanced by exposure to non-native languages.

Although bilingual programs in the Unites States originally were intended to serve "limited English-proficient" children (Stewner-Manzanares, 1988), they are gaining popularity among parents who want their monolingual English-speaking children to learn a second language (Steele et al., 2017). Additionally, a growing number of families in the United States are speaking non-English languages in their homes (Ryan, 2013). A similar trend can be seen in other English-speaking countries such as Canada and England (Geay, McNally, & Telhaj, 2012; Statistics Canada, 2012). With this rise in linguistic heterogeneity, children growing up in monolingual homes may receive repeated exposure to non-native languages at school, in the neighborhood, or through extended family. However, the influence of this non-native language experience on monolingual children has received limited attention in previous research. Our research focused on those children typically categorized as monolingual by assessing the relation between amount of exposure to a non-English language and children's willingness to endorse labels in two languages in a sample of children with varying amounts of second-language exposure.

Accepting two labels

Much of the work assessing children's willingness to learn words in two languages has come from the perspective of mutual exclusivity, a proposed bias to expect that an object

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will have no more than one label (Markman & Wachtel, 1988). Some research has shown that children fluent in only one language (i.e., monolingual) are more reluctant than children fluent in two languages (i.e., bilingual) to accept that a single object can have different labels within one language (e.g., Davidson & Tell, 2005). Studies have also shown that bilingual children more readily accept that a single object can have distinct labels across different languages (e.g., Akhtar, Menjivar, Hoicka, & Sabbagh, 2012; Au & Glusman, 1990; Houston-Price, Caloghiris, & Raviglione, 2010; though see Frank & Poulin-Dubois, 2002, for evidence that bilingual children younger than 3 years may be hesitant to violate mutual exclusivity across languages). Bilingual children also show understanding that a novel object can have more than one foreign label (Byers-Heinlein, Chen, & Xu, 2014), and they are more successful at word learning in cases of lexical overlap, in which two speakers clearly provide distinct labels for a single object (Kalishnikova, Mattoch, & Monaghan, 2015). Experience with a greater number of languages may promote violations of mutual exclusivity: Trilingual 17- and 18-month-olds, when compared with both monolingual and bilingual children, were more likely to gaze at a familiar (instead of novel) object in the presence of a novel label (Byers-Heinlein & Werker, 2009). Bilingual children may be more likely to violate mutual exclusivity because they frequently encounter words in each of their two languages for an individual item.

Still, some evidence exists for monolingual children's willingness to accept labels from a non-native language in specific situations. For example, when the experimenter has made it extremely clear that the novel label is in a different language (Au & Glusman, 1990) or when the children's vocabulary is high (Koenig & Woodward, 2012), monolingual children have violated mutual exclusivity across languages. Koenig and Woodward (2012) suggested that children who have high native vocabularies may be more willing to accept non-native vocabulary because they are, in general, better word learners than children with low vocabularies.

For children who understand that there are different languages that can convey the same information, accepting two labels across languages for a single object is, in a certain sense, not a violation of mutual exclusivity; indeed, these children should tend to expect labels in both languages for a particular item. However, for children who do not understand that there are other languages that describe the same items, then mutual exclusivity may be a deterrent to their acquisition of non-native vocabulary. Therefore, there is the question of what kind of exposure to non-native languages might enable children to appreciate that different languages convey the same content.

Influence of exposure

In previous research, most investigators have categorized children into one of two groups, monolingual or bilingual, to assess how proficiency with languages may promote willingness to accept novel labels (e.g., Au & Glusman, 1990; Davidson & Tell, 2005). Often, parents have been asked to categorize their children based on exposure and/or ability to speak two languages (e.g., Akhtar et al., 2012; Au & Glusman, 1990). One problem with these categorizations is that they do not capture the variability in exposure or speaking skills among children within each category. With approximately 20% of the U.S. population speaking a language other than English at home (and much higher percentages doing

so in many communities; Ryan, 2013), even those children who are raised in monolingual English-speaking homes have frequent opportunities to hear other languages being spoken. Additionally, with increased numbers of parents being interested in second-language learning for their children at younger ages (Steele et al., 2017), many children have at least some exposure to a second language during their preschool or early grade-school years.

As a result of these changing demographics and parents' views on bilingualism, a sizable number of children who are not fluent in two languages nonetheless have substantial exposure to non-native languages. It seems reasonable that as a result of greater exposure to a second language, children begin to appreciate that there can be two different labels across different languages for the same object, and they may therefore be more readily accepting of new vocabulary in a second language. Indeed, Akhtar et al. (2012) showed that exposure to non-native languages was associated with willingness to endorse a foreign label: Three- and 4-year-old children with exposure to, but not fluency in, a second language more often endorsed a foreign label than either their monolingual or bilingual counterparts. Exposure to a second language also has been associated with better perspective taking (Fan, Liberman, Keysar, & Kinzler, 2015) and potentially greater nominal realism (the understanding that language is arbitrary; Sutherland & Cimpian, 2015).

In studies such as these, however, exposure has been treated as an additional category, so the heterogeneity of experience with non-native languages has not been fully captured. In Akhtar et al. (2012), for example, parents described their children as having regular exposure to (but not fluency in) a language other than English, or they were categorized as monolingual or bilingual. In our study, we obtained a finer-grained measure of variability in language experience by asking parents to indicate their children's exposure to non-English languages in hours per week and then treating exposure as a continuous variable in our analyses.

Overview of study

The current study assessed the potential influence of linguistically heterogeneous environments on children's metalinguistic development. It expanded on previous work by evaluating the relation between a continuous measure of exposure to non-English languages and 4- to 6-year-old English-speaking children's willingness to accept labels across English and Spanish. A measure of children's language exposure was obtained from parents, who completed a questionnaire specifying the number of hours per week their children heard non-English languages from various sources. Parents also provided binary reports of fluency for each of the children's languages, so that a potential contribution of non-native fluency to the endorsing of labels across languages could be evaluated.

Children's willingness to accept different labels across languages was tested by showing children a short video of two women labeling familiar and novel objects in each of the two languages and then asking them to endorse the English label, the Spanish label, or both labels. In contrast with previous research using similar paradigms in which children were asked to choose between two possible labels for an object (e.g., Koenig, Clement, & Harris, 2004), children in our study also were offered the opportunity to endorse both of the two labels. This modification enabled us to assess children's understanding that both languages can provide equally valid information. Children also completed the Peabody Picture

Vocabulary Test (PPVT; Dunn & Dunn, 1997) to provide a measure of receptive vocabulary.

We predicted that children with greater amounts of exposure to non-English languages would show an increased willingness to accept labels in both English and Spanish. Additionally, because Koenig and Woodward (2012) found that high native vocabulary was associated with children's willingness to endorse non-native labels, we predicted that children with high receptive vocabulary scores would show more willingness to accept both Spanish and English labels when compared to their lower-scoring counterparts.

Method

Participants

Seventy-three English-speaking children with a mean age of 5;4 (*SD* = 10.2 months) participated in this study. Three additional children were excluded from the study due to experimental error (2) or because they were extremely distracted (1). All 73 children were native speakers of English. Participants were recruited from a city in the Southwestern United States. The ethnic composition was as follows: 85% White, 2% American Indian/Alaska Native, 19% Asian, 1% Black/African American, and 4% Other; some children were assigned to more than one category. Thirty-three percent of children were identified as Hispanic. Thirty-four children were male.

Materials

Objects and labels

Three familiar objects (a toy dinosaur, a toy train, and a baby doll) and two novel objects were used. The familiar objects were cognates in Spanish and English. Cognates (words in different languages with similar phonology and the same meaning, e.g., train in English and tren in Spanish) were used so that monolingual children understood that the Spanish speaker was labeling accurately. English labels for familiar objects were train, baby, and dinosaur. Spanish labels for familiar objects were tren, bebe, and dinosaurio. Novel objects had unfamiliar shapes and had no eyes or facelike features (i.e., an atomlike blob, an object constructed of multicolored blocks). Novel object labels were constructed to be phonologically consistent (consonant and vowel sounds and stress patterns) with the pertinent language. English labels for novel objects were wibber and rompet. Spanish labels for novel objects were bufo and chisa.

Video stimulus

Two female Spanish-English bilingual speakers played the role of informants and labeled all objects. Each speaker first introduced herself as either Mary (English speaker) or Ana (Spanish speaker) and consistently spoke one language throughout the experiment. The informants took turns labeling the objects in their respective language. In separate videos, each actress played the role of Mary and Ana; the actress playing each role was counterbalanced between participants. The order of the language heard first was also counterbalanced.

Peabody Picture Vocabulary Test

The PPVT-III (Version 3) with Form IIIA (Dunn & Dunn, 1997) is an age- and grade-based standardized vocabulary test (M = 100, SD = 15) for children aged 2 years to adults 90+ years old. The test assesses vocabulary in American English.

Language Background Questionnaire

Parents completed a copy of the Language Background Questionnaire for each of the languages to which their children were exposed. This measure was developed specifically for the present study and was refined through an extensive piloting process during which the questionnaire was modified so that parents could complete it in a consistent way. Parents completed a table containing boxes for each of the following sources: parents, siblings, babysitter/nanny, peers, teacher, and extended family members. We did not gather information about children's non-native language exposure via media (e.g., television or the radio) as during the pilot phase of this study, several parents reported finding the quantification of this exposure "extremely difficult."

Parents were asked to complete the table by providing an estimate of the number of hours per week during which their children heard the language from each source. Because some parents found it easier to complete the form in hours per day instead of hours per week, they were given the option to do so, and that choice was clearly indicated on the form. In these cases, the number of hours per day was multiplied by 5 for teacher, babysitter, and peers and was multiplied by 7 for parents, siblings, and extended family.

Parents typically based their estimates on the amount of time that children spent with each source, which overestimated the amount of time during which language was heard from each source. For children who had non-English exposure from two parents, the parental estimates thus included substantial overlap that in some cases resulted in unrealistically high exposure estimates. Consequently, the number of hours of exposure should be considered a proxy for relative amounts of exposure to the source. Parent estimates of teacher exposure typically were based on structured classroom activities (e.g., the amount of time during which a teacher came to the classroom to teach Spanish or the time periods designated for Spanish in a dual-immersion school). Parents provided these estimates because it was not feasible to obtain teacher estimates. Consequently, estimates of teacher exposure may be less precise than the parent exposure estimates, but nonetheless, they provide information about relative exposure in the classroom.

Parents also indicated if children were fluent in each of the languages they heard and were given a fluency score of 1 if they were fluent in a non-English language. Children fluent only in English were assigned a score of 0 for fluency.

All children received exposure to English, and all but 1 child received some weekly Spanish exposure (range = 0–149 hr per week). Twenty-six of the 73 participants were additionally listed as receiving exposure to a third language (Chinese, Japanese, German, Italian, French, Urdu, Hebrew, Tagalog, American Sign Language, Vietnamese, Hindi, or Farsi). Twenty of the total 73 participants were identified as fluent in a non-English language (19 in Spanish, 1 in Chinese). See Figure 1 for a distribution of children's non-native exposure and their fluency levels. Although information about dual-immersion programs or bilingual education was not systematically gathered, 23 children (33.8%) received 10 or more hours of exposure to a non-English language from a teacher.

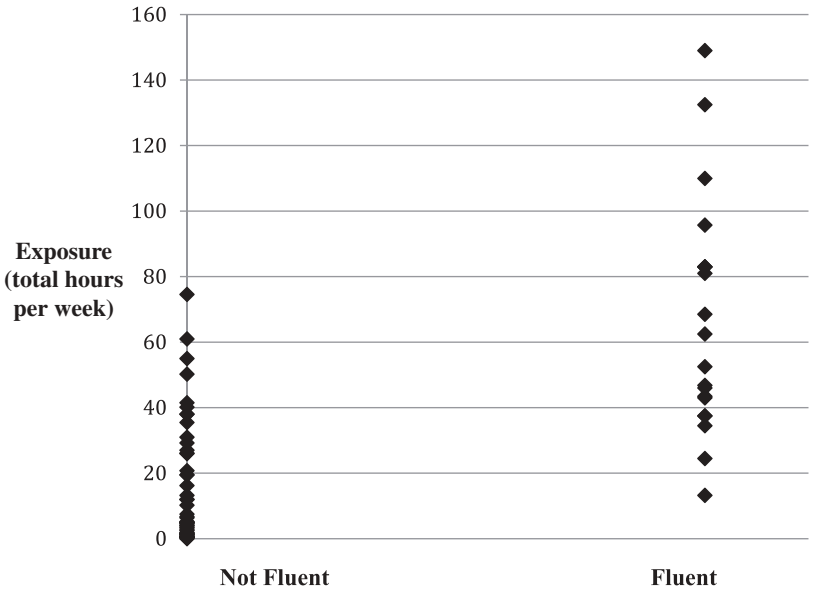

Figure 1. Bivariate distribution of exposure based on children's fluency (fluent or not fluent in a second language).

Procedure

Parents completed the Language Background Questionnaire while their children participated in the study. The study began with the video stimulus. On the video, Mary and Ana took turns presenting the three familiar objects, with one actress speaking consistently in English and one in Spanish throughout the procedure. Both actresses held each object in both hands and moved the object slightly up and down one time to emphasize the label in the context of the sentence. After both speakers labeled an object, the researcher asked the child to recall each of the labels. These recall responses were used to verify children's understanding of the task and were not included in the analyses. The two informants then labeled the first novel object. The researcher once again asked each child to recall the two labels. Children were then asked to endorse one of the two labels or accept both of the labels. The question was asked twice, and the presentation of the novel labels in the question was reversed upon repeating the question the second time: "Which do you think is the right name for this toy? Chisa? Rompet? Or are both OK? Rompet? Chisa? Or are both OK?" Experimenters inflected their voices in the same way for all three options (i.e., English label, Spanish label, or both). The same was done for the second novel object (labels "bufo" and "wibber"). The researcher inquired about each object only one time; thus, there were a total of two label-endorsement trials. A schematic of this procedure can be seen in Figure 2. Following the video presentation, the PPVT was administered.

Coding response score

Coding of children's label endorsements was as follows: a score of 2 was assigned for selecting the "both" option for each of the two trials, a score of 1 was assigned if children selected "both" for only one trial, and a score of 0 was assigned if they never selected "both."

Figure 2. Schematic for label-endorsement measure.

Results

Response scores

Forty children (55%) selected "both" on each of the two trials, 19 (26%) selected "both" on one of the two trials, and 14 (19%) endorsed only one label (either the Spanish label or the English label) on each of the two trials. See Figure 3 for a graph of children's response scores. In those instances in which only one label was endorsed, the English label (i.e., wibber or rompet) was most frequently the label of choice (72% of the time).

Exposure and response scores

Ordinal logistic regression analyses were used to investigate the relation between non-English exposure and response scores. *P* values at the level of .05 were considered significant. Data analyses were conducted using R software packages "MASS," "psych," and "car" (Fox & Weisberg, 2011; Revelle, 2015; Venables & Ripley, 2002).

An ordinal logistic regression was conducted to evaluate whether the following variables predicted children's response scores: age, PPVT score, fluency, and exposure. Two participants did not complete the PPVT due to fussiness; because ordinal logistic regression requires that there be no missing data, only 71 participants were included in this analysis. Results showed that only exposure significantly predicted children's response scores, $t(1, 69) = 2.44$, $p = .04$. The Nagelkerke Pseudo R-squared, which can be used as an estimate of effect size for

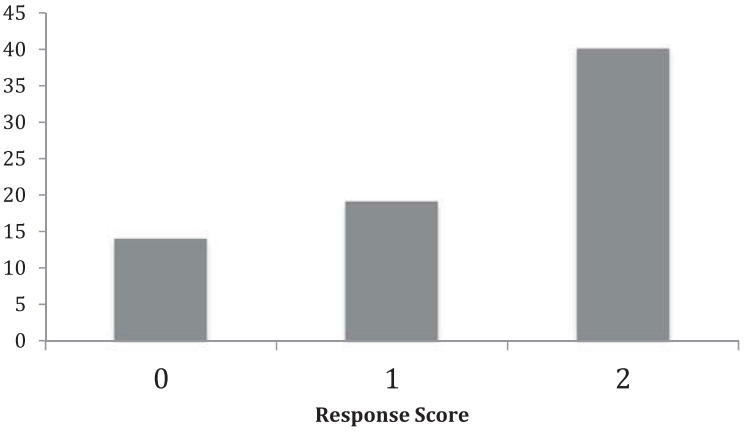

Figure 3. Response score frequency. A score of 2 was given for endorsement of both the English and Spanish labels across the two trials. A score of 1 was given for endorsement of both the English and Spanish labels across only one of the two trials. A score of 0 was given for endorsement of both the English and Spanish labels in none of the trials.

ordinal logistic regression, was 17. See Table 1 for the model summary of this analysis. A post-hoc analysis to test for a potential interaction between fluency and exposure in predicting response score also was conducted and was not significant.

A sizable number of children in the study (26, or 36%) were exposed to more than two languages, which raised the possibility that number of languages of exposure also might predict willingness to accept labels across languages. Although this question was not part of our planned analyses, we explored it by conducting a post-hoc ordinal logistic regression analysis, in which the number of languages of exposure was entered as a continuous term along with PPVT, age, fluency, and exposure to predict the response score. Having more than two languages of exposure did not predict children's response scores.

Individual sources of exposure

A second planned ordinal logistic regression was conducted to test whether exposure from the six different sources (extended family, teacher, siblings, parents, peers, and babysitter/nanny) individually predicted response score. Because we had no a-priori hypotheses about which sources would best predict children's willingness to endorse both languages, a backward elimination was used. In the backward elimination, all sources except parent and teacher were eliminated from the final model and only parent exposure significantly predicted children's

Table 1. Ordinal regression results of main analysis: Effect of exposure on children's response score.

	B	Standard Error	*t*	*p*
Exposure	0.29	0.01	2.05*	.04
Fluency	0.22	0.80	0.28	.78
Age	0.01	0.02	0.29	.78
PPVT	0.006	0.02	0.33	.74

Note. PPVT = Peabody Picture Vocabulary Test. *$p < .05$.

Table 2. Ordinal regression results of second analysis: effect of parent- and teacher-exposure on children's response score.

	B	Standard Error	*t*	*p*
Parent	0.04	0.02	2.12*	.04
Teacher	0.03	0.02	1.64	.10

*$p < .05$.

response scores, $t(1, 71) = 2.12$, $p = .03$. The Nagelkerke Pseudo R-squared was .15. See Table 2 for the model summary of this analysis.

Discussion

We expected that children with greater amounts of exposure to a non-English language would be more likely to endorse both English and Spanish labels for the same object. This prediction was confirmed: Increased exposure to a non-English language was associated with higher response scores. When looking specifically at different sources, exposure to a non-English language from parents played a particularly significant role in predicting children's willingness to endorse both labels.

Previous research findings have suggested that bilinguals are more willing than monolinguals to accept labels for an object in two different languages (e.g., Au & Glusman, 1990). Our study focused on the experiences that might promote monolingual children's acceptance of labels across language. Although mutual exclusivity may deter some monolingual children from learning words in a second language, our results suggest that exposure to a non-native language facilitates the recognition that different languages can convey the same information, thereby leading to children's acceptance of labels in two languages for the same object. The results also suggest that it is not necessary to be proficient in the second language to be accepting of new vocabulary in both a native language and non-native language, as fluency did not predict acceptance of two labels. Our findings are consistent with other recent evidence that children with exposure to a non-native language but who are not fluent in that language show language and sociocognitive advantages similar to those associated with bilingualism (Akhtar et al., 2012; Fan et al., 2015).

Furthermore, we found that specific sources of exposure can contribute to children's acceptance of labels across languages. In our analysis, both parent and teacher exposure were included in the model after a backward elimination procedure; parent exposure significantly predicted response scores, and teacher exposure trended toward this outcome. It is possible that because parent exposure tends to be the earliest and most consistent form of exposure, it is especially likely to affect children's conceptions of language. Teacher exposure may have been included in the model because many children in our sample were growing up in single-language families, wherein teachers were often the major source for exposure to Spanish. Indeed, in 75% of the cases in which children heard only English from parents, teachers were the primary source of non-English exposure. One limitation of this study was that teacher exposure was based on parents' estimates because it was not feasible to obtain teacher exposure from the teachers themselves. Nonetheless, these

estimates are an indication of relative exposure in the classroom. We expect that if future research incorporates a more precise measure of teacher exposure, then teacher exposure would significantly predict children's willingness to accept non-native vocabulary.

We also tested the possibility that the size of children's native vocabulary would predict their willingness to endorse labels across languages, as Koenig and Woodward (2012) found for monolingual English-speaking toddlers endorsing Dutch labels. In our study, however, children's receptive vocabulary in English played no significant role in their willingness to endorse Spanish labels. Although our results contrast with Koenig and Woodward's findings, they are consistent with Byers-Heinlein and Werker's (2009) failure to find influences of vocabulary size on monolingual, bilingual, and trilingual individuals' violations of mutual exclusivity. Byers-Heinlein and Werker suggested that vocabulary skills were not completely captured in their study because they were unable to measure vocabulary in all of the languages their participants knew. Similarly, because of the broad ranges of languages of exposure, we were able to include only English vocabulary in our analyses. Characteristics of our sample also might explain the different outcomes. The majority of the children in our study performed very well on the PPVT: Most children, including those fluent in a second language, scored above the 90th percentile, resulting in limited variability for this measure. Additionally, our participants were much older than Koenig and Woodward's; it is possible that the role of word-learning skills in willingness to accept words across languages changes during development.

Our finding that greater non-native language exposure is associated with willingness to accept two labels across languages, even in a predominantly monolingual sample, suggests that a more nuanced perspective on monolingualism is warranted. Our observations also relate to the question of whether, when considering potential influences of dual language exposure, it is appropriate to dichotomize children into one of two categories, monolingual or bilingual. It has been recognized for some time that bilingual children are highly heterogeneous in terms of onset, amount, and sources of exposure, as well as relative fluency and use of each language (Bedore et al., 2012). A primary contribution of our findings is that we found that monolingual children can also be heterogeneous in their non-native language exposure and that this heterogeneity is meaningful. Moreover, in combination with other recent findings (e.g., Fan et al., 2015), our results imply that varying amounts of non-native language exposure also may contribute to monolingual children's performance on a range of metalinguistic and social-cognitive tasks. Additionally, our findings suggest that children who have substantive opportunities to hear a non-native language prior to entry into a bilingual, second language (L2), or dual-immersion program will be more open to learning vocabulary in the new language.

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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