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Bilingual Development: Language Input at Home in Sequential Spanish-English Children

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BILINGUAL DEVELOPMENT: LANGUAGE INPUT AT HOME IN SEQUENTIAL SPANISH-ENGLISH CHILDREN

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ABSTRACT

BILINGUAL DEVELOPMENT: LANGUAGE INPUT AT HOME IN SEQUENTIAL SPANISH-ENGLISH CHILDREN

by Vanessa Noemy Bermudez

The literature on language input provided to sequential Spanish-English bilingual children has largely been focused on children attending Head Start. The role of siblings in children's language outcomes has only been investigated in simultaneous bilinguals. The current longitudinal study extended research on language input by investigating early developmental changes in language input and the role of siblings in the language outcomes of 112 sequential Spanish-English bilingual children. Relative exposure was assessed via a parent interview when children were 18 and 56 months of age. Standardized measures of receptive vocabulary and expressive language in Spanish and English were administered at 56 months. Findings showed an increase in English relative exposure over time in overall exposure and in the exposure provided by different sources of language input, including parents, siblings, and other adults. Linear mixed models' results demonstrated that relative exposure from siblings was a unique predictor of children's scores at 56 months, extending previous research on young simultaneous bilinguals. Future research should incorporate siblings when investigating the language input of sequential bilinguals and when designing programs aimed at supporting their language outcomes

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Introduction

The process of acquiring language and using it as a tool for learning about the world and to be successful in school is a multi-layered process for all children. This process becomes more intricate for children whose home language is different from the language of instruction at school. Over 20% of children attending public schools in the United States speak a language other than English at home, and approximately three quarters of these children live in Spanish-speaking households (Fry & Gonzales, 2008). Many children in these households develop language skills in their native language to various degrees of proficiency and are later exposed to English when they enter school. These children are faced with the complex task of developing skills in the second language while gaining other school-readiness skills, as Latino children are more likely than their non-Latino peers to live in poverty (Fry & Gonzales, 2008) and lag in language and school-readiness (Hoff, 2006; Lee & Burkham, 2002). Learning English as a second language and living in poverty places many Spanish-speaking Latino children at risk for poor academic outcomes. Latino children are more likely than their White peers to perform below grade levels in reading (Snow, Burns, & Griffin, 1998) and to drop out of high school (Federal Interagency Forum on Child and Family Statistics, 2013).

Children's early language skills in English provide a foundation for attaining reading comprehension skills essential for academic achievement. Oral language, which includes receptive and expressive skills, has been identified as an important precursor of reading ability, particularly during the initial phase of decoding letters into sounds to form words (Whitehurst & Lonigan, 1998). In other words, for children to successfully extract

meaning from reading a sentence they must first have a semantic representation of the words in the sentence. English receptive vocabulary and expressive language skills at school entry predict later reading ability during the first three years of schooling (NICHD Early Child Care Research Network, 2005; Snow et al., 1998). Moreover, children's oral language abilities at school entry are associated with later academic achievement in reading and math in the 5th grade (Duncan et al., 2007).

While school entry language skills in English are important for school success, maintaining the native language provides children with an array of literacy, cognitive, and social benefits. In the literacy domain, bilingual children demonstrate superior ability than monolinguals in understanding concepts of print and some aspects of phonological awareness that are important factors in developing reading skills (Bialystok & Herman, 1999). Research on Spanish-English bilingual children has found that phonological awareness skills in Spanish transfer to phonological awareness skills in English (Dickinson, McCabe, Clark–Chiarelli, & Wolf, 2004; Lopez & Greenfield, 2004). Bilingual children also demonstrate a cognitive advantage over monolingual children in metalinguistic ability (Galambos & Hakuta, 1988), the ability to attend to properties of language and to control language, but such an advantage is dependent on children's proficiency in the native language and regular exposure to both languages. Another cognitive advantage of bilingualism is superior executive function (Bialystok & Viswanathan, 2009; White & Greenfield, 2017), a set of cognitive skills that are essential for academic and school success. Furthermore, adolescents from immigrant families who communicate with their

parents in the native language have better psychosocial adjustment and quality of relationships in the family, compared to those who communicate in English (Tseng & Fuligni, 2000). The loss of the native language, on the other hand, is related to alienation in parent-child relations in bilingual families (Qin, 2006).

To acquire language, children must hear language (Hart & Risley, 1995). Given the importance of acquiring English and maintaining the native language for bilingual children, it is crucial to understand their language exposure from an early age. The greater the exposure to a language the more likely that children will become proficient in that language. Relative exposure to the two languages predicts children's language development (e.g., hearing more Spanish than English predicts greater vocabulary in Spanish than in English). (Marchman & Martínez- Sussmann, 2002; Parra, Hoff, & Core, 2011). In a review conducted by Hammer et al. (2014), it was found that differences in bilingual exposure (e.g., ratio of native to second language exposure) in toddler and preschool years predicted individual differences in various measures of both languages, accounting from 10% to 49% of the variance in outcomes. Furthermore, the relationship between language exposure and language ability is different for receptive and expressive skills, with language exposure having a greater influence on expressive than receptive skills (Hoff, Welsh, Place, & Ribot, 2014). Thus, language exposure may be the key to avoiding passive bilingualism, which refers to the ability to understand two languages but only speak one (Hoff et al., 2014).

The timing of exposure to the second language has also been identified as an important factor in the language development of Spanish-English bilingual children.

Children who are regularly exposed and expected to interact with others in both languages are considered simultaneous bilinguals. In contrast, those who are raised in predominantly Spanish-speaking households and are not expected to interact with others in English until entering school are considered sequential bilinguals. In a study conducted with Spanish-English bilingual children attending Head Start, simultaneous bilinguals had significantly higher vocabulary in English but lower vocabulary in Spanish than sequential bilinguals (Hammer, Lawrence, & Miccio, 2008). Despite comparable maternal education, approximately 90% of sequential bilingual children had mothers who were born outside of the United States, compared to 50% of simultaneous bilinguals (Hammer et al., 2008; Hammer, Miccio, & Wagstaff, 2003). Research has shown that Spanish-speaking children with parents born outside of the United States are four times as likely to speak English with difficulty than their counterparts with parents born in the United States (Fry & Gonzales, 2008). Thus, sequential bilinguals are particularly at risk for poor school outcomes given low levels of English proficiency at school entry that are at least partly due to limited opportunities to hear, learn, and use English.

Most of the research investigating in-home language experiences of bilingual children has focused on the role of language input provided by primary caregivers. Hammer, Davison, Lawrence, and Miccio (2009), conducted a longitudinal study with Spanish-English bilingual children of Puerto Rican descent who were attending Head Start (a federally subsidized preschool program) to investigate changes in language exposure provided by mothers over time. Over a 3-year period, mothers

increased the amount of English they used to communicate with their children, but such increase had little impact on children's English vocabulary, while it negatively impacted children's Spanish vocabulary growth.

In Hammer et al. (2009), the Puerto Rican mothers increased English input likely occurred in response to the children's increasing use of English as they continued schooling in English. As such, the reported developmental changes in mothers' English use may not generalize to other young children because many Spanish-speaking children do not receive English schooling and would unlikely increase their English use. For working Hispanic mothers, only about 14% of children between the ages of 0 and 4 years are taken care of outside of the home (Laughlin, 2013). Additionally, only about 31% of 3 to 5-year-old Hispanic children are enrolled in preschool programs (Aud, Wilkinson-Flicker, Kristapovich, Rathbun, Wang, & Zhang, 2013). Thus, most Spanish-speaking children are not exposed to English in daycare or ECE programs during the first four years of life. Furthermore, even if children increase their English use, many Spanish-speaking mothers may have limited English proficiency to increase their English input in response to the children's increased English use. Increased use of English could be unique to Puerto Rican mothers, who may have better English proficiency than mothers from other countries. For example, about 83% of Puerto Ricans ages 5 and older reported speaking English proficiently, compared to 68% of Mexicans (Lopez & Patten, 2015; Lopez, 2015). Parents with limited English proficiency may not increase their use of English with their children because they do not know how to speak the language.

Other studies with Spanish-English bilingual children have also found that parental usage of English is not necessary for children to attain proficiency in English (Place & Hoff, 2011), but attaining proficiency in Spanish requires both instructional support and parental use of Spanish at home (Duursma et al., 2007). A proposed explanation for these findings is that Spanish-English bilingual children have enough English exposure in their community and at school, and thus home (maternal) use of English does not further advance children's English vocabulary development. In contrast, maternal use of Spanish at home is a major source of Spanish exposure and thus necessary to support children's Spanish vocabulary development. An alternative explanation could be that the English provided by Spanish-speaking parents may be of limited proficiency, as related research has shown that children's language skills can be predicted based on whether the parents are native speakers of Spanish or English. Specifically, children with two native Spanish-speaking parents have higher vocabulary skills in Spanish than English, and children with one native English-speaking parent have better vocabulary skills in English than Spanish (Hoff et al., 2014). Taken together, these results suggest that Spanish input from native Spanish-speaking parents is vital for children's Spanish language development but not for English language development, likely because Spanish-speaking parents are one of many sources of English exposure in their children's lives. Thus, it is necessary to investigate other potential sources of English exposure in children of native Spanish-speaking parents and to better understand the role those sources play in the children's language abilities in each of their two languages.

Few studies have investigated other sources of language input aside from caregivers. Bridges and Hoff (2014) identified older siblings as a potential source of language input that could impact the language development of children living in bilingual households. There are several reasons why this may be the case. For example, the oldest child in the family may be the first member to receive formal instruction in English and to become the first English speaker in the family. In this instance, older siblings probably have greater English proficiency than parents. Moreover, the language used in interactions between siblings may be more developmentally appropriate for learning than the one used by parents. Bilingual children attending school in English may prefer to speak English to their siblings due to higher proficiency in English than in Spanish and because English is the language they use with peers at school (Jia & Aaronson, 2003; Oller & Eilers, 2002).

Bridges and Hoff (2014) conducted two studies to investigate the unique role of older siblings in the language development of bilingual toddlers. The first study was conducted with children of highly educated parents that were native and non-native speakers of a language other than English. Results indicated higher English use in siblings' conversations than in parent-child conversations, better English vocabulary in toddlers with older siblings (than without), and better English vocabulary in toddlers who heard only English (rather than both languages) from older siblings. The second study focused on simultaneous bilingual toddlers whose mothers were highly educated native Spanish-speakers. Results indicated that toddlers with school-aged siblings had greater overall English exposure at home and greater English exposure from mothers than toddlers

without school-aged siblings. Moreover, toddlers with school-aged siblings had greater English vocabulary, but lower Spanish vocabulary, compared to those without school-aged siblings. These results demonstrate that language input from older siblings contributes to the language abilities of simultaneous bilinguals. However, little is known about the role of sibling language input in sequential bilingual children's language development.

Spanish-English sequential bilingual children represent a unique population that is at risk for low academic outcomes. Many sequential bilingual children have parents who were born outside of the United States and have limited English proficiency (Hammer et al., 2003). Children of immigrant parents are more likely than children of US-born parents to be from lower socioeconomic status and are less likely to attend early childhood education programs (Karoly & Gonzalez, 2011). Lack of English exposure at home and in an instructional setting before school entry, coupled with fewer learning resources and opportunities due to low income, can place many Spanish-English sequential bilingual children at a double disadvantage in their language development and educational attainment. Despite initial greater language ability in Spanish, these children face the risk of decreasing their native language ability as they become more exposed to English, which would hinder benefits associated with bilingualism. Proficiency in both English and Spanish is important for a myriad of positive outcomes (Bialystok & Herman, 1999; White & Greenfield, 2017). Thus, it is crucial to understand early language experiences of sequential bilingual children and factors that contribute to optimal bilingual development.

Moreover, receptive and expressive language ability must be distinguished, as they contribute uniquely to development (Whitehurst & Lonigan, 1998) and are influenced differently by language exposure (Hoff et al., 2014).

The Current Study

The current study examined in-home sources of language input that may support sequential bilingual's English and Spanish language development. Existing data from an ongoing longitudinal project were analyzed to address issues of developmental changes. Specifically, the current study utilized data from two timepoints, when US-born children of predominantly Mexican descent were 18 and 56 months of age. Data consisted of information on overall developmental changes in language input across the two timepoints, developmental changes from four major sources of language input- parents, other adults, siblings, and other children- and language outcomes.

Four hypotheses were tested to examine children's language experience at home and related language outcomes. First, I hypothesized that exposure to English, relative to Spanish, would increase over time. As children become older, they would have increasing exposure to English as they engage with people beyond the family and partake in activities done in English (the major language at daycare or preschool). My second hypothesis was that language input from parents and other adults would stay consistent over time but would increase over time from siblings and other children. Research has shown that children may prefer to speak English to their siblings due to greater proficiency in that language and English being the language they speak with peers (Jia & Aaronson, 2003; Oller & Eilers, 2002), and thus language input from siblings and other children would change (English increases). In the case of parents and other adults, it may be more difficult to predict changes over time in language input. For example, although English use by Puerto Rican mothers has been found to increase during children's

preschool years (Hammer et al., 2009), this finding may not generalize to the current study. Persons of Puerto Rican descent may use English more than those of Mexican descent (Hakimzadeh & Cohn, 2007). Therefore, it may be that Mexican parents and other adults of Mexican descent will not significantly change the nature of their language input to children (nature of language input stays consistent). Third, I hypothesized that siblings would be the main source of English exposure when children were 56 months of age because Latino children are less likely to attend preschool (Aud et al., 2013) and the parents of sequential bilingual children tend to speak primarily in Spanish (Hammer et al., 2003). Thus, siblings who may have greater English proficiency are likely to be sequential bilingual children's primary source of English at this age. Fourth, consistent with previous research (Hammer et al., 2009; Place & Hoff, 2011), I hypothesized that parents' language input would predict children's English and Spanish language skills over and above traditional predictors of language input such as socioeconomic status, sex, and previous language ability. Moreover, siblings' language input would further predict children's language skills in English and Spanish over and above traditional predictors and parents' language input. Thus, I expected siblings' significant role in language development to generalize from simultaneous bilinguals as found in prior research (Bridges & Hoff, 2014) to the sequential bilinguals in the current study.

Method

Participants

Participants were 112 children (47 males, 65 females) enrolled in an ongoing longitudinal study of language development directed by Dr. Anne Fernald, at Stanford University. Children were tested when they were 18 months old (M = 18.89, SD = 0.75, range = 17.6 – 20.8) and 56 months old (M = 56.83, SD = 1.36, range = 54.1 – 63.0). About 77% (n = 86) of the children had siblings at 18 months, and approximately 86% (n = 96) had siblings at 56 months. At 56 months, children had two siblings, on average (M = 1.66, range = 0 – 5). Children were recruited from 2013 to 2015 through county birth records. Exclusion criteria included preterm birth, a known developmental disorder, and hearing or vision loss. Caregivers were initially interviewed by phone about their child's language background, health history, and family history of developmental disorders. Qualifying families were invited to participate if caregivers were native Spanish speakers, and if they spoke predominantly in Spanish to their child.

Demographic information was obtained at both timepoints. The sample consisted of U.S. born children, with 96% (n = 107) living in two-parent households. Children were from predominantly lower socioeconomic status (SES) backgrounds. Mothers had, on average, fewer than 12 years of education, with 44.6% having less than a high school education, 22.4% having completed high school, 16.0% having some college, and 17.0% having completed college or beyond. Fathers had, on average, about 10 years of education, with 59.8% having less than a high school education, 23.2% having completed high school, 8.1% having some college, and 8.9% having completed college or beyond.

Families' SES was calculated using the Hollingshead Four Factor Index of Socioeconomic Status (HI; Hollingshead, 1975). This widely used index of SES is based on a weighted average of both parents' education and occupation, with possible scores ranging from 8 to 66. The mean HI score when children were 18 months (M = 24.92, SD = 10.48) indicated most of the families were from lower SES backgrounds at the beginning of the study, with about 76% falling on the unskilled or semi-skilled strata. Families' SES when children were 56 months (M = 25.89, SD = 11.30) was not significantly different from the earlier timepoint, $t(111) = 1.65$, $p = .10$, indicating that SES remained constant over time. Most parents were born in Mexico (83.0%), and the remainder were born in Central America (9.0%), South America (0.9%), the Caribbean (0.5%), or the United States (6.7%). On average, immigrant parents arrived at the United States when they were about 20 years old and had been living in the United States for about 17 years.

Measures

Language background questionnaire. To derive estimates of relative Spanish and English language exposure, a language background environment interview was conducted at both timepoints (Marchman & Martínez-Sussmann, 2002; Marchman, Martínez, Hurtado, Grüter, & Fernald, 2017). This interview asked the parent to describe their child's typical weekday and weekend, including wake-up, night-time, and nap times, and then to list the people with whom their child comes into regular contact, when that contact occurred, and the proportion of Spanish versus English that person uses when speaking to the child. For each person in the child's life, the total number of hours that

person spent with the child, and the number of hours using Spanish and English, were computed. Parents were also asked whether their children were attending early childhood education (ECE) programs (e.g., daycare, preschool), number of days and hours attended, and proportion of Spanish and English they heard from teachers and peers at the program. Finally, parents were asked about times when children engaged in extracurricular activities (e.g., swimming, ballet, sports) and proportion of Spanish and English they heard during those activities. Total hours of exposure were the number of contact hours summed across all people and programs that were regular sources of input in the children's lives (e.g., parents, siblings, ECE programs). Total Spanish and total English hours were also computed by summing across all person and program hours within each category. These numbers were then used to compute the relative overall proportions of Spanish and English input for each child. In a similar fashion, proportions of Spanish and English input were computed for each person who had regular contact with the child. Estimates of relative exposure obtained from the language background questionnaire have been shown to correlate with the proportion of English and Spanish that children hear at home, based on audio recordings (Marchman, Martínez, Hurtado, Grüter, & Fernald, 2017). Moreover, relative exposure was shown to have predictive validity to language outcomes (Marchman, Martínez, Hurtado, Grüter, & Fernald, 2017).

Language outcomes. At 18 months, Spanish vocabulary size was estimated based on caregivers' reports on the MacArthur-Bates Inventarios del Desarrollo de Habilidades Communicativas: Primeras Palabras y Gestos (Words and Gestures; Jackson-Maldonado et al., 2003). Parents indicated on a vocabulary checklist the words that their child

"comprende y dice" ("understands and says"). Parents were told that childlike forms and words specific to the family or dialect were acceptable (e.g., "ota" for "pelota"). Scores are out of a maximum of 680 words. At 56 months, Spanish-English bilingual researchers administered standardized language assessments in Spanish and English during two separate sessions, typically about one week apart. Spanish receptive vocabulary was measured using the Test de Vocabulario en Imágenes Peabody: Adaptación Hispanoamericana (TVIP; Dunn, Padilla, Lugo, & Dunn, 1986). The TVIP is the Hispanic-American adaptation of the Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981). Translated items were selected based on its universality and appropriateness for Spanish-speaking communities. Spanish expressive language was measured using the Expressive Language Index (ELI) composite scores on the Spanish edition of the Clinical Evaluation of Language Fundamentals Preschool- Second Edition (CELF Preschool-2 Spanish; Wiig, Secord, & Semel, 2009). The CELF Preschool-2 Spanish was designed as a parallel, not translated, version of the English test. Subtests were designed to match the format of the English edition while considering skills specific to Spanish vocabulary, morphology, and syntax. English receptive vocabulary was assessed using the PPVT-4 (Dunn & Dunn, 2007). English expressive language was assessed using the Expressive Language sub-scale on the Preschool Language Scales (5th Edition; Zimmerman, Steiner, & Pond, 2011). Standardized scores were used for all language assessments at 56 months: A score of 100 represents performance at the 50th percentile, and the standard deviation is 15 points.

Some children could not engage in the test due to inability to respond in the language of test administration. For example, some Spanish-speaking children who did not speak English told the experimenter "I do not speak that language" when given instructions in English. A standard score of 70 (two standard deviations below the 50th percentile) was imputed in those cases. Imputations occurred in 2 instances for Spanish receptive, 12 for Spanish expressive, and 15 for English expressive. There was also missing data due to children's unwillingness to complete the tests (n = 1 for Spanish receptive; n = 5 for Spanish expressive; n = 1 for English receptive; n = 10 for English expressive).

Procedure

At both timepoints, parents were briefed about the study's procedures and their rights as participants before giving informed consent. All documents and communications with parents were done in Spanish by native bilingual and bicultural research assistants. All procedures were approved by Stanford University's institutional review board. Each time, parents were interviewed in person about their child's health history, family history of developmental disorders, demographic characteristics, and daycare or preschool information. The research assistant also completed the language background questionnaire with one or both parents, typically the mother. After the visits, parents were mailed a report that summarized their child's performance on standardized assessments.

At the 18-month timepoint, children and their parents were tested at either a satellite laboratory in Sunnyvale, CA (n = 16), or at a community center in San Jose, CA (n = 96). Participation consisted of two sessions that lasted one hour each. Children always remained with their parents. At the end of each session, caregivers received a $20 gift

card as travel reimbursement, and the child received a book. At the 56-month timepoint, all families were tested in the satellite laboratory. This timepoint consisted of two sessions, each lasting two hours. Children were assessed individually in a testing room by a research assistant while parents were interviewed by a second research assistant in the waiting room. An iPad showing the muted live streaming of the child completing standardized assessments was placed within parents' sight. At each visit, families received a $25 gift card and a small toy as compensation for their participation.

Results

Change Over Time

Table 1 provides information about the number of children receiving input from the different sources and proportions of English and Spanish they heard at each timepoint. Analyses testing hypotheses related to change over time were conducted using SPSS Statistics Version 25. A paired-samples *t*-test was conducted to test the first hypothesis that overall proportion of English input increased from toddler to preschool years for the sequential Spanish-English bilingual children.[1] Supporting the hypothesis, results revealed a significant increase in English input that children heard from 18 months (M = 13.22%, SD = 12.97%) to 56 months of age (M = 31.01%, SD = 21.09%), $t(111) = 10.51$, $p < .001$, Cohen's $d = 1.40$ (large effect size; large ES hereafter). The mean increase was 17.79%, 95% CI [14%, 21%]. These results showed that by the time sequential Spanish-English bilingual children were 56 months old, they heard significantly more English than when they were 18 months. Consequentially, because the proportions of English and Spanish input had a zero-sum relationship, Spanish input decreased significantly by the same amount (i.e., 17.79%) from 18 to 56 months.

[1] Prior to conducting the analysis, the assumption of normality was examined. The skewness and kurtosis levels were estimated at 2.57 and 1.86, respectively, indicating a positively skewed distribution and thus violating the normality assumption. Nevertheless, with relatively large sample sizes ($N \geq 30$), this violation is unlikely to cause any serious problems, thus deeming the paired-samples *t*-test appropriate for the current analysis (Cohen, 2013; Pallant, 2013).

Table 1

Frequencies for Source of Language Input and Descriptive Statistics for Exposure

Source of Language Input		Spanish %			English %		
	n	*M*	*SD*	Range	*M*	*SD*	Range
18 months							
Overall	112	86.78	12.97	50 - 100	13.22	12.97	0 - 50
Parents	112	95.44	8.86	58 - 100	4.56	8.86	0 - 42
Other adults	77	92.61	20.89	0 - 100	7.39	20.89	0 - 100
Siblings	86	70.14	28.10	0 - 100	29.86	28.10	0 - 100
Other children	56	65.77	32.70	0 - 100	34.23	32.70	0 - 100
56 months							
Overall	112	68.99	21.09	11 - 100	31.01	21.09	0 - 89
Parents	112	87.14	17.80	20 - 100	12.86	17.80	0 - 80
Other adults	64	85.32	27.51	0 - 100	14.68	27.51	0 - 100
Siblings	96	50.62	34.01	0 - 100	49.38	34.01	0 - 100
Other children	49	47.12	38.17	0 - 100	52.88	38.17	0 - 100

Note. Spanish % is calculated by dividing the number of Spanish hours children hear from a source by total hours children spend with that source (Spanish + English hours). English % is calculated by dividing the number of English hours children hear from a source by total hours children spend with that source (Spanish + English hours).

Four additional paired-samples *t*-tests (Table 2) were conducted to test the second hypothesis that proportion of English input from parents and other adults remains constant over time, but English input from siblings and other children increases.[2] Bonferroni's correction was used to control Type I error related to multiple comparisons, thus changing the criterion of significance to $p < .0125$. The second hypothesis was partially supported. In line with the hypothesis, there was a significant increase in siblings' English input from 18 months ($M = 29.86\%$, $SD = 28.10\%$) to 56 months of age ($M = 51.21\%$, $SD = 33.14\%$), $t(85) = 6.32$, $p < .001$, $d = 0.96$ (large ES), with a mean increase of 21.35%, 95% CI [15%, 28%]. However, results regarding the other sources were contrary to predictions. English input from parents increased significantly from 18 months ($M = 4.56\%$, $SD = 8.86\%$) to 56 months of age ($M = 12.86\%$, $SD = 17.80\%$), $t(111) = 5.44$, $p < .001$, $d = 0.75$ (medium ES), with a mean increase of 8.3%, 95% CI [5%, 11%]. Other adults also increased their English input from 18 months ($M = 4.96\%$, $SD = 15.74\%$) to 56 months of age ($M = 17.76\%$, $SD = 30.70\%$), $t(48) = 2.96$, $p < .01$, $d = 0.60$ (medium ES), with a mean increase of 12.8%, 95% [4%, 22%]. In contrast, English input from other children did not differ significantly between 18 months ($M =$

[2] The assumption of normality was examined prior to the main analyses. The skewness and kurtosis levels of the difference scores for parents were estimated at 7.93 and 10.30, respectively, and for other adults at 5.24 and 5.27, respectively. These estimates indicated positively skewed and leptokurtic distributions, thus violating the normality assumption. Estimates of skew and kurtosis levels of the difference scores for siblings were 0.44 and 0.84, respectively, indicating a normal distribution. Skew and kurtosis levels of the difference scores for other children were 2.38 and 1.92, respectively, indicating a positively skewed distribution and violating the normality assumption. However, as previously mentioned, with sample sizes larger than 30, the violation of this assumption is unlikely to cause any serious problems (Cohen, 2013; Pallant, 2013).

33.64%, *SD* =43.28%) and 56 months of age (*M* = 44.89%, *SD* = 39.29%), *t*(31) = 1.47, *p* = .15. Thus, from 18 to 56 months, children heard increasingly more English and less Spanish from parents, other adults, and siblings, but not from other children.

Table 2

Paired Samples t-tests Comparing Percentages of English Exposure Over Time

	18 months		56 months				
Source of Language Input	*M*	*SD*	*M*	*SD*	Mean Diff.	*t*	Df
Overall	13.22	12.97	31.01	21.09	17.79	10.51***	111
Parents	4.56	8.86	12.86	17.80	8.30	5.44***	111
Other adults	4.96	15.74	17.76	30.79	12.80	2.96**	48
Siblings	29.86	28.10	51.21	33.14	21.35	6.32***	85
Other children	33.64	43.28	44.89	39.29	11.25	1.47	31

** $p < .01$, *** $p < .001$.

Primary Source of English at 56 months

Using SPSS Statistics Version 25, a one-way repeated-measures analysis of variance (ANOVA) was conducted to test the third hypothesis that siblings were children's primary source of English input at 56 months. Prior to conducting the analysis, Mauchly's Test of Sphericity indicated the assumption of sphericity had been violated, $\chi^2(9) = 339.4$, $p < .001$. Thus, Greenhouse-Geisser's correction was employed to adjust the degrees of freedom. The ANOVA included number of contact hours in English as the dependent variable, and source of language input (siblings, parents, ECE program, other

children, other adults) as the within-subjects factor (Table 3).[3] Results indicated a significant main effect of source of language input, $F(1.62, 178.64) = 61.35$, $p < .001$, partial eta squared = 0.34 (large ES). Bonferroni-corrected post-hoc tests indicated that contact hours in English with siblings ($M = 39.34$, $SD = 40.71$) was significantly higher than with parents ($M = 13.09$, $SD = 19.08$), ECE programs ($M = 7.77$, $SD = 8.81$), other children ($M = 2.92$, $SD = 7.30$), and other adults ($M = 2.58$, $SD = 7.90$). These results support the third hypothesis that siblings were the primary source of English language for preschool-aged sequential Spanish-English bilingual children.

Table 3

Descriptive Statistics for English Contact Hours with Various Sources of Language Input at 56 Months

Source	*M*	*SD*	Min.	Max.
Siblings	39.34	40.71	0	169.65
Parents	13.09	19.08	0	96.00
ECE program	7.77	8.81	0	32.50
Other children	2.92	7.30	0	51.00
Other adults	2.58	7.90	0	43.75

Note. $n = 111$. ECE = Early Childhood Education.

[3] An alternative repeated-measures one-way ANOVA was conducted with percentage of English (relative to Spanish) as the dependent variable. Similar results emerged. The main effect of source was significant, $F(2.03, 213.37) = 69.5$, $p < .001$. Bonferroni-corrected post-hoc tests indicated percentage of English input was significantly higher for siblings ($M = 54\%$, $SE = 3\%$) than parents ($M = 19\%$, $SE = 2\%$), ECE programs ($M = 19\%$, $SE = 2\%$), other children ($M = 5\%$, $SE = 1\%$), and other adults ($M = 3\%$, $SE = 1\%$).

Parents and Siblings as Predictors of Language Outcomes

At 18 months of age, children were producing about 61 words (M = 61.17, SD = 68.21; range = 0 – 330) which represents the 46th percentile. Thus, at this age point, children's language production was comparable to aged-norms. Table 4 summarizes children's language outcomes at 56 months of age. On average, preschool-aged children's receptive and expressive skills in English were about 13 points, almost one standard deviation, below the aged-norm. Similarly, children's expressive skills in Spanish were about 12 points (almost one standard deviation) below the aged-norm, but their receptive skills in Spanish were closer to the aged-norm. Thus, across measures of receptive and expressive skills in both languages, children were performing below aged-norms.

Table 4.

Descriptive Statistics for Language Outcomes at 56 Months of Age

Measure	*N*	*M*	*SD*	Min.	Max.
Spanish receptive	111	94.42	18.56	59	139
Spanish expressive	107	88.48	18.35	48	128
English receptive	111	86.90	15.29	53	127
English expressive	102	86.35	12.84	56	126

Note. Standardized scores were used for all language assessments. A score of 100 represents performance at the 50th percentile, and the standard deviation is 15 points.

Linear mixed effects models were used to test the fourth hypothesis that controlling for traditional predictors of language outcomes, parents' language input would predict children's language scores, and that siblings' language input would be a significant predictor of language scores over and above parents' input. Table 5 presents zero-order correlations between all continuous variables: the two covariates (SES at 56 months, Spanish words produced at 18 months), the two predictor variables (parents' percentage of Spanish, siblings' percentage of Spanish; at 56 months), and the four outcome variables (Spanish receptive, Spanish expressive, English receptive, English expressive; at 56 months). The categorical variable sex was excluded from the correlation matrix. This approach was chosen over hierarchical multiple regression because it allowed for all language outcomes at 56 months to be in a single model rather than having separate regression analyses. It also allowed to investigate the effects of language (Spanish vs. English) and skill (receptive vs. expressive) on language scores. This approach reduced the likelihood of study-wise Type I error and allowed missing data on the dependent variable. Mixed models were calculated with the lme4 package (Bates, Mächler, Bolker, & Walker, 2015) in R (R Core Team, 2012). *P* values were calculated using the lmerTest package with the Kenward-Roger method to calculate degrees of freedom (Kuznetsova, Brockhoff, & Christensen, 2017). Post hoc tests were calculated with the emmeans package (Lenth, 2018).

Table 5.

Zero-Order Correlation Matrix between Covariates, Language Input, and Language Outcomes

Variable	1	2	3	4	5	6	7	8
1. HI	-							
2. Spanish words produced	.13	-						
3. Parents' Spanish %	-.28**	-.04	-					
4. Siblings' Spanish %	-.00	.10	.40***	-				
5. Spanish receptive	.20*	.33***	.29**	.41***	-			
6. Spanish expressive	.18	.35***	.37***	.54***	.83***	-		
7. English receptive	.30**	.15	-.35***	-.44***	.16	-.05	-	
8. English expressive	.37***	.11	-.32**	-.37***	.13	.03	.67***	-

Note. HI = Hollingshead Four Factor Index of Socioeconomic Status (Hollingshead, 1975). Spanish words produced were assessed when children were 18 months of age. All other variables were measured when children were 56 months of age. $N = 112$.
* $p < .05$, ** $p < .01$, *** $p < .001$.

A benefit of mixed models is the ability to include both random and fixed effects. For random effects, there is the possibility of including a random intercept, a random slope, or both. Given that the main focus of the current study was to identify the contribution of fixed effects (Bates, Kliegl, Vasishth, & Baayen, 2015), the models included only one random effect, a random intercept of participant, without any slopes (i.e., how each participant varies on each level of the respective fixed effects). Participants provided repeated observations (4 observations, one for each language measure completed at 56

months). Including a random intercept of participant in the model allowed the findings for fixed effects to consider each participant's individual variation on the dependent variable (standard score). Different models were compared to test the hypothesis that language input from parents and siblings are unique predictors of children's language outcomes at 56 months, after controlling for other variables. Comparison between linear mixed effects models must be done with the same dataset; thus the participants in each model must be the same. Therefore, the analysis was conducted on the sample of preschool-aged children with siblings (n = 96) rather than on the full sample (N = 112).

Model 1: covariates. In the first model, fixed effects included the covariates: SES at 56 months, sex, and Spanish words produced at 18 months. Only SES at 56 months was used because children's SES remained constant over time (see Participants section). The dependent variable was the standard scores children obtained in language assessments. Results indicated that SES status (B = 0.29, p < .01), sex (B = - 5.13 for male, p < .05), and Spanish words produced at 18 months (B = 0.05, p < .001) were significant predictors of children's language outcomes at 56 months of age. Higher SES backgrounds, being female, and more Spanish words produced at 18 months predicted better language outcomes at 56 months of age. Fixed effects in the first model accounted for 12.4% of the variance in children's standard scores.

Model 2: language of test and language skill. The second model included language of test (Spanish vs. English) and language skill (receptive vs expressive) in addition to all the variables in the first model. Results indicated no significant main effects of language of test (B = -0.15 for Spanish, p = .94) and language skill (B = 0.27 for receptive, p

= .89). However, there was a significant interaction between language and skill, $F(1, 273) = 4.37$, $p < .05$. As seen in Figure 1, children performed better in receptive than expressive language when tested in Spanish (Estimated Marginal Means, or *EMM*: *receptive* = 92.3, 95% CI [89.2, 95.4]; expressive = 86.1, [82.9, 89.2]; $t(280) = 3.10$, $p < .01$, $d = .46$). However, they showed no significant difference between receptive and expressive language when tested in English (receptive *EMM* = 86.5, 95% CI [83.4, 89.6]; expressive *EMM* = 86.2, [83.0, 89.5]; $t(281) = .13$, $p = .97$). Thus, at 56 months, children's receptive ability was better than their expressive ability in Spanish but not in English.

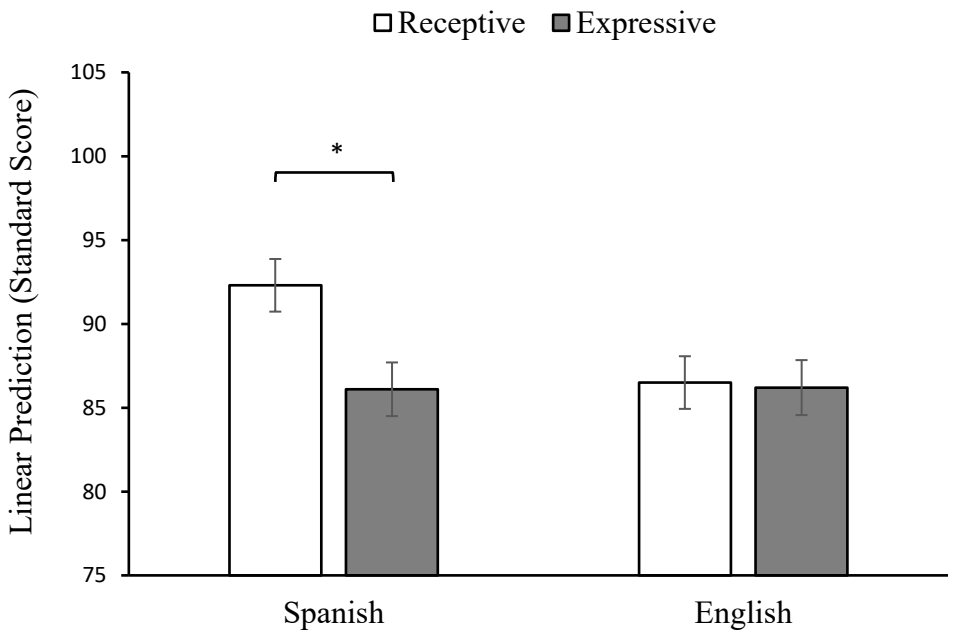

Figure 1. Interaction between language of test and language skill on predicted language standard scores. Error bars represent standard errors of the mean. $^{**}p < .01$.

The fixed effects in this second model accounted for 14.78% of the variance in children's standard scores. To investigate whether the effects of language of test and language skill were significant predictors of children's language standard scores, after controlling for covariates, an ANOVA comparing the first two models was conducted. By considering language of test and language skills, the second model was a better fit for the data than the first model, explaining an additional 2.38% of the variance, χ^2 (3) = 13.46, p < .01.

Model 3: parents' language input. The third model included the effects of parents' Spanish input, in addition to all the effects included in the second model. First, a full model containing all interactions between language of test, language skill, and parents' Spanish input was tested. Results indicated a non-significant main effect of parents' Spanish input (B = -0.17, p = .06). The 2-way interaction between parents' Spanish input and language of test was significant, F(1, 272) = 74.05, p < .001. The 2-way interaction between parents' Spanish input and language skill was non-significant, F(1, 274) = 0.49, p = .49. The 3-way interaction between language input from parents, language of test, and language skill was also not significant, F(1, 272) = .38, p = .54.

A revised model including only the significant effects was tested. The predictors were: the covariates (SES, sex, Spanish words produced at 18 months), the interaction between language of test and language skill, and the interaction between language of test and parents' Spanish input. The revised model replicated the significant two-way interaction effect between parents' Spanish input and language of test, F(1, 272) = 74.01, p < .001. As Figure 2 shows, the relationship between parents' Spanish input and

children's language outcome was significantly different for Spanish (slope = .42, *SE* = .07) and English (slope = -.22, *SE* = .07), $t(278) = 8.54$, $p < .001$. Moreover, slopes for Spanish and English were significantly different from zero [$t(176) = 5.71$, $p < .001$; $t(179) = -3.00$, $p < .01$; respectively], suggesting significant linear relationships between parents' Spanish input and children's scores in both languages. At the low end of Spanish input, with parents who spoke about 22% Spanish to their children, the children's predicted scores were about 72 in Spanish and 111 in English (see Figure 2). On the other end of the spectrum, with parents who spoke 100% Spanish to their children, the children's predicted scores were about 104 in Spanish and 93 in English. Thus, as parents spoke more Spanish (relative to English) to their children, children's language scores were better in Spanish but worse in English.

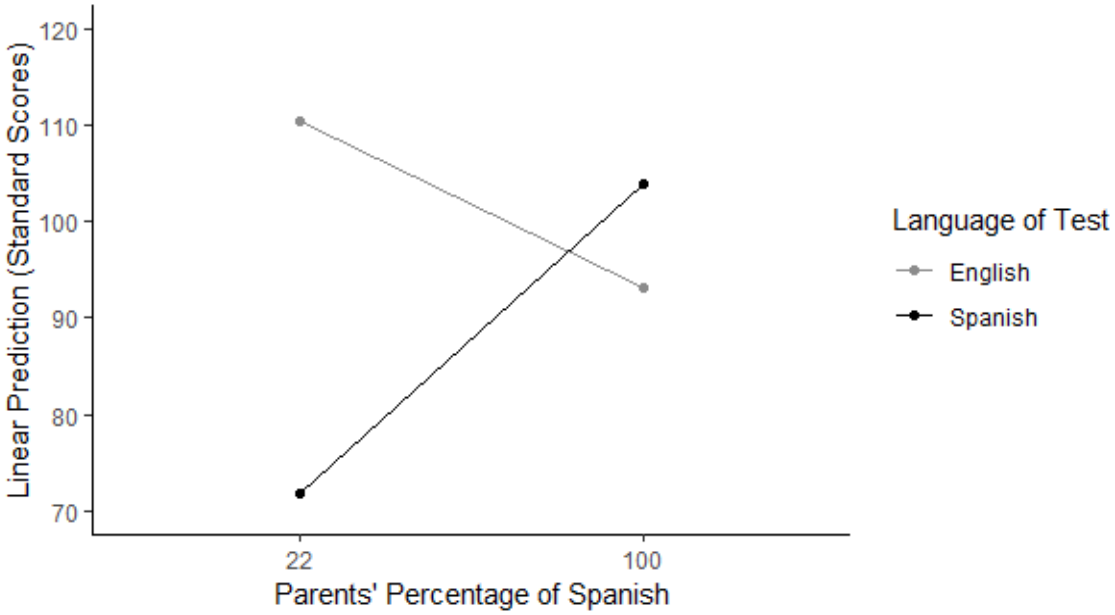

Figure 2. Interaction between language of test and parents' Spanish percentage on predicted language standard scores.

The revised third model accounted for 26.83% of the variance in children's standard scores. An ANOVA was conducted to investigate whether parents' language input in the third model was a unique predictor of children's language outcomes, over and above the previous model, which included the effects related to the covariates, language of test, and language skill. Results indicated a significantly better fit of the data in the revised third model than the second model, explaining an additional 12.05% of the variance, χ^2 (2) = 68.24, $p < .001$. This result supported the first part of the fourth hypothesis that parent's language input significantly predicted children's language skills, after controlling for children's SES, sex, and previous language ability.

Model 4: siblings' language input. The fourth model included the effects of siblings' Spanish input in addition to the effects included in the revised third model (i.e., the covariates, the interaction between language of test and language skill, the interaction between language of test and parents' Spanish input). A full model with all interactions between language of test, language skill, and siblings' Spanish input was tested. The main effect of siblings' Spanish input (B = -0.14, $p < .01$) was significant, such that as children heard more Spanish from siblings their language scores were lower. There was also a significant 2-way interaction between siblings' Spanish input and language of test [$F(1, 273) = 89.04$, $p < .001$]. The 2-way interaction between parents' Spanish input and language skill was non-significant [$F(1, 276) = 3.04$, $p = .08$]. The 3-way interaction between siblings' Spanish input, language of test, and language skill was non-significant, $F(1, 273) = 0.03$, $p = .87$.

A revised fourth and final model including only the significant effects was tested. The predictors were: the covariates (SES, sex, Spanish words produced at 18 months), the interaction between language of test and language skill, the interaction between language of test and parents' Spanish input, and the interaction between language of test and siblings' Spanish input. The revised fourth model replicated the significant two-way interaction between siblings' Spanish input and language of test, $F(1, 273) = 89.26$, $p < .001$. Figure 3 illustrated that the relationship between siblings' Spanish input and children's language outcome was significantly different for Spanish (slope = .16, *SE* = .04) and English (slope = -.18, *SE* = .04), $t(280) = 9.36$, $p < .001$. The slopes were significantly different from zero for both Spanish [$t(164) = 4.06$, $p < .001$] and English [$t(169) = -4.76$, $p < .001$]. When siblings spoke no Spanish to the children, the children's predicted scores were about 83 in Spanish and 107 in English; when siblings spoke exclusively Spanish to the children, the children's predicted scores were about 99 in Spanish and 88 in English. Thus, as siblings spoke more Spanish (than English) towards the children, the children's language scores in Spanish were better, but scores in English tended to be worse.

The revised fourth and final model accounted for 36.96% of the variance in children's language standard scores. Compared to the revised third model, the final model accounted for an additional 10% of variance, resulting in a significantly better fit of the data, $\chi^2 (2) = 77.34$, $p < .001$. These results indicated that language input from siblings was a unique predictor of children's language outcomes in Spanish and English, thus supporting the second part of the fourth hypothesis that siblings' language input would be

a significant predictor over and above children's SES, sex, previous language ability, and parent's language input.

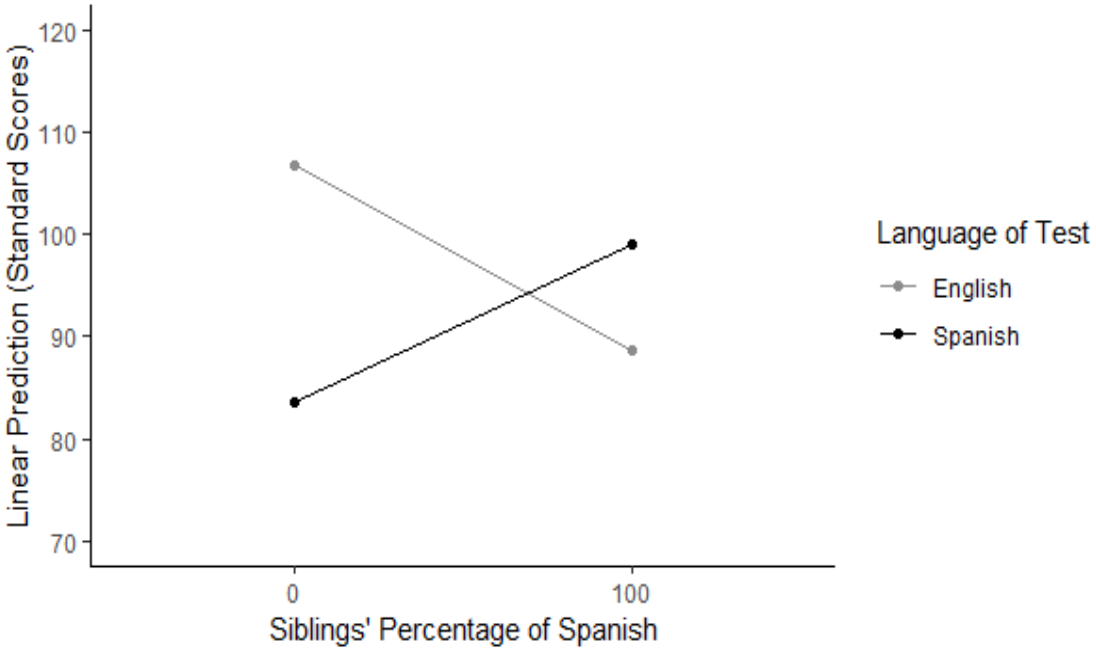

Figure 3. Interaction between language of test and siblings' percentage of Spanish spoken when predicting children's language standard scores at 56 months of age.

Discussion

The current study is among the first to investigate developmental changes in the Spanish and English language input that sequential Spanish-English bilingual children receive from toddlerhood to preschool-aged. Specifically, the current research investigated overall changes in English and Spanish language input from 18 to 56 months of age. Change over time was also analyzed for specific sources of language input, including parents, other adults, siblings, and other children. The current study also identified the main source of English exposure for these sequential Spanish-English bilingual children when they were preschool-aged. Finally, the study investigated whether language input from parents and siblings predicted preschool-aged children's Spanish and English language outcomes.

Results demonstrated that as the children grew older, they became more exposed to English, relative to Spanish, than when they were younger. Nonetheless, the language environment for most of these children remained Spanish-dominant at the preschool age. Increased exposure to English and decreased exposure to Spanish over time was partially due to siblings, parents, and other adults speaking more English and less Spanish over time. The change in parents' language usage was consistent with previous research indicating that the percentage of Puerto Rican mothers speaking more or all English to their children increased over the early childhood years (Hammer et al., 2009). Thus, contrary to the second hypothesis, the developmental changes seen in the language input of Spanish-speaking parents during the preschool and kindergarten years did generalize to earlier developmental changes. Moreover, the findings seen in Puerto Rican mothers

also generalized to predominantly Mexican parents. These findings extend previous research by showing that English and Spanish language input provided by parents to sequential bilinguals also changes over time from toddlerhood to preschool years.

This study was the first to investigate changes over time in sequential bilingual children's English and Spanish exposure from different sources of input. It is important to note that relative English exposure from parents and other adults had a small increase over time (about 8% and 13%, respectively) compared to siblings' increase (about 21%). Additionally, when children were 56 months of age, parents and other adults were still speaking to the children predominantly in Spanish (about 87% and 82% of the time, respectively), whereas siblings spoke roughly equal amounts of Spanish and English to the children. It was possible that parents felt compelled to speak more English as time passed and children grew older. Parents' increased English input may have been related to increased English input from siblings and other adults, and children's attendance in ECE programs taught in English. Thus, it is possible that parents and other adults felt the need to speak more English to the children as a result of the children's increasing English skills. Yet, despite the increases in the amount of English that parents spoke to the children, parents continued to speak mostly Spanish to their children, possibly due to limited English proficiency.

Future research may consider assessing parents' language use and relating that to their bilingual proficiency. Moreover, it could address the question of whether increased usage of English by Spanish-speaking parents and other adults is a result of changes within the sources over time or changes in the child. Other factors that may have

influenced parents' use of Spanish and English with their children are their perceived values of first-language retention and bilingualism, and the role of context for the interactions. For example, parents who consider it important for their children to maintain the first language may be inclined to speak less English to their children. In terms of context, it is possible that parents may prefer to use English with their children when their interaction revolves around school-related activities (i.e., learning letters) but may prefer to speak with their children in Spanish during other interactions (i.e., meal time, daily routines). Thus, future studies should obtain measures of parents' perceived values for their children in terms of maintaining the native language, acquisition of the second language, and attaining true bilingualism. In addition, studies could investigate whether contexts of interactions between children and different sources of language input change across time, and how different contexts impact Spanish and English language input.

Siblings were a primary source of English exposure for the Spanish-English sequential bilingual children. Thus, for children whose parents speak predominantly in Spanish, siblings may provide preschool-aged children with learning opportunities to develop English skills. It is possible that siblings provide children with greater contact hours in English than parents because of the number of people in that source (e.g., 3 siblings versus 2 parents). Nonetheless, the children in the current study had fewer than 2 siblings on average, and despite the small number, the siblings were a substantial source of English for children. The role of siblings' English input may be especially important for children who may not be enrolled in ECE programs yet and whose parents speak little English. Future studies investigating language input from siblings should take into

consideration the number of siblings and the siblings' bilingual proficiency. Other factors to consider may include the siblings' gender, age, and country of birth.

Exposure to Spanish and English from parents and siblings was related to children's language outcomes, even after controlling for SES, sex, and previous language ability. This finding is congruent with previous research showing that preschool-aged children who heard more Spanish than English from parents had better language skills than their peers in Spanish, whereas children who heard more English than Spanish from parents had better language skills in English relative to their peers (Hammer et al., 2009). After considering the exposure from parents, exposure from siblings explained a significant variance in preschool-aged sequential bilingual children's language outcomes. As siblings spoke more Spanish, the children had greater language skills in Spanish compared to children whose siblings spoke less Spanish. Similarly, as siblings spoke less Spanish (and more English) the children had greater language skills in English compared to children whose siblings spoke more Spanish (and less English). In a similar manner, a study showed that simultaneous bilingual toddlers with older siblings attending school in English were more advanced in English than Spanish while toddlers without older school-aged siblings were more advanced in Spanish than in English (Bridges & Hoff, 2014). Moreover, another study with simultaneous bilingual toddlers demonstrated that toddlers with older siblings who spoke only in English to them had higher English vocabulary than toddlers whose older siblings spoke to them in English and another language (Bridges & Hoff, 2014). The present study added to the literature by demonstrating that siblings play a significant role not only in the language development

of simultaneous Spanish-English bilingual children but also of sequential Spanish-English bilinguals.

Other findings indicated that children's Spanish skills were higher in receptive than expressive language abilities. This finding is consistent with previous research indicating that comprehension of language is easier to achieve than production (Thordardottir, 2011). However, the same pattern of results was not found for English receptive and expressive skills since they were not significantly different. It is important to note that, on average, children's receptive and expressive skills in English were almost a standard deviation below aged-norms. Moreover, about four fifths of the children in the current sample were still Spanish-dominant (i.e., heard more Spanish than English) at preschool-age. Thus, it is possible that in general children were not hearing enough English to achieve better comprehension than production in English.

Additionally, results revealed that relative Spanish/English language input from parents and siblings did not influence receptive and expressive abilities differently. This finding contradicts previous research suggesting that relative Spanish/English overall language input affects language comprehension and production differently (Hoff et al., 2014). Specifically, patterns suggested that simultaneous bilingual toddlers' expressive skills were relatively better than receptive skills in the language they heard most, but receptive skills were relatively better than expressive skills in the language they heard least (Hoff et al., 2014). Inconsistencies in these results could be due to differences in methodology or population. First, the authors used z scores that only captures relative differences and did not allow direct comparisons of children's receptive and expressive

abilities. The present study was able to directly compare those abilities by using age-normed scores for all language outcomes. Second, Hoff and colleagues (2014) measured expressive skills using the Mac-Arthur Bates inventories and the Expressive One Word Picture Vocabulary Test- 3rd edition, which are both measures of expressive vocabulary (Fenson et al., 2007; Jackson-Maldonado et al., 2003; Brownell, 2000). The current study measured expressive language, which is a more complex measure of expressive skill than expressive vocabulary alone because it includes word structure and recalling sentences in addition to expressive vocabulary. Thus, the relative expressive advantage seen in the language that simultaneous bilingual toddlers heard most may not have generalized to the current sample due to a more rigorous measure of expressive ability. Third, the authors investigated differences in children's receptive and expressive skills in Spanish and English among three groups of bilinguals, Spanish-dominant, balanced, and English-dominant, based on overall exposure. Rather than overall exposure, the current study investigated specific sources of input by examining the contributions of parents' and siblings' language input for children's receptive and expressive abilities. The present findings suggest that, contrary to overall exposure, relative exposure from parents and siblings does not differentiate between language comprehension and production skills. Finally, the present study did not compare among different groups of bilingual children based on overall exposure because most of the children were Spanish-dominant.

A limitation of the study was that language input was conceptualized as amount of exposure, and it did not incorporate measures of quality (i.e., semantic, syntactic, pragmatic). Having measures of the quantity and quality of language input would provide

a better representation of the language input that Spanish-English bilingual children receive at home. An additional limitation was the use of self-report. It is possible that Latino parents may be modest in their reporting of Spanish or English input. Moreover, it may be difficult for parents to estimate language exposure outside of the home. Future studies should also employ objective measures of language input, such as audio recordings at home, to corroborate findings from self-reports. Another limitation was that only in-home sources of language input are examined in relation to children's language abilities. ECE programs and peers may be important out-of-home sources of language input for these children (Karoly & Gonzalez, 2011). Future studies should consider factors such as number of hours and years attending ECE programs, language of instruction, and quality of ECE programs, that may influence children's bilingual abilities. A final limitation was that this study did not identify the optimal combination of relative exposure from the different sources of language input that promotes "true bilingualism" (i.e., proficiency in Spanish and English). Future research should investigate possible in-home and out-of-home combinations of sources of language input that work in tandem to best support bilingual proficiency.

The main implication of the current study was that siblings were identified as a primary source of English exposure for preschool-aged children whose parents spoke predominantly Spanish to the children. Siblings' language input predicted children's language scores in Spanish and English, over and above the contribution made by parents' input. The current study extends prior research by highlighting that both parents and siblings' language input influence the language development of Spanish-English

sequential bilingual children. At the same time, it is important to emphasize the uniqueness of the current sample: all parents were native Spanish-speakers, almost all parents were born in a Spanish-speaking country, and at 18 months children were overwhelmingly more exposed to Spanish than English. Thus, the present findings may not generalize to other groups of bilingual children (e.g., children of non-native Spanish speakers, children of US-born parents, children who hear more English than Spanish). Nonetheless, it is important for future research to consider the role of siblings when investigating the language environment of sequential Spanish-English bilingual children, an at-risk population for low academic achievement. Investigating only language input from caregivers would be an incomplete and inaccurate representation of the home language environment of these children. Additionally, parenting programs aimed at improving sequential bilingual children's language skills by improving parental language input should expand to include siblings given that they play an important role in these children's language development.

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