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Language Specificity in the Relation of Maternal Education to Bilingual Children's Vocabulary Growth

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Abstract

The robust relation between maternal education and child language that is observed in monolingual populations has not been reliably replicated among bilingual children from immigrant families in the U.S. We hypothesized that a variable that operates in immigrant populations—the language in which mothers achieved their highest level of education, is relevant to the benefits of maternal education to children's language growth. The participants were 92 US-born bilingually developing children (47 boys, 45 girls) with native Spanish-speaking immigrant mothers. The mothers varied both in their level of education and in the language (English or Spanish) in which they had achieved their highest level of education. The children's expressive vocabulary in English and Spanish was assessed at 6-month intervals between 30 and 60 months. Four sets of multilevel models, which included estimates of children's relative amount of input in each language and mothers' age of arrival, found that maternal level of education in English was significantly related to children's English skill, but not their Spanish skill, and that maternal level of education in Spanish was related to children's Spanish skill, but not their English skill. These language specific relations between mothers' levels of education and their children's language development potentially explain previous findings in immigrant populations. These findings further argue that maternal education benefits children's language because education changes mothers' use of the language in which that education was achieved. There was no evidence of a language general benefit of education, as might arise from increased knowledge of child development.

Keywords

maternal education; child language; bilingual development

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A perplexing finding in recent studies of bilingual children in the U.S. is that maternal education is correlated with the children's English language development, but it is not correlated with their Spanish language development (DeAnda, Arias-Trejo, Poulin-Dubois, Zesiger, & Friend, 2016; Hammer et al., 2012; Place & Hoff, 2016). The observed relation between maternal education and children's English language development is consistent with findings from many studies of monolingual English-speaking samples (see reviews in Hoff, 2006; Schwab & Lew-Williams, 2016). It is the null finding with respect to Spanish that is perplexing and that motivates the present study.

This null finding is not restricted to a single age or outcome measure. In Hammer et al. (2012) the bilingual children were 5 years old; the outcome measure was productive vocabulary. In Place and Hoff (2016), the bilingual children were 30 months old, and the outcome included measures of productive vocabulary, grammar, and language comprehension. DeAnda et al. (2016) studied two different samples of 16 month-olds, one in English-dominant bilingual homes and one in Spanish-dominant bilingual homes, assessing children's comprehension and production vocabulary only in the dominant language. Among the children in English-dominant homes, maternal education predicted children's English outcomes. Among the children in Spanish-dominant homes, maternal education did not predict the Spanish outcomes, despite the use of comparable measures and procedures and with a comparable range of variance in maternal education.

When maternal education predicts child language development, it is clear why. Differences in mothers' levels of education are associated with differences in the quantity and quality of their child-directed speech (Hart & Risley, 1995; Hoff, 2003; Hoff-Ginsberg, 1991; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2007), and the quantity and quality of mothers' child-directed speech predicts children's language growth (Hoff, 2003, 2006; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010; Rowe, 2012; Song, Spier, & Tamis-LeMonda, 2013). It is less clear why maternal education affects the quantity and quality of child-directed speech.

One proposed explanation of the influence of education on child-directed speech is that education increases mothers' knowledge of child development, including the understanding that children benefit from a rich language environment (Rowe, 2008). More talk to children and talk to children that is richer in vocabulary and more complex in grammar follow from this understanding. This hypothesis is supported by the finding that parents' scores on a test of knowledge about child development fully mediated the relation between parents' SES and properties of their child-directed speech (Rowe, 2008). In the sample Rowe (2008) studied, parents' adult directed speech did not vary as a function of either income or education, thus this finding demonstrates that SES-related differences in knowledge of child development produce SES-related differences in language use with children in the absence of SES-related differences in language use with adults.

A second hypothesis, specific to education as the indicator of SES, is that education makes mothers more verbal and also increases the lexical richness and grammatical complexity of their speech. On this account, maternal education affects mothers' talk to children because it affects their verbal style more generally (Hoff-Ginsberg, 1991). Consistent with this

hypothesis, Hoff-Ginsberg (1991) found differences in mothers' language use with adults that exactly paralleled differences in their child-directed speech. College-educated mothers talked more, used a richer vocabulary, and produced longer utterances in speech addressed to their children and also in speech addressed to an adult interviewer. No test of knowledge of child development was administered in this study, but the mothers were interviewed about their beliefs about their children's language capacity. There were no differences related to maternal education in the age at which the mothers reported they started talking to their child, in the age at which they believed children started to understand speech addressed to them, and in how much of the speech they heard the children currently understood. Thus, in the absence of clear differences in beliefs about children's capacities, there were differences in the amount and quality of child-directed speech related to maternal education.

These two hypothesized mechanisms by which education influences child-directed speech yield different predictions about the relevance to children's language development of the language in which the mothers' education was achieved. If education increases understanding of child development, either directly or because more educated mothers seek out information in books and magazines, then the resultant understanding of the value of speech to children should affect bilingual mothers' speech to children in both languages they speak. In contrast, if education changes language use, those effects on speech to children should be specific to the language in which the education was achieved. Language specific effects might explain the lack of education effects on children's Spanish growth among immigrants groups where those with the highest levels of education are also likely to have completed their education in the U.S., in English.

Testing the hypothesis of language specific effects of maternal education on children's language growth addresses two questions. One is the question of what influences English and Spanish language development among children in immigrant families. Such children constitute a large and growing segment of the U.S. school aged population, and current understanding of the factors that shape their language skills is incomplete (Hoff, 2013; McCabe et al., 2014). A second question is the broader question of identifying the pathways by which maternal education affects child development in both bilingual and monolingual populations. Effective public policies to remedy SES-related disparities in children's achievement require understanding the mechanisms by which socioeconomic disparities among parents, including disparities in educational achievement, become achievement disparities among children (Duncan & Magnuson, 2012; Hoff & Laursen, in press).

The Present Study

The Spanish-speaking immigrant population of South Florida provides an opportunity to test the hypothesis that the benefit of maternal education to child language is language specific. Many immigrants in this community were highly educated in their countries of origin prior to their immigration to the U.S. Thus, among Spanish-English bilingual children in these immigrant families, it is possible to examine effects of mothers' level of education in English and also effects of mothers' level of education in Spanish on their children's English and Spanish outcomes in the same sample. In the present study we make use of the larger study from which the bilingual participants in Place and Hoff (2016) were drawn, using only

those participants on whom subsequent longitudinal data were collected and adding to that sample participants who were recruited subsequent to the analyses in Place and Hoff (2016). In addition, we restricted the present analyses to children in households in which fathers, as well as mothers, were immigrants and native Spanish speakers to avoid a confound between maternal education and exogamous marriage. The data also differ from those analyzed in Place and Hoff (2016) in that we focus on one examiner-administered measure of children's vocabulary, which was administered at 6-month intervals from the age of 30 to 60 months. Using this sample of mothers and this longitudinal data on their children's English and Spanish expressive vocabulary development, we test the hypothesis that the benefit of maternal education to child language growth is specific to the language in which the education was attained.

Method

Participants

The child participants were 92 Spanish-English bilingually developing children (47 girls, 45 boys) assessed at 30 months and followed up, with some missing data, at 6-month intervals up to the age of 60 months. Data from 37 of these participants at 30 months of age were in the data analyzed by Place and Hoff (2016). The adult participants were the mothers of these 92 children. All mothers were born in a Spanish-speaking country in Latin America or the Caribbean. The mothers' mean age was 34.75 years (*SD*=5.82); their mean years of residence in the U.S. was 12.26 (*SD*=6.69). All families were residents of South Florida.

Although the focus is on mothers, we restricted the sample to families in which the fathers were also born in a Spanish-speaking country. In preliminary analyses of the larger sample from which the present sample is drawn, we found that the education level of mothers who were native Spanish-speaking immigrants was related to the probability of being married to a non-immigrant native English speaker, creating a confound between maternal level of education and child access to a native English speaker in the home.

All children were born in the U.S., were full term and healthy at birth, and had normal hearing based on parent report of otoacoustic emissions tests performed in the hospital. All children were screened for evidence of communicative delay at 30 months. Participants were recruited through advertisements in local magazines and at programs for parents with young children, as well as through word of mouth. Eighty-eight of the 92 children were identified by their primary caregiver as Hispanic White, 3 as Hispanic African, and 1 as another ethnicity. All children were exposed to Spanish at home; English exposure at home at study entry ranged from none to 85 percent of home language exposure, according to caregiver report.

Procedure

Primary caregivers were administered an extensive interview about family background and language use in the home at 30 months by a fully bilingual researcher in the language of the participant's choosing. Updates to that information were collected at each subsequent visit. Children's English and Spanish skills were assessed at 30, 36, 42, 48, 54, and 60 months.

Interviews and assessments were conducted either in the participants' homes or a laboratory play room, depending on the participants' preference. Approximately 85% of the visits were in the participants' homes. The protocol for this study, "Early Dual Language Development," protocol number 195057-21, was approved by the Florida Atlantic University Institutional Review Board.

Measures

Maternal education—Mothers reported the highest level of education they attained in their country of origin (in Spanish) and in the U.S. (in English), using a 5 point scale in which 1 = less than high school, 2 = high school degree, 3 = some college, 4 = college degree, and 5 = post graduate degree. These categories were regrouped to create two dichotomous variables: (1) English education level = less than a 4-year degree, or a 4-year degree or more and (2) Spanish education level = less than a 4-year degree, or a 4-year degree or more. Two reasons motivated the regrouping: (1) Previous research has found the distinction between having and not having a college education to be associated with differences in both maternal language use and child language development, (Hoff, 2003; Hoff-Ginsberg, 1991; Huttenlocher et al. 2007, 2010; Vernon-Feagans et al., 2008), while this same previous research also found that increased years of education beyond a 4 year degree (Huttenlocher et al., 2007) and fewer years of education below a high school degree (Vernon-Feagans et al., 2008) make a smaller or less robust difference. (2) Sample sizes in some of the categories using the 5-point scale were small. A further benefit of treating education as a categorical variable is that it captures a comparable distinction in the U. S. and Latin America. Although arbitrary dichotomization of a continuous variable is ill advised (MacCallum, Zhang, Preeacher, & Rucker, 2002), the dichotomization here was not arbitrary. The distribution of mothers across these education categories is presented in Table 1. The statistical consequence of dichotomization is also addressed in the results section.

English and Spanish home language input—Also in interview, at each assessment point, mothers provided estimates of the percent of their child's language exposure at home that occurred in English and in Spanish. (These are almost reciprocal measures; in a few families a third language was spoken up to 10 percent of the time). Previous research suggests such measures are reliable and are strongly related to diary-based measures of language use, and to bilingual children's language skill (Hoff et al., 2012; Place & Hoff, 2011). For children living in two households, a weighted average of the percentage of exposure in each language was calculated. Mothers' mean age of arrival and mean levels of English input in the home at each assessment point for each group are presented in Table 2.

Children's English and Spanish expressive vocabulary—Children's English and Spanish expressive vocabulary were assessed using the *Expressive One Word Picture Vocabulary Test-Bilingual Edition* (*EOWPVT*, Brownell, 2001). The test was administered separately in Spanish and in English, on different days in counterbalanced order, to obtain scores in each language. Although this instrument was developed to assess children's conceptual vocabulary using a procedure in which children may provide picture labels in either language, we used it to obtain raw scores in English and Spanish, as have others (Anthony, Solari, Williams, Schoger, & Zhang, 2009).

Data analysis

The approach to testing the effect of each measure of maternal education was to first model growth in English and Spanish vocabulary with only child age and the measure of relative amount of home language input as predictors and then to add the mothers' level of education and ask whether model fit improved. This was done separately for mothers' level of education in English and in Spanish. In all analyses, missing data was handled using FIML (full information maximum likelihood) estimation. This method of estimation allows cases that are incomplete in the outcome to be included in the analysis (Preacher, Wichman, MacCallum, & Briggs, 2008). Power analysis done for Place and Hoff (2016) indicated a sample size of 43 would yield a power of .8 to detect a medium effect size in comparisons of a constant group effect, and a sample size of 120, assuming unbalanced groups, would allow detection of differences in slope. The inclusion criteria of this study, with the resultant sample size of 92, allowed detection of medium-large effects for between-group differences in rates of language growth (Hedeker, Gibbons, & Waternaux, 1999; Hedeker & Barlass, 1999). Previous research utilizing growth curve analyses of language data has indicated that these estimates are reasonable (e.g, Huttenlocher, Haight, Byrk, Selzer, & Lyons, 1991; D'Angelo, Hipfne-Boucher, & Chen, 2017, Ribot, Hoff, & Burridge, 2017).

Results

Means and standard deviations for children's English and Spanish vocabulary scores at each age are presented in Table 3.

Four sets of longitudinal growth curve models tested the following effects:

1. The effect of level of maternal education in English on children's English vocabulary
2. The effect of level of maternal education in English on children's Spanish vocabulary
3. The effect of level of maternal education in Spanish on children's Spanish vocabulary
4. The effect of level of maternal education in Spanish on children's English vocabulary

Each set of analyses proceeded similarly. First, unconditional growth models were calculated separately for English and Spanish vocabulary. In each case, these models confirmed non-zero slopes and intercepts English and Spanish vocabulary, and the random error terms associated with the intercept and slope were significant as well, indicating heterogeneity that may be explained by between-individual (level 2) predictors (all p's $< .001$). Subsequently, based on prior literature (Ribot et al., 2017) a base model with child Age, the quadratic effect of Age, and Input in the language of the outcome measure was calculated (Model 1). Age was centered at 30 months, and Input was entered as a time-varying predictor. Next, the dichotomous measure of maternal education level was added (Model 2) and Model 1 and Model 2 fits were compared. Finally, all two-way interactions involving Age, Input, and Education Level were added to the best-fitting Model 2 (yielding

Model 3), and the fits of Models 2 and 3 were compared. Three fit statistics were used: the change in −2 log-likelihood, the AIC, and the BIC. Because of discrepancy in the indices, models were selected based on agreement of 2 of the 3 measures. Additional tests (not presented) screening for the presence of three-way interactions were not significant. All models were run in IBM SPSS Statistics Version 22 using maximum likelihood estimation and unstructured covariance matrices. Random effects included intercept, linear, and quadratic terms.

Fit statistics and model comparison statistics are presented in Table 4. Coefficients for Models 2 and 3 for each of these analyses are presented in Tables 5 through 8. Plots of the models that predict children's English and Spanish vocabulary growth from their mothers' level of education in English and in Spanish are presented in Figure 1.

In all final models there were significant effects of child age, significant quadratic effects of child age, and significant effects of the proportion of home input that was in the language of the outcome measure. The results of adding level of education in English or Spanish to the models were as follows:

1. Introducing a term for maternal education level in English significantly improved model fit on all three fit measures when children's English vocabulary growth was the outcome (Δ −2LL=9.86 > $\chi 2(df=1)=6.64$, $p<.01$), with maternal college education in English predicting higher English vocabulary scores. Model 3 yielded better fit than Model 2 (Δ −2LL=9.81 > $\chi 2(df=3)=7.81$, $p<.05$) because in addition to the significant effect of mothers' English Education Level there was also a significant Age × English Education Level interaction, indicating mothers' level of education in English affected both the intercept (with effect size δ=.538) and the slope (with effect size =.212) of children's English vocabulary growth. Put another way, children of mothers with a college education in English had English vocabulary scores at 30 months that were .43 *SD*s higher than the English vocabulary scores of children of mothers who did not have a college education in English, calculated following Feingold (2013). The English vocabulary of the more educated mothers also grew at a faster rate, with the result that at 60 months their English vocabulary was .97 *SD*s higher than that of the children of mothers who did not have a college education in English.

2. Maternal level of education in English did not improve model fit over the base model in predicting children's Spanish vocabulary growth (Δ −2LL=.01, ns).

3. Introducing a term for maternal education level in Spanish significantly improved model fit in predicting children's Spanish vocabulary growth (Δ −2LL=3.90 > $\chi 2(df=1)=3.84$, $p < .05$), with maternal college education in Spanish predicting higher Spanish vocabulary scores. Model 2 was the best fitting model, indicating that mothers' education in Spanish affected only the intercept (effect size δ=.487), but not the slope of children's growth in Spanish vocabulary. Put another way, children of mothers with a college education in Spanish had Spanish vocabulary scores at 30 months that were .39 SDs higher

than the Spanish vocabularies of children whose mothers did not have a college education in Spanish. The size of the difference did not change over the period from 30 to 60 months.

4. Maternal level of education in Spanish did not improve model fit in predicting children's English vocabulary growth (Δ −2LL=.53, ns).

Follow-up Analyses

Mothers with a 4-year degree earned in English were younger when they arrived in the U.S. than the mothers with less education in English, and the mothers with a 4-year degree earned in Spanish were older at arrival than the mothers with less education in Spanish. Thus, it could be that the effects of education identified in the foregoing models were carried fully or in part by differences in mothers' English and Spanish proficiency that arose from differences in their age of arrival, rather than from effects of education *per se*. To ask whether there were unique effects of education we recalculated the models, this time including mothers' age of arrival in all the base models. With Age of Arrival and Age of Arrival × Age effects included in the base models, the outcomes of adding maternal education followed the same pattern as without these additional variables. Mothers' highest level of education in English significantly improved model fit over the base model when children's English vocabulary was the outcome (English Δ −2LL=6.359 > $\chi 2(df=1)=3.84$, $p=.012$) but not when children's Spanish vocabulary was the outcome ($p>.69$). Mothers' highest level of education in Spanish significantly improved model fit over the base model when children's Spanish vocabulary growth was the outcome (Δ −2LL=4.068> $\chi 2(df=1)=3.84$, $p=.044$), but not when English growth was the outcome ($p>.69$). Once again, addition of the English education × Age interaction to the English language model significantly improved fit of the English expressive vocabulary model (English Δ −2LL=5.55 > $\chi 2(df=1)=3.84$, $p=.018$), but this effect was not present for Spanish language model.

We also asked whether children's out-of-home exposure to English might have contributed to these findings and found no evidence that it did. That is, from other, ongoing analyses that are part of this larger study we know that the primary source of out-of-home exposure to English for these children is preschool (Welsh, 2017) and we also know that – at least at age 4 years – hours of preschool attendance were unrelated to children's English skill.

Finally, to investigate the consequences of the decision to dichotomize the measure of maternal education, we calculated partial correlations between maternal education and child vocabulary scores at 30 months within English and within Spanish using both the dichotomized measure and the quasi-continuous measure of education on which the dichotomized measure was based. The results were similar, but for both languages, the value of the partial r was higher using the dichotomized measure of education than using the quasi-continuous measure. This finding suggests that the relation between level of education and child outcome is not linear within the range of education represented in the present sample. The correlations are provided in supplementary material.

Discussion

The aim of the present study was to provide an explanation for recent findings from bilingual samples in the U.S. that maternal education level predicts children's English vocabulary but not their Spanish vocabulary. We hypothesized that the explanation might reside in the combination of the fact that many Spanish-speaking mothers of Spanish-English bilingual children complete their education in American schools, after immigrating, and the proposal that the benefits of maternal education to child language development are specific to the language in which mothers received their education.

The present findings support the hypothesis that the benefits of mothers' education to their children's language development are language specific. Among Spanish-English bilingual mothers and their children, the level of education the mothers had attained in English was related to their children's English skill, but not their children's Spanish skill. Among the same mothers and children, the level of education mothers had attained in Spanish was related to their children's Spanish skill, but not their children's English skill. However, we can only speculate that this accounts for previous null findings with respect to the relation of maternal education to children's Spanish language skills among Spanish-speaking immigrants because only level, but not language, of education has been reported.

The larger aims of the present study were to contribute to understanding of the factors that influence English and Spanish language development in bilingual children in immigrant families and to identify pathways by which maternal education affects child development. The present findings add a variable, language of parents' education, to the many variables that influence the environment and developmental outcomes of children in immigrant families. The present findings point to direct effects of education achieved in English as a pathway by which parents' education affects their children's English language outcomes.

One final suggestion in the present data is that maternal education in English may have a larger effect on children's English than maternal education in Spanish has on children's Spanish. This may simply reflect the fact that, in this sample, Spanish development is flat compared to English development, and thus he effects of external factors may not be as discernible . It is also possible that contexts in which Spanish is used in bilingual immigrant contexts may not be the contexts that elicit the most lexically rich and grammatically complex speech. Talk about school-related topics, for example, is more likely to be in English because school is in English. Oller, Pearson, and Cobo-Lewis (2007) have described bilingual children's vocabulary knowledge as distributed, meaning they have Spanish words for the things they talk about in Spanish and English words for the things they talk about and experience in English. We could extend this argument to suggest that Spanish and English serve different functions in immigrant bilingual homes, and the functions that English serves allows more advanced language use for speakers who are familiar with the academic uses of language.

DeAnda et al. (2016) have suggested that Hispanic cultural values also might attenuate the influence of education on child-directed Spanish. They cited evidence that Mexican immigrant parents value obedience and collaboration in their children more than verbal

skills and self-expression (Kayser & Guiberson, 2008; Greenfield, Trumbull, Keller, Rothstein-Fisch, Suzuki, & Quiroz, 2006). These cultural influences could operate even within subjects in a bilingual sample. There is evidence from multiple sources that bilinguals express different attitudes in their different languages (Marian & Kaushanskaya, 2004; Shiro, 2016).

Limitations

There are two major limitations to the present study. The first is that we used only one measure of children's language, a standardized test of expressive vocabulary. Understanding influences on vocabulary is important because vocabulary is a predictor of reading skill (Sénéchal, Ouellette, & Rodney, 2006), but acquiring a vocabulary is only part of acquiring a language. An emerging story from the study of young bilinguals is that the factors that shape language growth may be different depending on the aspect of language skill under consideration (Hammer et al., 2012; Ribot & Hoff, 2014; Ribot et al., 2017). A second limitation is that we did not directly study the maternal speech that is hypothesized to be the link between maternal education and child language outcomes.

An important question for future research is the generalizability of these findings. The circumstance in which immigrant parents are well educated, but not in the language of their new country is not unique to South Florida. The finding of language specific effects of parental education should generalize, but it is unknown how cultural differences might moderate such effects. Another question concerning generalizability of these findings has to do with effects of maternal education on children's language in monolingual Spanish-speaking populations. The existing evidence on this topic is scant and mixed in its findings. There is evidence of SES-related differences in the receptive vocabularies of 3- to 5-year-old Spanish-speaking children in Ecuador (Paxson & Schady, 2007) and in the narratives of school-aged monolingual Spanish-speaking children in Venezuela (Shiro, 2003), but there are also findings of no difference in the receptive and expressive vocabularies of very young children in monolingual Spanish populations (DeAnda et al., 2016; Friend, DeAnda, Arias-Trejo, Poulin-Dubois, & Zesiger, 2017; Jackson-Maldonado, et al., 1993). Finally, in order to avoid a confound between maternal education and the native language of the father, we selected participants from a larger study of children in Spanish-speaking homes, including only those for whom both parents were native Spanish speakers. This is the population to which these results should generalize. Among children who have native English speaking father, we would expect the influence of their mothers' level of education in English to be diminished.

These limitations and open questions notwithstanding, the present study makes a contribution both to understanding the factors that shape the language growth of bilingual children in immigrant families and, more broadly, the paths of influence that connect adults' educational experience to their children's developmental outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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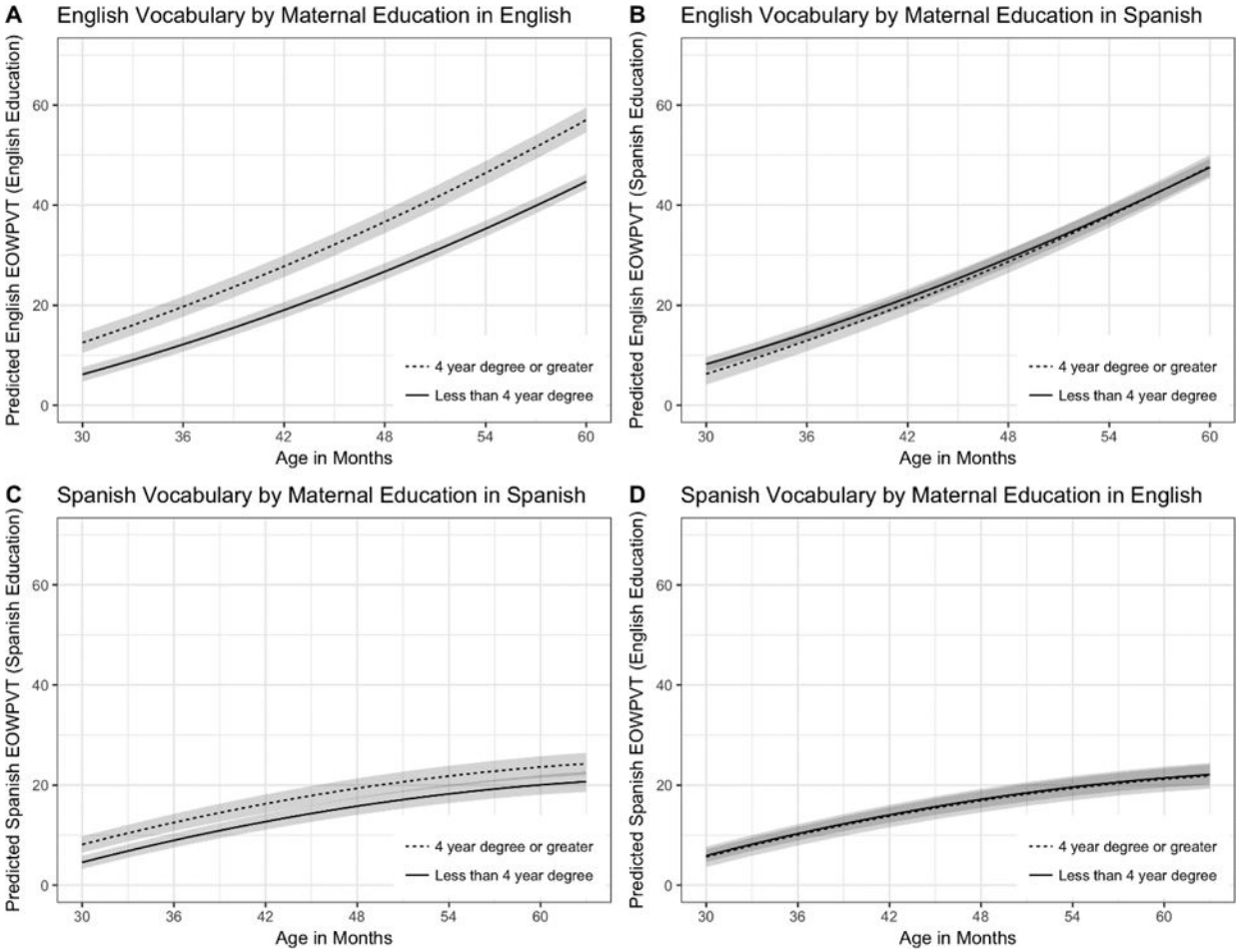

Figure 1.

Models of (A) the effect of level of maternal education achieved in English on children's English vocabulary, (B) the (non)effect of level of maternal education achieved in Spanish on children's English vocabulary, (C) the effect of level of maternal education achieved in Spanish on children's Spanish vocabulary, and (D) the (non)effect of level of maternal education achieved in English on children's Spanish vocabulary. For all figures, the value of the proportion of home language input in the language of the outcome measure is set to .50; shaded areas indicate +/− 1 *SE* around the mean.

Table 1

Crosstabulation of Mothers by Level of Education in English and Level of Education in Spanish

		Level of Education in English		
		< 4 Year Degree	**≥ 4 Year Degree**	**Total**
Level of Education in Spanish	< 4 Year Degree	42	14	56
	≥ 4 Year Degree	31	5	36
	Total	73	19	92

Table 2

Means and (Standard Deviations) for Mothers' Age of Arrival and Percentage of Home Language Exposure at Each Assessment Point in English (a) by Level of Education in English and (b) by Level of Education in Spanish

	n at 30 Mos	Mothers' Age of Arrival	English Percentage of Home Language Exposure					
			Child Age					
			30 Mos	36 Mos	42 Mos	48 Mos	54 Mos	60 Mos
Participants Partitioned by Mothers' Level of Education in English								
< 4 Year Degree	73	24.05 (7.51)	17.03 (16.32)	17.36 (18.14)	20.24 (20.51)	20.49 (20.51)	26.54 (22.56)	27.77 (22.88)
≥ 4 Year Degree	19	16.50 (7.91)	24.47 (24.32)	25.93 (26.60)	37.73 (25.82)	40.25 (25.24)	37.50 (27.02)	38.25 (27.54)
Participants Partitioned by Mothers' Level of Education in Spanish								
< 4 Year Degree	56	19.51 (8.56)	21.20 (20.53)	22.51 (21.88)	26.60 (24.77)	28.11 (25.96)	32.36 (26.34)	34.13 (26.25)
≥ 4 Year Degree	36	27.14 (4.62)	14.51 (13.65)	11.71 (14.59)	16.38 (14.69)	20.00 (16.81)	23.55 (18.49)	23.85 (19.41)

Table 3

Sample Sizes, Means, and Standard Deviations for Children's Age, English, and Spanish Expressive Vocabulary (EOWPVT) Scores at Each Assessment Point

	Child Age		English EOWPVT[1] Raw Score		Spanish EOWPVT Raw Score	
Assessment Point	**Valid N**	**Mean (SD)**	**Valid N**	**Mean (SD)**	**Valid N**	**Mean (SD)**
30 Months	92	30.46 (41)	88	5.16 (7.75)	91	7.74 (9.43)
36 Months	59	36.47 (.37)	57	10.98 (11.02)	59	12.66 (11.04)
42 Months	72	42.49 (38)	68	20.46 (15.20)	70	17.77 (14.37)
48 Months	76	48.47 (38)	75	27.45 (14.6)	76	18.63 (14.58)
54 Months	74	54.36 (144)	76	38.84 (12.74)	79	20.63 (16.91
60 Months	83	60.50 (50)	80	47.05 (12.46)	80	23.88 (18.26)

[1]Expressive One Word Picture Vocabulary Test

Table 4

Fit Comparisons for Models of Maternal Education in English and Spanish Predicting Their Bilingual Children's English and Spanish Expressive Vocabulary

			Level 2 Predictor			
			English Education Level		Spanish Education Level	
Outcome	**Uncond. Means**	**Model 1**	**Model 2**	**Model 3**	**Model 2**	**Model 3**
English EOWPVT[1]						
−2LL	3104.00	2971.92	**2962.06****	**2952.25***	2971.39	2969.09
# of parameters	6	11	12	15	12	15
AIC	3116.00	2993.92	2986.06	2982.25	2995.29	2990.09
BIC	3140.58	3038.80	3035.02	3043.45	3044.35	3060.29
Spanish EOWPVT[1]						
−2LL	3132.31	3048.17	3048.16	3045.35	**3044.27***	3040.70
# of parameters	6	11	12	15	12	15
AIC	3144.31	3070.78	3070.16	3075.35	3068.26	3070.70
BIC	3169.03	3115.30	3121.39	3136.88	3117.50	3132.24

*p < .05,

**p < .01

[1]Expressive One Word Picture Vocabulary Test

Model 1 includes Child Age, Child Age^2, and Input; Model 2 adds either mothers' level of education achieved in English or level of education achieved in Spanish; Model 3 adds all twoway interaction terms. Model 2 is compared to Model 1; Model 3 is compared to Model 2.

Table 5

Coefficients for Models 2 and 3: Mothers' Level of Education in English Predicting Their *Bilingual Children's English Expressive Vocabulary*

	Model 2		Model 3	
	Parameter	***p***	**Parameter**	***p***
Intercept	8.57 (1.72)	0.001	5.78 (1.94)	0.001
Time	6.36 (0.76)	0.001	7.4 (0.88)	0.001
English Input	0.06 (0.02)	0.005	0.13 (0.04)	0.003
English Education	6.12 (1.83)	0.001	3.22 (2.12)	0.018
Age * Age	0.38 (0.14)	0.007	0.43 (0.14)	0.003
Age * English Input			−0.01 (0.01)	0.13
Age * English Education			1.2 (0.52)	0.008
English Input * English Education			0.06 (0.05)	0.198

Note. Standard errors are in parentheses

Table 6

Coefficients for Models 2 and 3: Mothers' Level of Education in Spanish Predicting Their *Bilingual Children's English Expressive Vocabulary*

	Model 2		Model 3	
	Parameter	***p***	**Parameter**	***p***
Intercept	3.00 (1.32)	0.025	2.62 (1.44)	0.072
Age	6.35 (0.76)	0.001	6.72 (0.81)	0.001
English Input	0.06 (0.02)	0.005	0.07 (0.05)	0.124
Spanish Education	−1.19 (1.62)	0.464	−1.16 (1.82)	0.527
Age * Age	0.38 (0.14)	0.007	0.41 (0.14)	0.004
Age * English Input			−0.01 (0.01)	0.308
Age * Spanish Education			0.42 (0.46)	0.359
English Input * Spanish Education			−0.02 (0.05)	0.743

Note. Standard errors are in parentheses

Table 7

Coefficients for Models 2 and 3: Mothers' Level of Education in Spanish Predicting Their *Bilingual Children's Spanish Expressive Vocabulary*

	Model 2		Model 3	
	Parameter	***p***	**Parameter**	***p***
Intercept	4.57 (2.41)	0.059	2.67 (4.27)	0.532
Age	4.71 (0.6)	0.001	4.05 (1.05)	0.001
Spanish Input	0.07 (0.02)	0.002	0.1 (0.05)	0.039
Spanish Education	3.57 (1.78)	0.047	−1.17 (4.62)	0.801
Age * Age	−0.32 (0.1)	0.002	−0.29 (0.1)	0.006
Age * Spanish Input			0.01 (0.01)	0.227
Age* Spanish Education			0.45 (0.53)	0.39
Spanish Input * Spanish Education			0.06 (0.05)	0.206

Note. Standard errors are in parentheses

Table 8

Coefficients for Models 2 and 3: Mothers' Level of Education in English Predicting Their *Bilingual Children's Spanish Expressive Vocabulary*

	Model 2		Model 3	
	Parameter	***p***	**Parameter**	***p***
Intercept	1.94 (2.62)	0.46	6.79 (3.96)	0.088
Age	4.71 (0.6)	0.001	3.7 (1.02)	0.001
Spanish Input	0.07 (0.02)	0.001	0.01 (0.04)	0.837
English Education	−0.24 (2.16)	0.912	4.58 (4.6)	0.32
Age * Age	−0.32 (0.1)	0.002	−0.29 (0.1)	0.007
Age * Spanish Input			0.01 (0.01)	0.281
Age*English Education			−0.18 (0.63)	0.776
Spanish Input * English Education			−0.07 (0.05)	0.198

Note. Standard errors are in parentheses