HHS Public Access

Author manuscript

J Speech Lang Hear Res. Author manuscript; available in PMC 2015 November 04.

Published in final edited form as:

J Speech Lang Hear Res. 2014 October ; 57(5): 1804–1816. doi:10.1044/2014_JSLHR-L-13-0055.

The role of primary caregiver vocabulary knowledge in the development of bilingual children's vocabulary skills

Milijana Buac, **Megan Gross**, and **Margarita Kaushanskaya**
University of Wisconsin-Madison

Abstract

Purpose—The current study examined the impact of environmental factors (SES, the percent of language exposure to English and to Spanish, and primary caregivers' vocabulary knowledge) on bilingual children's vocabulary skills.

Method—We measured vocabulary skills of 58 bilingual children between the ages of 5 and 7 who spoke Spanish as their native language and English as their second language. Data related to language environment in the home, specifically the percent of language exposure to each language and SES, were obtained from primary caregiver interviews. Primary caregivers' vocabulary knowledge was measured directly using expressive and receptive vocabulary assessments in both languages.

Results—Multiple regression analyses indicated that primary caregivers' vocabulary knowledge, the child's percent exposure to each language, and SES were robust predictors of children's English, but not Spanish, vocabulary skills.

Conclusions—These findings indicate that in the early school age, primary caregiver vocabulary skills have a stronger impact on bilingual children's second-language than native-language vocabulary.

The role of primary caregiver vocabulary knowledge in the development of bilingual children's vocabulary skills

Numerous studies have demonstrated the importance of vocabulary skills for language and cognitive development (e.g., Dickinson & Tabors, 2001; Duncan et al., 2007; Stanovich, 1986), and literacy outcomes are especially sensitive to individual differences in early vocabulary knowledge (e.g., Mason, Stewart, Peterman, & Dunning, 1992; Morris, Bloodgood, & Perney, 2003; Sénéchal & LeFevre, 2002; Snow, Burns, & Griffin, 1998). Therefore, it is imperative to identify environmental factors that can shape the development of children's vocabulary skills. Research has demonstrated that bilingual children consistently score below their monolingual peers on single-language measures of vocabulary (e.g., Ben-Zeev, 1977; Bialystok et al., 2010; Hemsley, Holm, & Dodd, 2006; Leseman, 2000); thus, it is especially important to consider factors that may contribute to the development of vocabulary skills in each language in bilingual children.

Address correspondence to Margarita Kaushanskaya, Language Acquisition & Bilingualism Lab, Waisman Center Room 476, 1500 Highland Avenue, Madison, WI 53705. Phone: (608) 263-5764. kaushanskaya@wisc.edu.

Research has pointed to a few factors that may play an influential role in vocabulary development. In research with monolingual children, socioeconomic status (SES) has been suggested as an important predictor of children's vocabulary development (e.g., Hoff & Naigles, 2002; Hoff, 2003; Huttenlocher, Haight, Bryke, Seltzer, & Lyons, 1991; Naigles & Hoff-Ginsberg, 1998). This relationship between SES and children's language abilities is thought to be mediated by the effect that SES has on the quality and the quantity of linguistic input that the child receives (e.g., Dollaghan et al., 1999; Feldman et al., 2000; Hoff, 2003; Hoff, Laursen, & Tardif, 2002; Huttenlocher, Haight, Bryke, Seltzer, & Lyons, 1991; Pan, Rowe, Singer, & Snow, 2005; Rescorla & Alley, 2001; Weizman & Snow, 2001). Similarly, research on factors that impact vocabulary development in bilingual children has pointed to SES as an important predictor of children's vocabulary growth (e.g., Eilers, Pearson, & Cobo-Lewis, 2006; Hurtado, Marchman, & Fernald, 2008; Umbel & Oller, 1994). However, the majority of prior work has examined the role of environmental factors in language acquisition in very early phases of development (e.g., Hammer, Lawrence, & Miccio, 2008; Hammer et al., 2012; Pearson, Fernandez, Lewedeg, & Oller, 1997; Quiroz, Snow, & Zhao, 2010). In the present study we focused on English-Spanish bilingual children in the school-age range, and examined the relationship between environmental factors (SES, the children's percent exposure to English and Spanish, and the primary caregivers' expressive and receptive vocabulary knowledge in English and in Spanish), and the children's receptive and expressive vocabulary skills in both languages.

Environmental Influences on Monolingual Children's Vocabulary

In the first several years of a child's life, parents tend to be the child's primary source of linguistic input, and parent individual differences have been linked to the variance in children's language-learning experiences (e.g., Pungello et al., 2009). One chiefly studied factor is primary caregivers' socioeconomic status, and maternal educational level is most often used to index SES in studies of language acquisition (Ensminger & Fothergill, 2003). The strong relationship between SES and vocabulary development in monolingual children has been robustly demonstrated by a number of studies (e.g., Dollaghan et al., 1999; Feldman et al., 2000; Hart & Risley, 1995; Rescorla & Alley, 2001), and the mechanism by which SES influences language development appears to be parental language input (e.g. Hart & Risley, 1995; Hoff, 2003; Hoff & Naigles, 2002; Huttenlocher, Haight, Bryke, Seltzer, & Lyons, 1991; Naigles & Hoff-Ginsberg, 1998; Pan et al., 2005). For instance, Hart and Risley (1995) showed that higher SES was associated with a significantly larger number of words parents directed towards their children.

The aspects of language input that are associated with higher SES and that yield superior vocabulary skills in children include both the quality and the quantity of linguistic exposure (e.g. Hoff & Naigles, 2002; Hoff, 2003; Huttenlocher et al., 1991; Huttenlocher, Waterfall, Vasilyeva, Vevea, Hedges, 2010; Naigles & Hoff-Ginsberg, 1998; Pan et al., 2005; Rowe, 2012). Parent vocabulary skills are a key contributor to the quality of linguistic input that the child receives. For instance, Pan et al. (2005) showed that the diversity of maternal vocabulary predicted children's vocabulary growth. The study further showed that maternal verbal ability as well as maternal literacy skills mediated the effect of maternal education on children's vocabulary. Similarly, Rowe (2012) analyzed the diversity and the sophistication

of the parents' vocabulary and the number of decontextualized utterances during a 90-minute parent-child interaction, and found links between these parental vocabulary measures and children's vocabulary knowledge.

Together, studies of the role of SES, amount, and quality of linguistic exposure in children's vocabulary development suggest that linguistic environment is an important factor in language acquisition (e.g., Dollaghan et al., 1999; Feldman et al., 2000; Heart & Risley, 1995; Hoff & Naigles, 2002; Hoff, Laursen, & Tardif, 2002; Hoff, 2003; Huttenlocher, Haight, Bryke, Seltzer, & Lyons, 1991; Naigles & Hoff-Ginsberg, 1998; Pan et al., 2005; Rescorla & Alley, 2001; Weizman & Snow, 2001). However, the vast majority of prior work on this topic was conducted with monolingual English-speaking families. Yet, bilingual environments may differ from monolingual environments, and the predictors of language development in monolingual vs. bilingual children may thus also differ.

Environmental Influences on Bilingual Children's Vocabulary

Bilinguals' vocabulary knowledge cannot be fully captured by language-specific vocabulary measures (e.g., Kester Stubbe & Peña, 2002; Oller & Pearson, 2002; Oller, Pearson, & Cobo-Lewis, 2007, Peña, Bedore, & Zlatic-Giunta, 2002). A number of previous studies have demonstrated that bilingual children perform on par with monolingual peers on measures that take into account both languages, using either total or conceptual vocabulary (e.g., De Houwer, Bornstein, & Putnick, 2013; Hoff et al., 2012). However, the development of language-specific vocabulary skills can continue to trail behind in bilingual children, and they often score below their monolingual peers on standardized language measures as toddlers and into the school-age years (e.g., August et al., 2005; Ben Zeev, 1977; Bialystok et al., 2010; Fernández, Pearson, Umbel, Oller, & Milinetmolina, 1992; Hemsley, Holm & Dodd, 2006; Hoff et al., 2012; Leseman, 2000; Marchman, Fernald, & Hurtado, 2010; Thordardottir, Rothenberg, Rivard, & Naves, 2006; Uccelli & Paez, 2007; Vagh, Pan, & Mancilla-Martinez, 2009). For example, Hoff et al. (2012) found that even when bilingual and monolingual children were matched on SES, the bilingual children had lower productive vocabularies in their two languages than the monolingual children. In general, it appears that the need to acquire two lexical systems yields a slower arc of vocabulary acquisition in each of bilingual children's two languages compared to language-specific vocabulary acquisition in monolingual children. This pattern of slower language-specific lexical acquisition in bilingual children may lead to cascade effects on a bilingual child's success in predominantly English-speaking school environments and in predominantly Spanish-speaking social circles (Pearson et al., 1993). Therefore, factors that can shape language-specific vocabulary development in bilingual children are especially important to examine.

Just like research with monolingual children, research with bilingual children suggests a relationship between SES and children's vocabulary skills (e.g., Hammer et al., 2012; Oller & Eilers, 2002; Quiroz, Snow, & Zhao, 2010; Tabors et al., 2003). In a recent study, Hammer and colleagues (2012) examined a variety of factors that may contribute to Spanish-English bilingual children's vocabulary development. They found that mothers with higher SES had children with higher vocabulary skills in English and better story-retell skills in both English and Spanish. An important finding was that maternal education was not

related to children's Spanish vocabulary scores. However, the extent to which parental language input mediates the effects of SES on bilingual children's vocabulary outcomes has not been studied as extensively in bilingual children as it has in monolingual children. Furthermore, the few studies that have examined the role of the linguistic environment have largely focused on the *amount* of exposure to each language as the predictor variable (e.g., David & Wei, 2008; Pearson, Fernández, Lewedeg, & Oller, 1997; Hammer et al., 2012; Hoff et al., 2012; Mancilla-Martinez & Lesaux, 2011; Marchman, Fernald, & Hurtado, 2010; Place & Hoff, 2011; Thordardottir, 2011).

Only a small number of studies have included a measure indexing the *quality* of linguistic input as a possible contributor to bilingual children's language development (e.g., Jia & Anderson, 2003; Jia & Fuse, 2007; Paradis, 2011; Place & Hoff, 2011; Scheele, Leseman, & Mayo, 2010). In these previous studies, the quality of linguistic input was variously defined as the amount of native-speaker language input (parent self-rated language fluency) provided to the children either by parents (Place & Hoff, 2011; Paradis, 2011) or friends (Jia & Anderson, 2003; Jia & Fuse, 2007), extent of enriching home activities such as book reading, story-telling, and television watching in English (Jia & Anderson, 2003; Jia & Fuse, 2007; Scheele, Leseman, & Mayo, 2010), and richness of English environment outside of the home (Paradis, 2011). For instance, in the Place and Hoff (2011) study, parents of English-Spanish bilingual children self-rated their language proficiency, and the authors measured how much language input was provided by the native speakers in each language. Place and Hoff (2011) found that vocabulary growth in young Spanish-English bilingual children was related to this measure of input quality; that is, native-speaker status significantly impacted the quality of language input even in those parents who rated their language skills as highly proficient. The Place and Hoff (2011) study, as well as other studies that have examined the role of input quality in bilingual children's language development (e.g., Paradis, 2011; Scheele, Leseman, & Mayo, 2010), relied on indirect measures of input quality, typically obtained through parent questionnaires. In the present study, we took a more direct approach by examining the relationship between primary caregivers' vocabulary knowledge and vocabulary skills in bilingual children. Our logic was that primary caregivers with higher vocabulary scores would be more likely to use higher-quality vocabulary when interacting with their children. Although measuring primary caregivers' vocabulary skills as a window into the quality of language input in the home still provides only an indirect index of language-input quality, it may yield more objective data than parent self-reports.

The Current Study

The goal of the current study was to examine whether, after accounting for SES and percent exposure to English and to Spanish, a relationship exists between primary caregivers' vocabulary knowledge and children's performance on vocabulary measures in English and in Spanish. In the present study, SES was indexed by primary caregivers' years of education, and exposure was indexed by the percent of exposure to each language during a typical week as reported by the primary caregiver. Primary caregivers' vocabulary knowledge was indexed by their scores on standardized measures of receptive and expressive vocabulary in English and in Spanish. We were interested in whether the relationships between children's

and primary caregivers' vocabulary skills would be instantiated differently in the children's native language (Spanish) vs. the children's second language (English).

The role of the primary caregivers' vocabulary knowledge in children's vocabulary performance was assessed using regression analyses. The main question was whether primary caregivers' vocabulary scores would be a significant predictor of children's vocabulary performance, once SES and the percent exposure to each language were factored out. In general, we expected that parental vocabulary knowledge would predict children's vocabulary performance over and above SES and language-exposure factors. The regression models examined both within-language and across-language relationships between environmental factors and children's vocabulary skills in order to delineate the degree to which children's vocabulary skills in the two languages were permeable to cross-linguistic environmental influences.

Method

Participants

The children in the present study were recruited from local schools in Madison, WI. Exclusion criteria included a diagnosis of language impairment, learning disability, psychological/behavioral disorders, neurological impairments, or other developmental disabilities. All testing was conducted in a laboratory setting. Participants included 58 Spanish-English bilingual children (22 males, 36 females) between the ages of 5 and 7 and their primary caregivers. Primary caregivers were those individuals who accompanied the child to the laboratory and with whom the child spent the most time on a daily basis, as self-reported by the families. Primary caregivers included 46 mothers, 10 fathers, and 2 grandmothers. Demographic characteristics for the children and primary caregivers can be found in Table 1. None of the children had a language-related Individualized Education Program (IEP), and all children were reported to be typically developing by the primary caregivers. All children also passed a pure tone hearing screening.

Thirty-six of the children were of Latino background, 19 were multiracial, and 3 were Caucasian. Information regarding children's country of birth was available for 45 children; 38 children were born in the United States while 7 immigrated from a variety of countries, including Argentina (1), Colombia (2), Guatemala (1), Mexico (2), and Spain (1). Of those children born in the United States, 29% were first-generation Americans. Spanish was the native language for all the children, and the age at which children began producing two-word phrases in English varied widely (M = 27.35 months, *SD* = 13.41). Fifty-six percent of the children spoke only Spanish in the home, 28% spoke only English in the home, and 16% spoke both English and Spanish in the home. School language varied among the participants: 47% of the children attended dual-immersion programs, where the language of instruction was at least 50% Spanish, while the rest of the children attended English-only schools. In addition to providing information about the children's language use and exposure, primary caregivers also indicated their child's preferred language (i.e., English, Spanish, or both). More than half of the sample (57%) was reported to prefer to speak English.

Information on primary caregivers' birth country was available for 57 participants: 37% of the primary caregivers were born in the United States and 63% immigrated. Primary caregivers immigrated from a variety of countries, including: Argentina (4), Bolivia (1), Guatemala (1), and Mexico (15). The majority of primary caregivers, 41, listed Spanish as their native language, while 16 listed English as their native language. Per self-report, those primary caregivers whose native language was English began acquiring Spanish at a mean age of 14.08 years (*SD* = 6.11). The primary caregivers whose native language was Spanish began acquiring English at a mean age of 12.97 years (*SD* = 6.92).

Materials

Primary caregivers completed the Language Experience and Proficiency Questionnaire (LEAP-Q; Marian, Blumenfeld, & Kaushanskaya, 2007) – a validated tool for adults that yields information about bilinguals' language background. Primary caregivers were interviewed face-to-face regarding their child's developmental, educational, medical, and language use/experience history. Primary caregivers' total years of education served as a measure of socioeconomic status (SES). Primary caregivers also provided detailed information regarding their child's language exposure. Specifically, primary caregivers completed a table (Figure 1) in which they indicated the language the child was exposed to during the hours the child was awake. Parents were instructed to think of a child's typical week when completing the table. Exposure was measured as the percentage of English and the percentage of Spanish the child heard throughout a typical week. For more information regarding how exposure was calculated please refer to Figure 1.

The Visual Matrices subtest of the *Kaufman Brief Intelligence Test*, 2nd Edition (KBIT-2; Kaufman & Kaufman, 2004) was administered as a measure of nonverbal intelligence to all the children and all the primary caregivers. Standardized English and Spanish vocabulary measures were administered to the children and their primary caregivers. To measure English receptive vocabulary, the *Peabody Picture Vocabulary Test*-3rd Edition (PPVT-III; Dunn & Dunn, 1997) was used. To measure English expressive vocabulary, the Picture Vocabulary subtest of the *Woodcock-Johnson III Tests of Achievement* (Form A) (Woodcock, McGrew, & Mather, 2001) was used. The *Test de Vocabulario en Imágenes Peabody* (TVIP; Dunn, Padilla, Lugo, & Dunn, 1986) was used to assess Spanish receptive vocabulary skills. The "Vocabulario sobre dibujos" subtest of the *Batería III Woodcock-Muñoz Pruebas de aprovechamiento* (Muñoz-Sandoval, Woodcock, McGrew, & Mather, 2005) was used to assess Spanish expressive vocabulary.

Procedure

Primary caregivers and children were tested simultaneously, but separately, over the course of three one-hour visits to the laboratory. Standardized assessments were administered in a random order over the three visits. Trained bilingual English-Spanish research assistants administered the Spanish measures. All standardized measures used for the present study were administered and scored in accordance with standardized rules described in each measure's manual. Standard scores were used in all of the analyses.

Analyses

First, preliminary correlation analyses (*Pearson r*) were conducted for the child and primary caregiver measures. Based on the correlations, regression models were constructed where primary caregivers' data served as predictors (controlling for child's nonverbal IQ, SES, and percent exposure to each language), and children's vocabulary scores served as outcomes.

Results

Correlations were run to examine broad patterns of relationships between primary caregivers' and child factors. These raw correlations are included as supplementary material. Based on the preliminary correlations, factors that would be entered as predictors in the regression analyses were identified.

In building the regression models, children's nonverbal IQ was always entered as the initial predictor because it was found to correlate with children's vocabulary scores. SES was also entered as an initial predictor, both because prior studies have identified it as an important factor in vocabulary development (e.g., Hoff, 2003; Hurtado et al., 2008; Pan et al., 2005; Umbel & Oller, 1994; Weizman & Snow, 2001), and because SES was found to correlate with children's vocabulary in the current data set. Children's age was not found to correlate with vocabulary outcomes, likely because vocabulary skills were indexed by standard scores that already took age into account. Therefore, children's age was not included in the regression models. Primary caregivers' age and non-verbal IQ were also not entered as predictors. Although primary caregivers' non-verbal IQ did correlate with children's vocabulary measures, we did not include it in the model because it correlated highly with primary caregivers' receptive and expressive vocabulary scores. In summary, children's non-verbal IQ and SES were entered into the regressions first to form Model 1. Percent exposure to English was added to form Model 2 when the outcome was an English vocabulary measure and percent exposure to Spanish was added to form Model 2 when the outcome was a Spanish vocabulary measure. In the final model, Model 3, the primary caregivers' vocabulary scores were added as a predictor to examine whether they accounted for additional significant variance in children's vocabulary skills once the children's non-verbal IQ, SES, and percent of language exposure were accounted for. The modality was kept consistent across primary caregiver and child variables, so that primary caregivers' receptive vocabulary skills were used to predict children's receptive vocabulary skills and primary caregivers' expressive vocabulary skills were used to predict children's expressive vocabulary skills. This approach was chosen because receptive and expressive measures correlated highly for the primary caregivers and the children. Thus, cross-modal analyses (where expressive measures for the caregivers would be correlated with receptive measures for the children and vice versa) would be methodologically redundant.

Separate models were built for within-language analyses (child's English vocabulary as the outcome and primary caregiver's English vocabulary as the predictor and child's Spanish vocabulary as the outcome and primary caregiver's Spanish vocabulary as the predictor) and across-language analyses (child's English vocabulary as the outcome and primary caregiver's Spanish vocabulary as the predictor and child's Spanish vocabulary as the outcome and primary caregiver's English vocabulary as the predictor). Only two models

were constructed for across-language analyses to avoid redundancy with within-language analyses. Thus, Model 1 for cross-language analyses included children's non-verbal IQ, SES, and language exposure, while Model 2 also included cross-language primary caregiver vocabulary measures. New models were constructed for cross-language analyses because some of the primary caregivers did not have Spanish vocabulary scores, and thus the cross-language models were based on a smaller sample size than the within-language models.

English receptive vocabulary

Table 2 presents within-language and across-language regression models built to predict children's English receptive vocabulary. The first *within-language* model, Model 1, contained children's non-verbal IQ and SES as predictors, and accounted for 56% of the variance in children's English receptive vocabulary scores ($p < .01$). Adding English exposure to form Model 2 improved the model by 10% ($p < .01$) and together, the three predictors accounted for 66% ($p < .01$) of the variance in children's English receptive vocabulary. Finally, adding the primary caregivers' English receptive vocabulary to the model further improved the model by a significant 6% ($p < .01$) and Model 3 accounted for 72% ($p < .01$) of the variance in children's English receptive vocabulary scores. The across-language model with primary caregivers' Spanish receptive vocabulary as the predictor was not statistically significant ($p = .69$).

English expressive vocabulary

Table 3 presents the within-language and across-language regression models built to predict children's English expressive vocabulary. The first *within-language* model, Model 1, contained children's non-verbal IQ and SES as predictors, and accounted for 50% of the variance in children's English expressive vocabulary ($p < .01$). Adding English exposure to form Model 2 improved the model by 12% ($p < .01$) and together the three predictors accounted for 62% of the variance in children's English expressive vocabulary ($p < .01$). Finally, adding the primary caregivers' English expressive vocabulary to the model significantly increased the amount of explained variance by 2% ($p < .05$) and Model 3 accounted for 64% ($p < .01$) of the variance in children's English expressive vocabulary. The *across-language* regression model with primary caregivers' Spanish expressive vocabulary as the predictor was not significant ($p = .97$).

Spanish receptive vocabulary

Table 4 presents the within-language and across-language regression models built to predict children's Spanish receptive vocabulary. The first *within-language* model, Model 1, revealed that only child non-verbal intelligence ($p < .01$) was a significant predictor of Spanish receptive vocabulary while SES ($p = .94$) was not a significant predictor. Model 1 accounted for 19% ($p = .01$) of the variance in children's Spanish receptive vocabulary. Model 2 was overall significant ($p = .01$), but the addition of Spanish exposure did not improve the model ($p = .13$) and together the three variables accounted for 23% of the variability in children's Spanish receptive vocabulary. Model 3 was also overall significant ($p = .02$), but the addition of primary caregivers' Spanish receptive vocabulary failed to increase the amount of variance explained by the model ($p = .54$). The *across-language*

model with primary caregivers' English receptive vocabulary as the predictor was not significant (p = .63).

Spanish expressive vocabulary

Table 5 presents the within-language and across-language regression models built to predict children's Spanish expressive vocabulary. The first *within-language* model (Model 1) revealed that child non-verbal intelligence (p = .48) and SES (p = .73) were not significant predictors of Spanish expressive vocabulary. Model 1 accounted for a non-significant 1% (p = .75) of variability in children's Spanish expressive vocabulary. Adding Spanish exposure to create Model 2 improved the model by 16% (p < .01), and together the three variables accounted for 17% of the variance in children's Spanish expressive vocabulary (p = .02). Model 3 was overall significant (p = .03), but the addition of the primary caregivers' Spanish expressive vocabulary failed to increase the amount of variance explained by the model (p = .36). The *across-language* model with primary caregivers' English expressive vocabulary as the predictor was not significant (p = .35).

Discussion

Vocabulary skills form the foundation for literacy development and academic success (e.g., Mason, et al., 1992; Morris, Bloodgood, & Perney, 2003; Sénéchal & LeFevre, 2002; Snow, Burns, & Griffin, 1998). Because bilingual children tend to lag behind monolingual children in vocabulary development (e.g., Bialystok, et al., 2010; Marchman, Fernald, & Hurtado, 2010; Thordardottir, et al., 2006; Vagh, Pan & Mancilla-Martinez, 2009), it is especially important to delineate the environmental factors that can shape vocabulary skills in bilingual children's two languages. The present study was designed to examine whether primary caregivers' vocabulary knowledge predicted receptive and expressive vocabulary skills in early school-age bilingual children, over and above SES and the percent exposure to each language. We found that SES played an important role in bilingual children's vocabulary performance, but only when English measures were considered. We also found that language exposure served as an important predictor of children's vocabulary skills in the two languages, with the exception of Spanish receptive vocabulary skills. Furthermore, we found that bilingual children's English vocabulary skills were highly sensitive to primary caregivers' vocabulary knowledge in English. Finally, only within-language relationships but not across-language relationships were observed, suggesting language-specific links between language environment and vocabulary development in bilingual children.

The group of early school-age bilingual children tested in this study performed within the average range on both the receptive and the expressive English vocabulary measures when compared to the normative data for the monolingual English-speaking children as well as on the Spanish receptive vocabulary measure (but not the expressive Spanish vocabulary measure) when compared to the normative data for the monolingual Spanish-speaking children. We hypothesize that this pattern may reflect the well-documented shifts in language dominance in bilingual children who speak Spanish as their native language. Specifically, children are likely to shift from being Spanish-dominant to being English-dominant upon entering the school system (Flege et al., 1995; Jia et al., 2002). Such a

dominance shift from L1 to L2 can be rather rapid and tends to occur within the first two years of school entry (Oller & Eilers, 2002; Veltman, 1983). The average age of our participants is 6.22 years, and because it is likely that these children have been in school since the age of 4, a language shift may have begun. A concomitant process of L1 attrition tends to accompany such dominance shifts, and a number of studies have demonstrated a rapid decline of the L1 with acquisition of the L2, especially in the expressive domain (e.g., Gibson, et al., 2012; Oller, et al., 2007; Oller, Pearson, & Cobo-Lewis, 2007). The profile of vocabulary skills observed in the bilingual children in our sample is consistent with such a dominance shift, as the children demonstrated within-average English vocabulary skills, but somewhat low Spanish expressive vocabulary skills (in relation to the monolingual normative data). However, future longitudinal work is warranted in order to confirm the dominance-shift hypothesis. A longitudinal approach would allow for an assessment of children's vocabulary skills over time, thus providing insight into whether a shift in language dominance is likely to explain the patterns of vocabulary skills observed in bilingual children tested here. In general, longitudinal studies are imperative to fully delineate the nature of the relationship between children's vocabulary and primary caregiver's vocabulary skills.

It is notable that in the present study, despite relatively strong vocabulary skills in English, the children's English vocabulary abilities were sensitive to environmental variables such as SES, the percent of English exposure in the home, and primary caregivers' English vocabulary knowledge. Previous studies reported robust relationships between children's language development and SES in monolingual (e.g., Hoff, 2003; Pan et al., 2005; Weizman & Snow, 2001) as well as in bilingual populations (e.g., Oller & Eilers, 2002; Weizman & Snow, 2001). Our work is highly convergent with this previous research in that we found clear links between SES and bilingual children's vocabulary skills in both the receptive and the expressive domains. However, SES was a significant predictor of children's English receptive and expressive vocabulary but was not found to be a significant predictor in any of the analyses focusing on Spanish vocabulary measures. This finding of the role that SES plays in second-language (L2) vocabulary development is in fact consistent with previous studies of environmental variables that may influence bilingual children's language development (e.g., Hammer et al., 2012; Quiroz, Snow, & Zhao, 2010). For instance, Hammer et al. (2012) found in their sample of bilingual Spanish-English children that the maternal education level was predictive of children's English but not Spanish vocabulary scores. Similarly, Quiroz, Snow, and Zhao (2010) showed that SES was not related to children's Spanish vocabulary scores but was related to children's English vocabulary scores.

However, it must be pointed out that a number of previous studies have documented relationships between SES and bilingual children's vocabulary skills in the native language (e.g., Dixon, Wu, Daraghmeh, 2012; Genesee et al., 2004; Tabors et al, 2003), and that robust links between SES and vocabulary skills in monolinguals have been reported (e.g., Dollaghan et al., 1999; Hoff, 2003; Huttenlocher, et al., 1991; Rescorla & Alley, 2001; Weizman & Snow, 2001). One possible explanation for the lack of SES/Spanish vocabulary relationships in the current study vs. previous studies is that prior studies focused on younger children (e.g., Hoff, 2003; Pan et al., 2005; Oller & Eilers, 2002), while we focused

on school-age children. Younger children may be more variable in their language abilities across both the L1 and the L2. Higher variability in native-language abilities may make it more likely that a relationship between SES and L1 vocabulary skills would be observed. Further, our results are likely influenced by the fact that in our sample, SES was positively associated with the proportion of English exposure and negatively associated with the proportion of Spanish exposure. That is, higher SES was associated with more English use in the home. Thus, the relationship between SES and children's English vocabulary skills may be underlined by their shared link to English exposure. Nonetheless, the two variables, SES and the percent exposure to each language, are not interchangeable in their influences on children's vocabulary development because the effect of language exposure was observed after the effect of SES was taken into account.

Previous studies have documented a relationship between language exposure and language performance in bilinguals (e.g., Hammer et al., 2012; Pearson, et al., 1997) and the current study confirms these findings. However, the relationship between language exposure and children's vocabulary skills was not uniform across all the vocabulary measures, and we did not observe a relationship between the percent of Spanish exposure and children's Spanish receptive skills. This finding is consistent with the findings reported by Thordardottier (2011), who found that in a sample of French-English bilingual children, the amount of language input was more related to children's expressive language measures than receptive language measures. In general, we observed stronger relationships between the environmental variables and bilingual children's vocabulary skills in English than in Spanish. This pattern was found both when language exposure and the primary caregivers' vocabulary skills were considered as predictor variables. It is notable that although the percent exposure was predictive of children's performance on the vocabulary measures, particularly in the L2, primary caregivers' vocabulary scores accounted for variability in the children's vocabulary over and above that accounted for by language exposure.

Our results revealed that primary caregivers' English vocabulary knowledge was predictive of children's English vocabulary performance. However, similar to our findings with regards to SES, we found that primary caregivers' Spanish vocabulary knowledge did not significantly predict children's Spanish vocabulary performance. This result is consistent with the findings in a recent study with young bilingual children (Place & Hoff, 2011). Specifically, Place and Hoff (2011) showed that Spanish-English bilingual children's English development was dependent on the quantity as well as the quality of English input, while their Spanish development was related only to the amount of exposure in Spanish, but not its quality. In their study, Place and Hoff (2011) inferred the quality of language input on the basis of native-speaker status of the children's parents, with higher quality of input assumed to be produced by native speakers of English versus non-native speakers of English. Although we used primary caregivers' vocabulary skills rather than native-speaker status as the measure of language input, our findings are highly congruent with those of Place and Hoff (2011). Thus, we conclude that vocabulary skills in English, the children's second language, may be especially sensitive to the fluctuations in vocabulary skills of their primary caregivers.

What may underlie such language-specific patterns of results, with children's L2 vocabulary skills more sensitive to environmental influences than children's L1 vocabulary skills? One possibility is that this pattern characterizes this particular group of children and their primary caregivers. Our sample of children learned Spanish from birth and 47% of the children were attending dual immersion programs where part of their instruction was in Spanish. Thus, the children likely had more exposure opportunities in a variety of environments for Spanish than for English. With bilingual children experiencing redundant language input in Spanish (through home, school, relatives, etc.), the children's Spanish lexical system would become less sensitive to the environmental influences in the home, especially once the child reached school age. Conversely, the exposure to English for these children likely occurs primarily in school, whereas at home the children are not exposed to English at all or are exposed to more basic-level English.

It is notable that in the current sample, relationships between primary caregiver and child variables only held within language, and none of the cross-language regression models proved significant. Bilingual children's vocabulary is distributed across their languages (e.g., Miccio, Tabors, Paez, Hammer & Wagstaff, 2005; Oller, Jarmulowicz, Gibson & Hoff, 2007; Oller & Eilers, 2002; Oller & Pearson, 2002; Oller, Pearson, & Cobo-Lewis, 2007; Windsor & Kohnert, 2004), and bilingual children may possess knowledge of certain words in only one language but not the other (e.g., Kester Stubbe & Peña, 2002; Oller & Pearson, 2002; Oller, Pearson, & Cobo-Lewis, 2007; Peña, Bedore, & Zlatic-Giunta, 2002). The distributed nature of bilingual children's vocabulary knowledge is what prompts the use of conceptual scoring when considering bilingual children's vocabulary skills, where instead of assessing the number of language-specific lexical items a bilingual child knows, the number of language-independent concepts (or children's total vocabulary knowledge) is assessed (De Houwer, Bornstein, & Putnick, 2013; Hoff et al., 2012). The design of the current study enabled us to examine whether the role of linguistic environment in bilingual children's vocabulary development is language-specific (such that primary caregivers' vocabulary scores in English would only predict children's vocabulary scores in English, but not in Spanish, and vice versa) or more general (such that high-quality input would facilitate broad vocabulary development in children, for example, through strengthening the child's conceptual knowledge). We observed a lack of cross-linguistic relationships, suggesting that the role of linguistic environment in bilingual children's vocabulary development is language-specific. These results align with a recent study, which took an exploratory approach to examining possible cross-language vocabulary effects in Turkish-Dutch six-year old bilinguals (Prevoo et al. 2013), and did not find significant correlations between maternal use of Turkish and children's Dutch vocabulary skills. On the contrary, the authors observed a trend where the two variables were negatively correlated, suggesting that vocabulary skills in bilingual children may be language-specific.

It is important to consider the possibility that the findings observed in the present study may have been driven by the methodological choices made, both with regard to the tools chosen and with regard to the sample of children tested. For instance, the different predictive relationships observed for English and for Spanish may be due to the fact that the measure used to assess receptive language skills in Spanish is an older assessment tool. The TVIP was chosen to measure Spanish receptive vocabulary because it has been used extensively in

previous studies (e.g., Bialystok, Luk, & Kwan, 2005; Gibson et al., 2012; Hammer, Lawrence, & Miccio, 2008) and because alternative available measures of bilinguals' receptive vocabulary (such as the Receptive and Expressive One-Word Picture Vocabulary Test) incorporate both languages in the assessment. The possible lower validity and reliability associated with using the TVIP for capturing children's Spanish receptive vocabulary skills may have contributed to the lack of predictive relationships observed for Spanish receptive vocabulary measures.

Another possible explanation is that the stronger relationships observed for English vs. Spanish in the present work are an outcome of higher variability in the English data vs. the Spanish data. Although the wide range of proficiencies within our sample is a strength of this study, the different degrees of variability across the different predictor and outcome variables may have contributed to the pattern of findings. Such differences in variability across outcome variables may explain the finding that non-verbal intelligence was a significant predictor of English receptive and expressive vocabulary skills and Spanish receptive vocabulary skills but not Spanish expressive vocabulary skills. Interestingly, when considering the role of SES in children's English vs. Spanish vocabulary performance, variability in SES did not fluctuate across English and Spanish analyses. The stronger relationship observed between SES and children's English vocabulary skills vs. Spanish vocabulary skills therefore cannot be attributed to the higher variability in the primary caregiver characteristics included in the English vs. the Spanish analyses. Since variability levels in the children's English vs. Spanish vocabulary scores are highly similar, the SES analyses strongly indicate that the more robust relationships observed for the children's L2 than for their L1 are a reflection of language status (L1 vs. L2) rather than a side-effect of how the data were distributed in the two languages. In addition, it is important to point out that the current study focused on vocabulary skills because of their broad importance to language development and academic achievement. However, future studies can build on the present work by considering the role of language input variables in the development of other language domains, such as grammar, and extending the relevance of this work to the language system as a whole.

The findings of the current study carry significant clinical implications in suggesting that bilingual children's English vocabulary skills depend on both the percent of exposure to English and the primary caregivers' scores on English vocabulary measures. A powerful demonstration of this study's real-life impact can be derived from examining how fluctuations in primary caregivers' English vocabulary scores impact children's English vocabulary skills. Using real child participants in our sample as examples, it is possible to contrast two children with similar non-verbal IQ scores (Child 1 = 113; Child 2 = 117), percent exposure to English (Child 1 = 67%; Child 2 = 71%), and SES (Child 1 = 19; Child 2 = 18), but with a 7-point difference in primary-caregiver English receptive vocabulary scores (Child 1 = 100; Child 2 = 107). Plugging these children's data into the regression model reveals that a 7-point difference in caregivers' vocabulary scores yields a 5% increase in Child 2's English receptive vocabulary score, and a 20-point difference in caregivers' vocabulary scores results in a 9% increase in the child's English receptive vocabulary score. Thus, even a nominally small increase in primary caregiver vocabulary scores can positively impact the child's vocabulary skills. The role of the home environment appears to play a

larger role in children's English vocabulary development than their Spanish vocabulary development, suggesting that the development of vocabulary skills in the children's second language is especially sensitive to fluctuations in the input in that language. Together, our findings point to the importance of primary caregivers' vocabulary skills to bilingual children's vocabulary development even in the school-age years, and underscore the importance of continuous need for parent-focused activities in clinical practice with this population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This research was supported by NIDCD Grants R03 DC010465 and R01 DC011750 awarded to Margarita Kaushanskaya, and by the NIH Diversity Supplement R03 DC0104565-01 and Training Grant T32 DC005359-10 awarded to Milijana Buac. The authors would like to thank all of the families who participated in this study as well as the numerous schools who generously aided in participant recruitment. We are grateful to Michelle Batko, Nicole Compty, Katie Engh, Regina Estrada, Marni Garfinkel, Erica Goldstein, Kiran Gosal, Liz Jaramillo, Eva Lopez, Breana Mudrock, Sarah Naumann, Emily Silverberg, and Julie Winer for their assistance with participant recruitment, data collection, and data coding, and to all the members of the Language Acquisition and Bilingualism Lab for their valuable comments on this paper.

References

August D, Carlo M, Dressler C, Snow CE. The critical role of vocabulary development for English language learners. Learning Disabilities Research and Practice. 2005; 20(1):50–57.

Ben Zeev S. The influence of bilingualism on cognitive strategy and cognitive development. Child Development. 1977; 48:1009–1018.

Bialystok E, Luk G, Kwan E. Bilingualism, biliteracy, and learning to read: Interactions among languages and writing systems. Scientific Studies of Reading. 2005; 9(1):43–61.

Bialystok E, Luk G, Peets KF, Yang S. Receptive vocabulary differences in monolingual and bilingual children. Bilingualism: Language and Cognition. 2010; 13(4):525–531.

David A, Wei L. Individual differences in the lexical development of French- English bilingual children. International Journal of Bilingual Education and Bilingualism. 2008; 11(5):598–618.

De Houwer A, Bornstein MH, Putnick DL. A bilingual-monolingual comparison of young children's vocabulary size: Evidence from comprehension and production. Applied Psycholinguistics, FirstView Articles. 2013:1–23.

Dickinson, DK.; Tabors, PO., editors. Beginning literacy with language: Young children learning at home and school. Baltimore: Brookes; 2001.

Dixon LQ, Wu S, Daraghmeh A. Profiles in bilingualism: Factors influencing kindergarteners' language proficiency. Early Childhood Education Journal. 2012; 40:25–34.

Dollaghan CA, Campbell TF, Paradise JL, Feldman HM, Janosky JE, Pitcairn DN, et al. Maternal education and measures of early speech and language. Journal of Speech, Language and Hearing Research. 1999; 42:1432–1443.

Duncan GJ, Dowsett CJ, Claessens A, Magnuson K, Huston AC, Klebanov P, et al. School readiness and later achievement. Developmental Psychology. 2007; 43:1428–1446. [PubMed: 18020822]

Dunn, LM.; Dunn, LM. Peabody Picture Vocabulary Test. 3rd ed.. Circle Pines, MN: AGS; 1997.

Dunn, LM.; Padilla, ER.; Lugo, DE.; Dunn, LM. Test de Vocabulario en Imágenes Peabody (Adaptación Hispanoamericana) [Peabody Picture Vocabulary Test Hispanic American version]. Circle Pines, MN: AGS; 1986.

Eilers, RE.; Pearson, BZ.; Cobo-Lewis, AB. The social circumstances of childhood bilingualism: The Miami experience. In: McCardle, P.; Hoff, E., editors. Childhood Bilingualism. Clevedon, UK: Multilingual Matters; 2006. p. 68-90.

Ensminger, ME.; Fothergill, K. A decade of measuring SES: What it tells us and where to go from here. In: Bornstein, MH.; Bradley, RH., editors. Socioeconomic status, parenting, and child development. Mahwah, NJ: Lawrence Erlbaum; 2003.

Feldman HM, Dollaghan CA, Campbell TE, Krs-Lasky M, Janosky JE, Paradise JL. Measurement properties of the MacArthur Communication Development Inventory at ages one and two years. Child Development. 2000; 71:310–322. [PubMed: 10834466]

Fernández MC, Pearson BZ, Umbel VM, Oller DK, Molinetmolina M. Bilingual receptive vocabulary in Hispanic preschool children. Hispanic Journal of Behavioral Sciences. 1992; 14(2):268–276.

Flege JE, Munro MJ, MacKay IRA. Effects of age of second-language learning on the production of English consonants. Speech Communication. 1995; 16:1–26.

Genesee, F.; Paradis, J.; Crago, MB. Dual language development and disorders: A handbook of bilingualism and second language learning. Vol. 11. Baltimore, MD: Paul H. Brooks; 2004.

Gibson TA, Oller DK, Jarmulowicz L, Ethington CA. The receptive-expressive gap in the vocabulary of young second-language learners: Robustness and possible mechanisms. Bilingualism: Language and Cognition. 2012; 15:102–116.

Hammer CS, Lawrence FR, Miccio AW. Exposure to English before and after entry into Head Start: Bilingual children's receptive language growth in Spanish and English. International Journal of Bilingual Education and Bilingualism. 2008; 11(1):30–56. [PubMed: 26430382]

Hammer CS, Komaroff E, Rodriguez BL, Lopez LM, Scarpino SE, Goldstein G. Predicting Spanish-English Bilingual Children's Language Abilities. Journal of Speech, Language, and Hearing Research. 2012; 55:1251–1264.

Hart, B.; Risley, T. Meaningful differences in the everyday experience of young American children. Baltimore: Brookes; 1995.

Hemsley G, Holm A, Dodd B. Diverse but not different: The lexical skills of two primary age bilingual groups in comparison to monolingual peers. International Journal of Bilingualism. 2006; 10(4): 453–476.

Hoff, E.; Laursen, B.; Tardif, T. Socioeconomic status and parenting. In: Bornstein, MH., editor. Handbook of parenting. Ecology and Biology of Parenting. Vol. II. Mahwah, New Jersey: Lawrence Erlbaum; 2002. p. 161-188.

Hoff E, Naigles L. How children use input in acquiring a lexicon. Child Development. 2002; 73:418–443. [PubMed: 11949900]

Hoff E. The specificity of environmental influences: Socioeconomic status affects early vocabulary development via maternal speech. Child Development. 2003; 74(5):1368–1378. [PubMed: 14552403]

Hoff E, Core C, Place S, Rumiche R, Señor M, Parra M. Dual language exposure and early bilingual development. Journal of Child Language. 2012; 39(1):1–27. [PubMed: 21418730]

Hurtado N, Marchman VA, Fernald A. Does input influence uptake? Links between maternal talk, processing speed and vocabulary size in Spanish-learning children. Developmental Science. 2008; 11(6):F31–F39. [PubMed: 19046145]

Huttenlocher J, Haight W, Bryk A, Seltzer M, Lyons T. Early vocabulary growth: Relation to language input and gender. Developmental Psychology. 1991; 27(2):236–248.

Huttenlocher J, Waterfall H, Vasilyeva M, Vevea J, Hedges LV. Sources of variability in children's language growth. Cognitive Psychology. 2010; 61:343–365. [PubMed: 20832781]

Jia G, Aaronson D, Wu Y. Long-term language attainment of bilingual immigrants: Predictive variables and language group differences. Applied Psycholinguistics. 2002; 23:599–621.

Jia G, Anderson D. A longitudinal study of Chinese children and adolescents learning English in the United States. Applied Psycholinguistics. 2003; 24:131–161.

Jia G, Fuse A. Acquisition of English grammatical morphology by native Mandarin speaking children and adolescents: Age-related differences. Journal of Speech, Language and Hearing Research. 2007; 50:1280–1299.

Kaufman, AS.; Kaufman, NL. Kaufman Brief Intelligence Test. 2nd ed.. Circle Pines, MN: American Guidance Service; 2004.

Kester Stubbe E, Peña ED. Language ability assessment of Spanish-English bilinguals: Future Directions. Practical Assessment, Research & Evaluation. 2002; 8(4)

Leseman PPM. Bilingual vocabulary development of Turkish preschoolers in the Netherlands. Journal of Multilingual and Multicultural Development. 2000; 21(2):93–112.

Mancilla-Martinez J, Lesaux NK. Early home language use and later vocabulary development. Journal of Educational Psychology. 2011; 103:535–546.

Marchman VA, Fernald A, Hurtado N. How vocabulary size in two languages relates to efficiency in spoken word recognition by young Spanish-English bilinguals. Journal of Child Language. 2010; 37:817–840. [PubMed: 19726000]

Marian V, Blumenfeld H, Kaushanskaya M. The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing language profiles in bilinguals and monolinguals. Journal of Speech Language and Hearing Research. 2007; 50(4):940–967.

Mason, J.; Stewart, J.; Peterman, C.; Dunning, D. Toward an integrated model of early reading development. Champaign, IL: Center for the Study of Reading; 1992. (Tech. Rep. No. 566).

Miccio, A.; Tabors, PO.; Paez, M.; Hammer, CS.; Wagstaff, D. Vocabulary development in Spanish-speaking Head Start children of Puerto Rican descent. Paper presented at the 4th International Symposium on Bilingualism; Tempe, AZ. 2003.

Morris D, Bloodgood J, Perney J. Kindergarten predictors of first and second grade reading achievement. The Elementary School Journal. 2003; 104:93–109.

Muñoz-Sandoval, AF.; Woodcock, RW.; McGrew, KS.; Mather, N. Batería III Woodcock-Muñoz. Rolling Meadows, IL: Riverside Publishing; 2005.

Naigles LR, Hoff-Ginsberg E. Why are some verbs learned before other verbs? Effects of input frequency and structure on children's early verb use. Journal of Child Language. 1998; 25:95–120. [PubMed: 9604570]

Oller, DK.; Eilers, RE. Language and literacy in bilingual children. Clevedon: Multilingual Matters; 2002.

Oller, DK.; Pearson, BZ. Assessing the effects of bilingualism: A background. In: Oller, DK.; Eilers, RE., editors. Language and literacy in bilingual children. Clevedon: Multilingual Matters; 2002. p. 3-21.

Oller, DK.; Jarmulowicz, L.; Gibson, T.; Hoff, E. First language vocabulary loss in early bilinguals during language immersion: A possible role for suppression. In: Caunt-Milton, H.; Kulatilake, S.; Woo, I., editors. Proceedings of the 31st Annual Boston University Conference on Language Development. Somerville, MA: Cascadilla Press; 2007. p. 474-484.

Oller DK, Pearson BZ, Cobo-Lewis AB. Profile effects in early bilingual language and literacy. Applied Psycholinguists. 2007; 28:191–230.

Pan BA, Rowe ML, Singer JD, Snow CE. Maternal correlates of growth in toddler vocabulary production in low-income families. Child Development. 2005; 76(4):763–782. [PubMed: 16026495]

Paradis J. Individual differences in child English second language acquisition: Comparing child-internal and child-external factors. Linguistic Approaches to Bilingualism. 2011; 1(3):213–237.

Pearson BZ, Fernández VL, Lewedeg V, Oller DK. The relation of input factors to lexical learning by bilingual infants. Applied Psycholinguistics. 1997; 18(1):41–58.

Pearson BZ, Fernandez SC, Oller DK. Lexical development in bilingual infants and toddlers - Comparison to monolingual norms. Language Learning. 1993; 43(1):93–120.

Peña ED, Bedore LM, Zlatic-Giunta R. Category-generation performance of bilingual children: The influence of condition, category, and language. Journal of Speech, Language, and Hearing Research. 2002; 45:938–947.

Place S, Hoff E. Properties of dual language exposure that influence 2-year-olds' bilingual proficiency. Child Development. 2011; 82(6):1834–1849. [PubMed: 22004372]

Pungello EP, Iruka IU, Dotter AM, Mills-Koonce R, Reznick JS. The effects of socioeconomic status, race, and parenting on language development in early childhood. Developmental Psychology. 2009; 45(2):544–557. [PubMed: 19271838]

Quiroz BG, Snow CE, Zhao J. Vocabulary skills of Spanish—English bilinguals: impact of mother-child language interactions and home language and literacy support. International Journal of Bilingualism. 2010; 14:379–399.

Rescorla L, Alley A. Validation of the Language Development Survey (LDS): A parent report tool for identifying language delay in toddlers. Journal of Speech, Language and Hearing Research. 2001; 44:434–445.

Rowe ML. A longitudinal investigation of the role of quantity and quality of child- directed speech in vocabulary development. Child Development. 2012; 83(5):1762–1774. [PubMed: 22716950]

Sénéchal M, LeFevre JA. Parental involvement in the development of children's reading skill: A five-year longitudinal study. Child Development. 2002; 73:445–460. [PubMed: 11949902]

Scheele A, Leseman P, Mayo A. The home language environment of monolingual and bilingual children and their language proficiency. Applied Psycholinguistics. 2010; 31:117–140.

Snow, CE.; Burns, MS.; Griffin, P., editors. Preventing reading difficulties in young children. Washington, DC: National Academy Press; 1998.

Stanovich KE. Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. Reading Research Quarterly. 1986; 21:360–407.

Tabors PO, Párez MM, López LM. Dual language abilities of Spanish-English bilingual four-year-olds: Initial findings from the early childhood study of language and literacy development of Spanish-speaking children. NABE Journal of Research and Practice. 2003; 1:70–91.

Thordardottir E, Rothenberg A, Rivard M-E, Naves R. Bilingual assessment: Can overall proficiency be estimated from separate assessment of two languages? Journal of Multilingual Communication Disorders. 2006; 4:1–21.

Thordardottir E. The relationship between bilingual exposure and vocabulary development. International Journal of Bilingualism. 2011; 15(4):426–445.

Uccelli P, Paez MA. Narrative and vocabulary development of bilingual children from kindergarten to first grade: Developmental changes and associations among English and Spanish skills. Language, Speech & Hearing Services in Schools. 2007; 38:225–236.

Umbel VM, Oller DK. Developmental changes in receptive vocabulary in Hispanic bilingual school children. Language Learning. 1994; 44(2):221–242.

Vagh SB, Pan BA, Mancilla-Martinez J. Measuring growth in bilingual and monolingual children's English productive vocabulary development: The utility of combining parent and teacher report. Child Development. 2009; 80:1545–1563. [PubMed: 19765017]

Veltman, C. Language shift in the United States. Amsterdam: Mouton; 1983.

Weizman ZO, Snow CE. Lexical input as related to children's vocabulary acquisition: effects of sophisticated exposure and support for meaning. Developmental Psychology. 2001; 37(2):265–279. [PubMed: 11269394]

Windsor J, Kohnert K. The search for common ground. Part I: Lexical performance by linguistically diverse learners. Journal of Speech Language and Hearing Research. 2004; 47(4):877–890.

Woodcock, RW.; McGrew, KS.; Mather, N. Woodcock-Johnson III Tests of Achievement. Rolling Meadows, IL: Riverside Publishing; 2001.

Hour of the Day	*WEEKDAY*	*SATURDAY*	*SUNDAY*
6 AM			
7 AM			
8 AM			
9 AM			
10 AM			
11 AM			
12 PM			
1 PM			
2 PM			
3 PM			
4 PM			
5 PM			
6 PM			
7 PM			
8 PM			
9 PM			
10 PM			

Figure 1. Exposure Table

In the time slots indicate what language your child hears during the hours of the day during the week and weekend. Please cross out any hours when your child is asleep

Note. Table used to calculate language exposure in English and Spanish. Instructions were available in English and Spanish. Example formula used to calculate exposure:

% English exposure = ((No. of hrs. of English heard on a weekday * 5 days per week) + (No. of hrs. of English heard on Sat. & Sun.)) / (No. of hrs. child is awake per week)

% Spanish Exposure = 100 – percent of English exposure

The formula was adjusted to take into consideration special circumstances such as if a child heard one language more on certain days of the week.

Table 1

Child and Primary Caregiver Participant Characteristics

	Children ***n*** **= 58**	**Primary Caregivers** ***n*** **= 58**
Age	6.22 (.79)	36.42 (6.31)
Age of English two-word phrases (months)[a]	27.35 (13.41)	
Age of Spanish two-word phrases (months)[a]	19.69 (8.58)	
English Exposure (%)	44.36 (18.51)	
Spanish Exposure (%)	55.81 (18.56)	
Socioeconomic Status (SES)[b]	15.67 (5.57)	15.67 (5.57)
Non-Verbal IQ (Visual Matrices, K-BIT)	101.76 (12.14)	98.78 (19.67)
English Receptive Vocabulary (PPVT-III)	99.52 (22.29)	85.54 (30.55)
Spanish Receptive Vocabulary (TVIP)	97.02 (16.75)	109.85 (15.15)
English Expressive Vocabulary (Picture Vocabulary)	90.83 (19.98)	82.40 (19.67)
Spanish Expressive Vocabulary (Vocab. Sobre Dibujos)	76.53 (19.67)	88.50 (8.81)

Note. The data in Table 1 represent Means and Standard Deviations. The means for standardized measures represent Standard Scores.

[a] Age of two-word phrases is age in months at which the child began producing two-word phrases in each language, according to parent report.

[b] Socioeconomic Status was indexed by the years of education completed by the primary caregiver.

Table 2

English Receptive Vocabulary Within- and Across-Language Regression Models

Within-Language Models (*n* = 57)			
Variable	**Model 1 (β)**	**Model 2 (β)**	**Model 3 (β)**
Child Non-Verbal IQ	.35**	.31**	.22**
SES	.62**	.50**	.26*
Exposure to English		.35**	.25**
PC English Receptive Vocab.			.40**
R^2	.56**	.66**	.72**
F	33.71**	34.14**	33.43**
ΔR^2	.56**	.10**	.06**
Δ*F*	33.71**	16.12**	11.34**
Across-Language Models (*n* = 52)			
Variable	Model 1 (β)	Model 2 (β)	
Child Non-Verbal IQ	.33**	.32**	
SES	.50**	.47**	
Exposure to English	.37**	.37**	
PC Spanish Receptive Vocab.		.05	
R^2	.66**	.66**	
F	30.44*	22.47*	
ΔR^2	.12**	.00	
Δ*F*	16.62**	.16	

Note. Significance at $p < 0.05$ is designated by a single asterisk*, significance at $p < 0.01$ is designated by two asterisks**

SES- Socioeconomic Status; PC- Primary Caregiver

Table 3

English Expressive Vocabulary Within- and Across-Language Regression Models

Within-Language Models (n = 58)			
Variable	**Model 1 (β)**	**Model 2 (β)**	**Model 3 (β)**
Child Non-Verbal IQ	.34**	.29**	.23**
SES	.57**	.44**	.30**
Exposure to English		.37**	.31**
PC English Expressive Vocab.			.25**
R^2	.50**	.62**	.64**
F	27.61**	28.81**	23.90**
ΔR^2	.50**	.11**	.03**
ΔF	27.61**	16.08**	4.14*
Across-Language Models (n = 54)			
Variable	Model 1 (β)	Model 2 (β)	
Child Non-Verbal IQ	.28**	.28**	
SES	.45**	.45**	
Exposure to English	.36**	.36**	
PC Spanish Expressive Vocab.		.00	
R^2	.59**	.59**	
F	23.54**	17.31**	
ΔR^2	.11**	.00	
ΔF	13.16**	.00	

Note. Significance at $p < 0.05$ is designated by a single asterisk*, significance at $p < 0.01$ is designated by two asterisks**

SES- Socioeconomic Status; PC- Primary Caregiver

Table 4

Spanish Receptive Vocabulary Within- and Across-Language Regression Models

Within-Language Models (*n* = 46)			
Variable	**Model 1 (β)**	**Model 2 (β)**	**Model 3 (β)**
Child Non-Verbal IQ	.43**	.44**	.43**
SES	.01	.09	.00
Exposure to Spanish		.23	.22
PC Spanish Receptive Vocab.			.12
R^2	.19*	.23*	.24*
F	5.05*	4.29*	3.26*
ΔR^2	.19*	.04	.01
ΔF	5.05*	2.43	.38
Across-Language Models (*n* = 50)			
Variable	Model 1 (β)	Model 2 (β)	
Child Non-Verbal IQ	.38**	.37**	
SES	.13	.06	
Exposure to Spanish	.29*	.32*	
PC English Receptive Vocab.		.11	
R^2	.21*	.21*	
F	4.01*	3.02*	
ΔR^2	.07*	.01	
ΔF	4.22*	.23	

Note. Significance at $p < 0.05$ is designated by a single asterisk*, significance at $p < 0.01$ is designated by two asterisks**

SES- Socioeconomic Status; PC- Primary Caregiver

Table 5

Spanish Expressive Vocabulary Within- and Across-Language Regression Models

Within-Language Models (*n* = 54)			
Variable	**Model 1**	**Model 2**	**Model 3**
Child Non-Verbal IQ	.09	.14	.10
SES	−.05	.11	.08
Exposure to Spanish		.44**	.44**
PC Spanish Expressive Vocab.			.13
R^2	.01	.17*	.19*
F	.29	3.51*	2.84*
ΔR^2	.01	.16**	.01
ΔF	.29	9.86*	.86
Across-Language Models (*n* = 57)			
Variable	Model 1	Model 2	
Child Non-Verbal IQ	.11	.15	
SES	.11	.20	
Exposure to Spanish	.48**	.44**	
PC English Expressive Vocab.		− .17	
R^2	.20**	.21*	
F	4.39**	3.51*	
ΔR^2	.19**	.01	
ΔF	12.71**	.89	

Note. Significance at $p < 0.05$ is designated by a single asterisk*, significance at $p < 0.01$ is designated by two asterisks**

SES-Socioeconomic Status; PC-Primary Caregiver