

Speech and Language Outcomes in Low-SES Spanish-English Bilingual Preschoolers: The Role of Maternal Education

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Authors' Biographical Notes

Simona Montanari, Ph.D., is a Professor in the Department of Child and Family Studies at California State University, Los Angeles. She received a Ph.D. in Linguistics from the University of Southern California specializing on early trilingual development. Her research has focused on the emergence of different language components (speech sound production, vocabulary, verbal morphology, narrative skills, pragmatics) in Spanish-speaking children growing up bilingually or trilingually in the United States. Dr. Montanari has also been involved in the creation of an Italian/English dual language program in the Glendale Unified School District (Los Angeles County) and has been studying its educational outcomes since its launch in 2009. She also works as a consultant on bilingual/dual language education for different schools in different world regions and has designed curricula for Italian/English, French/English and German/English dual language programs.

Robert Mayr is a senior lecturer in linguistics at Cardiff Metropolitan University, Wales, and a research associate at the Centre for Research on Bilingualism, Bangor University. He previously held positions at the University of Vienna, Austria, and at Sheffield University, England, where he also completed his PhD. Dr Mayr has published widely in the field of speech development of bilinguals and multilinguals across the lifespan, focusing particularly on the phonetic and phonological aspects of first and second language acquisition, first language attrition, and atypical development. His research uses a number of behavioral measures, including acoustic methods of analysis and psycholinguistic experimentation.

Kaveri Subrahmanyam received her Ph.D. from UCLA. She is Interim Associate Dean & Professor of Psychology in the College of Natural and Social Sciences at California State University, Los Angeles and Associate Director of the Children's Digital Media Center @ Los Angeles, which has sites at UCLA and Cal State LA. In 2013, she was a recipient of the Cal State LA *Outstanding Professor Award*. One strand of her research has focused on the cognitive and social implications of interactive media use; another strand has examined dual language learning among Latinx pre-school children. Her current research investigates the relation between technology use, school belonging, and academic performance among first generation college students and the relation between parents' and children's home media use and children's sleep, behavior problems, and oral language development.

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Abstract

This paper presents a longitudinal examination of Spanish and English phonological, lexical, and morpho-syntactic abilities in 20 low-SES bilingual preschoolers with mothers who had either completed primary or secondary education in Spanish in their country of origin, Mexico. We focused on the link between maternal education and the following spontaneous production measures: 1) phonological accuracy as measured by Percent of Consonants Correct-Revised, 2) lexical variety as measured by Number of Different Words, and 3) utterance length as measured by Mean Length of Utterance in words; the relation between maternal education and spontaneous production was examined both a) at preschool entry, when children were on average 3;6 and dominant in Spanish, and b) a year later, after one year of exposure to the majority language (English) and culture. The results showed that although children of more educated mothers performed significantly better on all English measures than children of less educated mothers, maternal education was not related to Spanish outcomes. The same differences persisted a year later. These results suggest that maternal education may play a different, but long-lasting role in English compared to Spanish development possibly due to language input differences attributable to distinct cultural values and practices associated with different languages.

KEY WORDS: maternal education; speech and language outcomes; Spanish-English bilingualism; bilingual preschoolers; longitudinal

Introduction

Considerable empirical work has demonstrated that socio-economic status (SES), and in particular, maternal education are strong predictors of language and cognitive outcomes in English-speaking monolingual and bilingual children. Beginning with Hart and Risley's (1995) seminal work, which documented profound differences in the linguistic knowledge of children growing up in low-income versus middle class homes, many studies have replicated the finding that SES and maternal education are closely linked to children's skills in a vast array of language and cognitive domains and at different ages. In particular, low-SES infants have been found to display fewer gestures in their early lexicon (Rowe & Goldin Meadow, 2009), to initiate play verbally less frequently, and to produce half the number of vocalizations than their mid-SES peers (Hammer & Weiss, 1999). Research has also found that by 18 months of age, there are differences between children from low- and high-SES families in a variety of measures including receptive and expressive vocabulary, memory, concept attainment, and rudimentary problem-solving skills (Fernald, Marchman, & Weisleder, 2013; Fuller, Bein, Kim & Rabe-Hesketh, 2015). By 24 months, there are large gaps between SES groups in reported and real-time vocabulary comprehension (Fernald et al., 2013) and in vocabulary growth trajectories (Hoff, 2003). By three years of age, low-SES children also display lower intelligibility rates than their mid/high-SES peers (i.e. lower percentages of correct consonants and vowels in their speech), increasing the likelihood that they will be diagnosed with a speech sound disorder (Campbell et al., 2003; Eadie et al., 2015). Furthermore, preschoolers with less educated mothers produce fewer and less diverse words and shorter utterances than children with more educated mothers (Dollaghan et al., 1999; Huttenlocher, Waterfall, Valilyeva, Vevea, & Hedges, 2010; Vasilyeva, Waterfall, & Huttenlocher, 2008). SES and maternal education effects persist throughout

childhood, as children from disadvantaged backgrounds continue to display more limited syntactic structures and overall expressive abilities in elementary school (Sarsour et al., 2011).

A considerable amount of research has also documented SES- and maternal-education-related differences for bilingual children growing up in English-speaking countries. As with monolinguals, low-SES bilingual infants have been found to have smaller receptive and productive vocabularies than bilingual infants from higher-SES homes (Friend, DeAnda, Arias-Trejo, Poulin-Dubois, & Zesiger, 2017; Fuller et al., 2015; DeAnda, Arias-Trejo, Poulin-Dubois, Zesiger, & Friend, 2016; Place & Hoff, 2016). Similarly, studies have documented more limited semantic and morpho-syntactic abilities in bilingual preschoolers and kindergarteners from low-SES backgrounds than in children from more advantaged families (Bohman, Bedore, Peña, Mendez-Perez & Gillam, 2010; Calvo & Bialystok, 2014; Hammer et al., 2012). Differences have been documented into elementary school, suggesting that the relation between SES and language outcomes persists even with increasing language competence and education. For example, Oller and Eilers (2002), who studied the oral language and literacy skills of over 900 monolingual and bilingual children from Southern Florida from age 5 to 10, found that SES had a main effect on practically every studied outcome and in each language, including levels of proficiency as assessed by standardized tests, narrative skills, mastery of grammatical devices, and phonological awareness. Furthermore, Gathercole, Kennedy and Thomas (2016), who studied 732 monolingual and bilingual participants in Wales ranging across seven age groups from age 3 to over 60 years, found that SES as measured by parental education and occupation was related to both language (vocabulary and grammar) and cognitive measures in all age groups. These findings suggest that the effects of SES on language and cognitive abilities are long-lasting and persist across the lifespan.

Interestingly, for Spanish-English bilingual children growing up in the U.S., a common finding has been that maternal education only predicts children's acquisition of English and is not related to their Spanish language development (Bohman et al., 2010; DeAnda et al., 2016; Friend et al., 2017; Hammer et al., 2012; Place & Hoff, 2016). Hoff, Burridge, Ribot and Giguere (2018) have recently shown that the language in which mothers were schooled might mediate the relationship between maternal education and bilingual children's language outcomes. However, no study to date has replicated this finding, specifically with regard to the relation between *limited* maternal education and language outcomes that go beyond vocabulary measures, and over the course of children's development. This is especially relevant to the U.S. context, where half of Spanish-English bilingual children hail from low-income families with parents who did not graduate from high school (National Academies of Sciences, Engineering, and Medicine, 2017).

The goal of this study is to contribute to the growing literature on the role of maternal education in bilingual preschoolers' developing Spanish and English phonological, lexical, and morpho-syntactic skills. We focus on maternal education because there is evidence suggesting that it is the component of SES most strongly related to children's language outcomes (Hoff, 2003; Schwab & Lew-Williams, 2016). Specifically, we examine the implication of limited maternal education on children's bilingual outcomes among mothers who had obtained either primary or secondary education in Spanish in their country of origin, Mexico. Since the roles of education and income are deeply intertwined, we also limit our investigation to children from comparable, low-SES backgrounds, as attested by their eligibility to participate in a Head Start program, in order to explore the sensitivity of the language system to changes in the caregiver's limited educational background. We finally examine an array of speech and language outcomes

longitudinally to investigate whether the impact of maternal education diminishes or disappears after children have experienced a year of schooling and acculturation to the majority culture.

Maternal Education and Spanish-English Bilingual Children's Language Outcomes

Previous studies on the role of maternal education on Spanish-English bilingual children's language outcomes, which have been primarily limited to vocabulary and grammatical measures assessed at one time point, have converged on the finding that maternal level of schooling – measured in terms of the number of years of education attained irrespective of the language – has a different impact on children's English versus Spanish development. For instance, DeAnda et al. (2016), who examined the comprehension and production vocabularies of two different samples of 16-month-olds – one in English-dominant bilingual homes and one in Spanish-dominant bilingual homes, found that word knowledge and SES were significantly related only for infants growing up in English-dominant bilingual homes, such that greater maternal educational attainment was associated with larger English vocabularies in children. However, maternal education did not predict Spanish outcomes for children in Spanish-dominant homes, that is, higher maternal school attainment was not related to knowledge of more Spanish words in children.

Similar results were replicated at 22, 30 and 60 months. For instance, Friend et al. (2017), who conducted a follow-up study with the same children from DeAnda et al. (2016) when they were 22 months, continued to document no link between maternal education and Spanish vocabulary size, although maternal education effects did persist for English-dominant children. Similarly, Place and Hoff (2016), who investigated language comprehension, productive vocabulary, and grammatical skills in 90 Spanish-English bilingual two-and-a-half-year-olds from South Florida, found that maternal education was correlated with the children's English

language skills but not with their Spanish proficiency. Likewise, Hammer et al. (2012), examined Spanish and English vocabulary and story recall abilities in a large sample of bilingual 5-year-olds from Pennsylvania, New Mexico and Florida and found that children whose mothers had higher education also demonstrated higher English vocabulary skills, English story recall, and Spanish story recall. However, maternal education was not related to the children's Spanish vocabulary, as has been previously found by Bohman et al. (2010) for kindergarteners. These findings suggest that, despite typically experiencing a shift from Spanish to English dominance and increased acculturation to Anglo-American culture (Montanari, Ochoa & Subrahmanyam, 2019), Spanish-English bilingual children in the U.S. with mothers who have attained limited education continue to display more limited English skills than children of more educated mothers.

DeAnda and colleagues (2016) have speculated that SES and maternal education effects might emerge at different ages in English- and Spanish-speaking populations or that SES does not play the same role on language acquisition in Spanish speakers. For instance, studies of Spanish monolingual infants and toddlers in the U.S. and Mexico that have used a range of assessments and SES metrics have also found no relation between SES/maternal education and children's receptive, expressive, and word processing skills (Hurtado, Fernald & Marchman, 2008; Jackson-Maldonado et al., 2003; Tamis-LeMonda, Song, Leavell, Kahana-Kalman & Yoshikawa, 2012). Moreover, DeAnda and colleagues (2016) pointed out that differential effects of SES on English and Spanish development might also be tied to language input differences attributable to different cultural practices, which might have more consequences on children's language outcomes than SES or maternal education. Furthermore, although no previous study has examined this issue, it is also possible that maternal school attainment interacts with other

variables – for example acculturation – with different consequences on children’s English and Spanish skills. For example, more educated mothers may be more acculturated to Anglo-American culture, and, as a result, they may adopt literary practices that are dominant in this culture – such as labelling, book reading, and going to the library; they may also use more English and engage their children in language- and literacy-related activities in English more than in Spanish (Hammer & Rodriguez, 2012).

One possibility for this finding is that the *language* in which mothers have been schooled mediates the relationship between maternal education and bilingual children’s language outcomes. Hoff and colleagues (2018) recently examined the relation between maternal education and productive vocabulary between 30 and 60 months in a sample of 92 US-born Spanish-English bilingual children with native Spanish-speaking immigrant mothers who had received their highest level of education either in English in the U.S. or in Spanish in their country of origin. The results showed that maternal school attainment in English was significantly related to children’s English vocabulary but not to their Spanish lexicon, and maternal level of education in Spanish predicted children’s Spanish lexical skills but not their knowledge of English words. Thus, Hoff and colleagues argued that previous research failed to document maternal education-related effects in Spanish since the participating mothers had perhaps attained their education in English.

Although Hoff et al. (2018) advanced the debate on the differential role of maternal education on children’s English and Spanish outcomes, the study was limited to college-educated vs. non-college-educated mothers from South Florida, a region characterized by a large percentage of educated Cuban-Americans who benefit from greater acculturation, human capital, social acceptance, and community institutions compared to other Latinx groups (Portes &

Rumbaut, 2001). Furthermore, the study was limited to vocabulary skills, and did not examine speech and language outcomes across other domains.

The Present Study

In the present study, we examine Spanish and English phonological accuracy, lexical diversity and utterance length longitudinally in a sample of low-SES bilingual preschoolers with mothers who had either completed primary or secondary education in Spanish in their country of origin, Mexico. We focus on phonological accuracy – children’s ability to produce speech sounds – because while speech sound production has been found to be related to general measures of language proficiency in Spanish-English bilingual preschoolers (Montanari, Mayr & Subrahmanyam, 2018) and to be affected by maternal education in monolingual children (Campbell et al., 2003; Eadie et al., 2015), no study to date has assessed the link between mother’s school attainment and bilingual children’s accuracy in producing speech sounds. We also focus on lexical variety and utterance length because, although both measures have been shown to be related to maternal education in the monolingual literature (Dollaghan et al., 1999), studies with bilingual children have not examined linguistic performance in terms of these spontaneous production measures.

In order to investigate whether the role of maternal education changes after a year of schooling and acculturation, we measure phonological, lexical and morpho-syntactic abilities a) at preschool entry, when children were about 3;6 and dominant in Spanish, and b) after a year of exposure to the language and culture of the school, when children were about 4;6. Previous research with this sample has shown that children’s language proficiency and preference change dramatically after just one year of schooling in English (Montanari et al., 2018; Montanari et al., 2019). Therefore, this study also contributes to the discussion as to whether English exposure

and instruction in the preschool setting might mitigate any early relation between maternal education and linguistic performance in English or both languages.

On the basis of the extant literature, we hypothesize that (a) children of more educated mothers will perform better than children of less educated ones in all linguistic measures and across both languages; (b) differences should be particularly visible in lexical and morpho-syntactic measures, language domains that have been shown to be vastly affected by maternal school attainment; and (c) maternal education-related differences in children's English outcomes will persist even after one year of English schooling. The previous literature does not allow us to make a clear prediction about the role of maternal education in Spanish versus English since, as discussed above, findings have been contradictory (DeAnda et al., 2016; Friend et al., 2017; Hammer et al., 2012; Hoff et al., 2018; Place & Hoff, 2016).

Method

Participants

The data for the present study were derived from a larger longitudinal study of dual language development in Mexican-American dual language learners enrolled in Head Start programs in Southern California. The sample included 10 children (7 boys and 3 girls) whose mothers had only attained primary education, that is, they had only completed elementary school or *educación primaria* (6 years of schooling from grade 1 through 6) in Mexico; the majority of the remaining participants had mothers who had completed secondary education (*la escuela preparatoria*) up to the 12th grade and hence an additional 6 years of formal education.

Therefore, from this latter pool, we carefully selected 10 children (7 boys; 3 girls) who were closely matched on all demographic and language use variables to the children whose mothers had completed elementary school, as shown in Table 1. All children were typically developing

and had no hearing, speech, language, cognitive, or neurological deficits based on parental reports and program screening tests. All participants were born in the U.S. but came from Spanish-speaking, Mexican-origin intact families who had been living in Los Angeles County for approximately 12-13 years (12.8 years [range = 8-20] for mothers with primary education; 13 years [range = 5-22] for mothers with secondary education). The children of the less educated mothers were 3;7 on average (range: 3;2-4;2) while those of the more educated mothers were 3;6 on average (age range: 3;2-4;0) at the beginning of the study. All families came from low-SES backgrounds as determined by the children's eligibility to participate in the Head Start program, which is specifically designed to promote school readiness in children between birth and age 5 from low-income families (<https://www.acf.hhs.gov/ohs>).

All mothers had completed their education in Spanish in different Mexican states. Ninety percent of the less educated mothers and 80% of the more educated mothers were not employed at the time of the study and thus took care of their child. In order to assess maternal level of acculturation, the mothers were administered the Acculturation Rating Scale for Mexican Americans-II (ARSMA, Cuéllar, Arnold & Maldonado, 1995), a measure that allows for the independent assessment of an individual's involvement with Mexican culture and the host culture (Anglo culture). The scale consists of an Anglo orientation subscale (AOS) with 13 items and a Mexican orientation subscale (MOS) with 17 items that assess various aspects of acculturation including language preferences, behaviors, parental identification, peer ethnicity, and personal identification. The mean MOS score is subtracted from the mean AOS score to yield a linear continuous measure of acculturation that represents an individual's score along a continuum from very Mexican oriented (mean < -1.33) to very Anglo oriented (mean > 2.45) (Cuéllar et al., 1995). Both groups of mothers were found to have, on average, the lowest level of

acculturation to Anglo American culture or a “very Mexican orientation” (scores lower than -1.33). In addition, linear acculturation scores for more and less educated mothers were not statistically different ($t(18) = -1.907, p = .073$).

A detailed Spanish-language parent questionnaire that assessed children’s language history, exposure patterns, and language use also revealed that the children in both groups learned Spanish as their first language since this was the language primarily used at home and spoken by each mother to her child. At the same time, since all participants were born in the U.S. and all but one had siblings, they had also had secondary but less consistent exposure to English from infancy through siblings, media, and the larger community, although formal and regular exposure to this language had begun in preschool.

INSERT TABLE 1 HERE

Data Collection

The children’s phonological accuracy, lexical diversity and utterance length were assessed in Spanish and English at the beginning of the preschool program (when they were about 3;6) and a year later, in the fall of their second year in the program. To this end, we collected single word and spontaneous speech samples in both languages at preschool entry and in the fall of the children’s second year of preschool. As in several previous studies of Spanish-English bilingual phonological development (see Montanari et al., 2018, for a review), the phonology subtest of the Bilingual English Spanish Assessment (BESA; Peña, Gutiérrez-Clellen, Iglesias, Goldstein, & Bedore, 2014) was used to elicit single word samples and assess consonant production abilities. This assessment, which contains 31 separate target items for English and 28 for Spanish varying in length and lexical stress pattern, targets all singleton consonants in Spanish and

English (except /ʒ/ in English) between one and seven times, either in syllable-initial, syllable-final, or both positions.

The BESA was administered in one language at a time (Spanish or English) by separate research assistants who were bilingual in Spanish and English but only interacted with the children in the language of testing. The assistants used high-quality pictures that depicted the target items, asking the children to name the object shown in each picture. In the case of no response, children were given prompts or were allowed to repeat the answer provided by the examiner, as in previous studies, on the basis that spontaneous and imitated responses tend to be very similar (Goldstein, Fabiano, & Iglesias, 2004). Half the children completed the BESA Spanish phonology subtest first, whereas the other half completed the English version first. Samples were recorded using an Edirol R-09HR High-Resolution WAVE/MP3 recorder and a desktop microphone in close proximity to the child.

Furthermore, in order to assess lexical diversity and utterance length in English and Spanish in the two groups of children, spontaneous speech samples in each language were also collected through naturalistic conversations between the children and the research assistants. Before collecting the speech samples, the research assistants became familiar with the children by spending time and interacting with them in their classroom. At the time of data collection, children were individually taken to a room during regular school hours and audio recorded for approximately 45 minutes in one language. The research assistants used a pre-determined set of age-appropriate toys and books – including a food set, a car set, a doll set, a farm play set as well as the books *Frog Where Are You?* (Mayer, 1969) and *A Boy, a Dog, and a Frog* (Mayer, 1967) – to interact with the participants. Because the goal was to elicit spontaneous speech, the research assistants interacted with the children naturally, asking open-ended questions that

focused on the toys/books at hand but also on the child's interests and leads. However, since a monolingual-speaking situation was created, research assistants only spoke Spanish or English, depending on what language sample they were collecting. In situations when children spoke the non-target language, the research assistants pretended not to understand and asked the children to repeat it in the target language. In total, eight speech samples were collected from each child in Spanish and English from the beginning to the end of preschool. However, for the purpose of the present study, we only examined the Spanish and English samples collected at 3;6 and at 4;6.

Transcription and Analyses

Each single word sample collected through the BESA was independently transcribed by the first author and by two graduate students in narrow phonetic transcription, using the conventions of the International Phonetic Alphabet (IPA, 1999). One student transcribed all Spanish data, while the other worked on the English data. All transcribers were phonetically trained and bilingual in Spanish and English. The two independent transcriptions in each language were then compared for reliability purposes. Inter-rater reliability, calculated for 100% of the target consonants, was 96% for Spanish and 94% for English. In order to perform intra-judge reliability on their own transcriptions, the three transcribers re-transcribed 100% of the samples; intra-rater reliability was 98% for the first author and 96% for the graduate assistant for Spanish, and 96% for the first author and 95% for the graduate assistant for English. Disagreements on sounds were discussed by listening to the recordings several more times until consensus was reached. Overall consonant accuracy was then calculated in terms of Percent of Consonants Correct-Revised (PCC-R) (Shriberg, Austin, Lewis, McSweeney, & Wilson, 1997) as in most studies of Spanish-English bilingual children (see Montanari et al., 2018, for a review). PCC-R indicates the percentage of consonants that the child has produced correctly out of the total number of consonants targeted,

although speech sound distortions – which are common in typical speech development in monolinguals as well – are not coded as errors. Likewise, productions that differed on fine phonetic detail (such as substituting less aspirated syllable-initial voiceless stops) were not coded as errors as long as they were target-like in terms of place and manner of articulation as well as overall voicing category.

The conversational speech samples were transcribed orthographically and analyzed by two additional research assistants using Systematic Analysis of Language Transcripts (SALT, Miller & Iglesias, 2008). Each transcription was reassessed by a second transcriber and any disagreement was discussed by listening to the recordings several more times until consensus was reached. The Number of Different Words (NDW) and Mean Length of Utterance in words (MLUw) were then automatically generated by SALT for the first 100 utterances of the consensus transcriptions (after skipping the first ten utterances). NDW has been found to be positively associated with children's vocabulary by other lexical measures (Condouris, Meyer, & Tager-Flusberg, 2003) and therefore is commonly used as an indicator of children's lexical development (Hewitt, Hammer, Yont, & Tomblin, 2005). MLU is the most widely used measure of grammatical productivity (Bedore, Peña, Gilliam & Ho, 2010), with MLUw typically being used when comparing languages with different morphological patterns (Goldstein, Bunta, Lange, Rodriguez, & Burrows, 2010). NDW scores were calculated by counting English words only for English and Spanish words only for Spanish. MLUw in English was calculated from the English-only utterances and the English portion of mixed utterances produced while the child was interacting with the English-speaking research assistant. Likewise, MLUw in Spanish was calculated from Spanish-only utterances and the Spanish portion of mixed utterances produced in the Spanish context. Although some researchers completely eliminate language-mixed utterances

when calculating NDW and MLUw (Yow, Patricia, & Flynn, 2016), we considered this method overly restrictive and decided to give children credit for every word they produced in the target language.

Statistical comparisons of PCC-R, NDW scores, and MLUw values in the two groups of children, in different languages, and at different ages were completed using the Statistical Package for the Social Sciences (SPSS Statistics Version 25). Repeated measures ANOVAs with *age* (2 levels: 3;6 and 4;6) as a within-subjects factor and *maternal education* (2 levels: primary and secondary education) as a between-subjects factor were run separately for each dependent variable, i.e. PCC-R, NDW and MLUw, and in each language. Paired-sample *t*-tests were used to examine the growth of phonological, lexical and morpho-syntactic skills in English and Spanish separately for the two groups of children. Furthermore, independent samples *t*-tests were conducted to examine differences in English and Spanish language outcomes separately at age 3;6 and 4;6 between the two groups of children. The alpha level was adjusted for multiple comparisons throughout using the Holm-Bonferroni correction method (Holm, 1979). Effect sizes were calculated using Cohen's *d* for *t*-tests and partial eta squared (η^2) for ANOVAs.

Results

The Relation of Child Age and Maternal Education to Children's English and Spanish

Outcomes

Figures 1, 2 and 3 depict the results for phonological accuracy (PCC-R), lexical diversity (NDW) and utterance length (MLUw), respectively, in English and Spanish and at age 3;6 and 4;6 for children whose mothers had completed primary education and children whose mothers had attained secondary education.

INSERT FIGURES 1, 2 AND 3 HERE

Two-way repeated measures ANOVAs were conducted separately in each language to investigate the impact of age and maternal education on PCC-R, NDW, and MLUw values. The alpha level was adjusted for multiple comparisons in each language using the Holm-Bonferroni correction (Holm, 1979). In English, there was a significant main effect of *age* on PCC-R, $F(1, 18) = 11.686, p = .003$, partial $\eta^2 = .394$, NDW, $F(1, 18) = 7.534, p = .014$, partial $\eta^2 = .320$, and MLUw, $F(1, 18) = 22.110, p = .000$, partial $\eta^2 = .580$, with children performing better at age 4;6 than at age 3;6. Post hoc analyses indicated that, at age 4;6, children showed significantly higher English PCC-R ($M = 83.1, SD = 8.11$), NDW ($M = 98, SD = 27.6$) and MLUw scores ($M = 3.12, SD = .77$), than they did at age 3;6 (PCC-R: $M = 75.43, SD = 7.31, p = .003$; NDW: $M = 80, SD = 25.07, p = .014$; MLUw: $M = 2.36, SD = .53, p = .000$).

In English, there was also a significant main effect of *maternal education* on PCC-R, $F(1, 18) = 7.056, p = .016$, partial $\eta^2 = .282$, NDW, $F(1, 18) = 13.246, p = .02$, partial $\eta^2 = .453$, and MLUw, $F(1, 18) = 9.055, p = .008$, partial $\eta^2 = .361$, with children of more educated mothers obtaining overall higher scores in these language measures than children of less educated mothers at both ages. Posthoc analyses indicated indeed that, overall, participants whose mothers had completed secondary education demonstrated significantly higher English consonant accuracy ($M = 82.35, SD = 7.4$), lexical diversity ($M = 103.78, SD = 23.14$) and utterance length ($M = 3.07, SD = .65$) than children whose mothers had only completed primary education (PCC-R: $M = 76.17, SD = 8.3, p = .016$; NDW: $M = 74.22, SD = 22.43, p = .002$; MLUw: $M = 2.41, SD = .68, p = .008$). However, there was no significant interaction of age and maternal education for the different language measures, suggesting that age and maternal education effects were independent of each other.

In Spanish, there was also a significant main effect of *age* on PCC-R, $F(1, 18) = 6.115, p = .024$, partial $\eta^2 = .254$, NDW, $F(1, 18) = 6.130, p = .023$, partial $\eta^2 = .254$, and MLUw, $F(1, 18) = 23.815, p = .000$, partial $\eta^2 = .570$, with children performing better overall at age 4;6 than at age 3;6. Post hoc analyses also indicated that, at 4;6, children showed significantly higher Spanish PCC-R ($M = 82.21, SD = 6.37$), NDW ($M = 93.2, SD = 28.99$) and MLUw scores ($M = 3.12, SD = .81$) than they did at age 3;6 (PCC-R: $M = 78.8, SD = 8.97, p = .024$; NDW: $M = 81.8, SD = 23.43, p = .023$; MLUw: $M = 2.39, SD = .55, p = .000$). However, there was no significant main effect of *maternal education* (PCC-R: $F(1, 18) = 3.949, p = .062$, partial $\eta^2 = .180$; NDW: $F(1, 18) = 1.366, p = .258$, partial $\eta^2 = .071$; MLUw: $F(1, 18) = .507, p = .486$, partial $\eta^2 = .027$), nor a significant interaction between maternal education and age for the different language measures.

Growth of Phonological, Lexical and Morpho-syntactic Skills in English and Spanish

Paired samples *t*-tests were conducted to examine the growth of phonological, lexical and morpho-syntactic skills in English and Spanish separately for the two groups of children. The alpha level was adjusted for multiple comparisons throughout using the Holm-Bonferroni method (Holm, 1979).

The results confirmed that both groups performed better at age 4;6 than at age 3;6. In particular, in English, children of more educated mothers displayed significantly higher English consonant accuracy at 4;6 ($M = 86.36, SD = 7.44$) than at age 3;6 ($M = 78.35, SD = 5.53$) ($t(9) = 2.406, p = .019, \alpha = .05, d = 1.22$). They also produced significantly more English unique words after a year of preschool ($M = 114.33, SD = 26.33$) than at program entry ($M = 89.5, SD = 19.24$) ($t(9) = 2.436, p = .020, \alpha = .025, d = .97$) and higher English utterance length at 4;6 (M

= 3.47, $SD = .65$) than at age 3;6. ($M = 2.57$, $SD = .53$) ($t(9) = 2.810$, $p = .011$, $\alpha = .05$, $d = 1.44$).

Growth was also evident for children of less educated mothers, at least for consonant accuracy and utterance length. In particular, these children obtained significantly higher PCC-R scores at age 4;6 ($M = 79.83$, $SD = 7.73$) than at age 3;6 ($M = 72.51$, $SD = 7.96$) ($t(9) = 2.437$, $p = .018$, $\alpha = .025$, $d = .93$) and their English MLUw significantly increased from an average of 2.03 ($SD = .43$) at preschool entry to an average of 2.77 ($SD = .74$) a year later ($t(9) = 4.589$, $p = .001$, $\alpha = .025$, $d = 1.19$). The average number of English unique words also increased from 3;6 ($M = 66.70$, $SD = 24.62$) to 4;6 ($M = 81.67$, $SD = 18.03$). However, this difference did not reach statistical significance ($t(9) = 1.512$, $p = .084$, $\alpha = .05$).

Somewhat different patterns were found in Spanish. In particular, for children whose mothers had completed secondary school, Spanish consonant accuracy at 4;6 ($M = 84.91$, $SD = 4.51$) was not significantly different than accuracy at 3;6 ($M = 82.03$, $SD = 7.99$) ($t(9) = 1.760$, $p = .056$, $\alpha = .05$). Likewise, based on a critical alpha of .025, the number of unique Spanish words produced after a year of preschool ($M = 100.9$, $SD = 29.23$) was not statistically higher than the one at program entry ($M = 86.7$, $SD = 27.7$) ($t(9) = 1.882$, $p = .046$, $\alpha = .025$, $d = 0.5$).

However, Spanish utterance length significantly increased from 2.60 ($SD = .52$) at 3;6 to 3.10 ($SD = .71$) at 4;6 ($t(9) = 2.137$, $p = .03$, $\alpha = .05$, $d = 0.8$).

Children whose mothers had completed elementary school displayed similar limited growth in Spanish phonological and lexical measures. In particular, consonant accuracy at 4;6 ($M = 79.51$, $SD = 7.00$) was not significantly different than accuracy at 3;6 ($M = 75.57$, $SD = 9.11$) ($t(9) = 1.774$, $p = .055$, $\alpha = .025$). Similarly, the number of unique Spanish words at 3;6 ($M = 76.9$, $SD = 18.39$) was not significantly different than the number of such words at 4;6 (M

= 85.5, $SD = 28.08$) ($t(9) = 1.774, p = .055, \alpha = .05$) ($t(9) = 1.628, p = .069$). Spanish MLUw, on the other hand, did significantly increase from an average of 2.18 ($SD = .52$) at preschool entry to an average of 3.14 ($SD = .94$) a year later ($t(9) = 5.163, p < .001, \alpha = .025, d = 1.26$).

Differences in English and Spanish Language Outcomes between Children of Mothers with Secondary Education and Children of Mothers with Primary Education

Independent samples t -tests were also conducted to examine differences in English and Spanish language outcomes separately at age 3;6 and 4;6 between the two groups of children. The alpha level was again adjusted for multiple comparisons using the Holm-Bonferroni method (Holm, 1979).

The results confirmed that, at age 3;6, children of more educated mothers performed significantly better than children of less educated mothers on all English measures. In particular, the former produced significantly higher consonant accuracy scores ($M = 78.35, SD = 5.53$) than the latter ($M = 72.51, SD = 7.96$) ($t(18) = -1.905, p = .036, \alpha = .05, d = .85$). Children whose mothers had higher school attainment also produced a significantly larger number of unique English words ($M = 89.5, SD = 19.24$) and higher utterance length ($M = 2.57, SD = .53$) than children whose mothers had completed fewer years of schooling (NDW: $M = 66.70, SD = 24.62, t(18) = -2.307, p = .016, \alpha = .05, d = 1.03$; MLUw: $M = 2.03, SD = .43, t(18) = -2.516, p = .01, \alpha = .025, d = 1.12$).

Similar differences persisted at age 4;6, at least for lexical and morpho-syntactic measures, such that children of more educated mothers continued to have significantly higher English NDW ($M = 114.33, SD = 26.33$) and MLUw ($M = 3.47, SD = .65$) than children of less educated ones (NDW: $M = 81.67, SD = 18.03, t(18) = -3.071, p = .003, \alpha = .025, d = 1.45$; MLUw: $M = 2.77, SD = .74, t(18) = -2.118, p = .025, \alpha = .05, d = 1$). However, English PCC-R

scores did not significantly differ between the former ($M = 86.36, SD = 7.44$) and latter group ($M = 79.83, SD = 7.73, t(18) = -1.924, p = .035, \alpha = .025, d = .86$).

On the other hand, maternal education did not relate to children's Spanish language outcomes to the same extent as it did in English. At age 3;6, mean consonant accuracy for children whose mothers had higher school attainment ($M = 82.03, SD = 7.99$) was not significantly different from mean PCC-R for children whose mothers had completed fewer years of schooling ($M = 75.57, SD = 9.11$) ($t(18) = -1.686, p = .055, \alpha = .05$). Children whose mothers had completed high school produced more unique Spanish words ($M = 86.7, SD = 27.7$) than children of mothers with less education ($76.9, SD = 18.39$); however, this difference was not statistically significant ($t(18) = -0.932, p = .180, \alpha = .05$). The same was true for Spanish MLUw, which did not significantly differ for children of more ($M = 2.60, SD = .52$) and less educated mothers ($M = 2.18, SD = .52; t(18) = -1.825, p = .042, \alpha = .025, d = 0.8$) based on an alpha level of .025.

The results remained the same at age 4;6, when Spanish phonological accuracy ($M = 84.91, SD = 4.51$), number of different Spanish words ($M = 100.9, SD = 29.23$) and Spanish MLUw values ($M = 3.10, SD = .71$) for children of more educated mothers were not significantly different from PCC-R ($M = 79.51, SD = 7.00; t(18) = -2.052, p = .027, \alpha = .025, d = .92$), NDW ($M = 85.5, SD = 28.08; t(18) = -1.201, p = .122, \alpha = .025$) and MLUw values ($M = 3.14, SD = .94; t(18) = 0.97, p = .46, \alpha = .05$) for children of less educated ones. These results suggest that, unlike in English, maternal education did not contribute to children's Spanish outcomes.

Discussion

The purpose of this study was to examine Spanish and English phonological, lexical and morpho-syntactic abilities longitudinally in a sample of low-SES bilingual preschoolers with

mothers who had either completed primary or secondary education in Spanish in their country of origin, Mexico. We focused on the contribution of maternal education to different spontaneous production measures: 1) phonological accuracy as measured by Percent of Consonants Correct-Revised (PCC-R) (Shriberg et al., 1997), 2) lexical variety as measured by Number of Different Words (NDW), and 3) utterance length as measured by Mean Length of Utterance in words (MLUw) both a) at preschool entry, when children were about 3;6 and dominant in Spanish, and b) after a year of exposure to the language and culture of the school, when they were about 4;6.

Our study revealed interesting and somewhat unexpected results. First of all, extending the findings of previous work that documented maternal-education-related differences in language outcomes for children with college-educated vs. non-college-educated mothers (DeAnda et al., 2016; Friend et al., 2017; Hammer et al., 2012; Hoff et al., 2018; Place & Hoff, 2016), we found that children of mothers who had completed secondary school performed significantly better than children of mothers who had only completed primary school in all English measures, suggesting that even low levels of maternal education can have implications on children's English skills. Indeed, with the exception of PCC-R at age 4;6, phonological accuracy, lexical diversity and utterance length in English were significantly higher among children of more educated mothers both at preschool entry and after a year into the program. Differences were particularly pronounced for lexical and morpho-syntactic measures, language domains that have been shown to be vastly affected by maternal education and input characteristics. Yet, differences were found even for speech sound production, at least at age 3;6, which has been hypothesized to be less likely to be affected by maternal education due to the availability of substantial information on consonant sounds even in input that is not particularly frequent or diverse (Dolloghan et al., 1999). Overall, these results suggest that, among children

from a comparable, low-SES background, the relationship between maternal education and children's English skills is robust and encompasses different language domains.

Interestingly, all mothers were educated in Spanish in Mexico, and therefore, unlike in Hoff et al. (2018), the language in which the mothers had received their education did not explain the differences we found in children's English outcomes. It is possible that factors other than the language of maternal education mediate the relationship between general maternal school attainment and children's English abilities. For example, acculturation, language experiences, and literacy practices may differ in homes where mothers have completed more schooling, irrespective of the language in which such schooling has occurred. In particular, more educated mothers may be more acculturated to Anglo-American culture and more affected by the high status of English, therefore adopting literacy practices that are dominant in this culture – such as labelling, book reading, and going to the library, and striving to promote their children's English skills (Hammer & Rodriguez, 2012). In this study, there was no significant difference in the acculturation status between the groups of mothers, who both exhibited a “very Mexican orientation;” yet, it is possible that the more educated mothers – despite reporting primary use of Spanish with their children – spoke and engaged them more in language and literacy learning opportunities in English than the less educated ones, promoting their English skills and their acculturation to the majority culture.

Not surprisingly, maternal education-related differences in children's English outcomes persisted even after one year of regular English exposure and with increased English proficiency. This means that one year of exposure to the majority language and culture did not close the gap in English skills that we observed between children of more and less educated mothers at 3;6. This result is in line with findings from bilingual studies that document SES-related differences

in English outcomes during the school years (Bohman et al., 2010; Hammer et al., 2012), adolescence, and across the lifespan (Gathercole et al., 2016). In fact, Gathercole and colleagues (2016) have shown that whereas home language exposure is a stronger predictor of linguistic performance than SES at younger ages, perhaps because more fundamental aspects of the language are being learned, SES plays the most predictive role on language measures in the teen years and among older adults, when more subtle fine-tuning of the language may be taking place. According to Gathercole et al. (2016: 1075), “it is possible that as the differences across home language groups become leveled, the effects of SES become more visible and are perhaps more long-lasting; at younger ages, the predictive value of SES may be partially masked by the strength of home language as a predictor.” Although Gathercole et al. (2016) focused on Welsh-English bilinguals, it is possible that SES- and maternal education-related effects on performance in English as a majority language may persist, if not be exacerbated with age irrespective of the socio-political/geographical context.

Contrary to the English findings, maternal education was not related to children’s Spanish outcomes. As found by DeAnda et al. (2016) for 16-month-olds, Friend et al. (2017) for 22-month-olds, Place and Hoff (2016) for 30-month-olds, and Hammer et al. (2012) for 5-year-olds, our participants’ Spanish phonological, lexical and morpho-syntactic abilities did not change as a function of maternal school attainment but rather were similar for children whose mothers had completed 6 versus 12 years of schooling in Spanish. These results point to the different role that maternal education may play on children’s language outcomes in different cultural contexts, as certain cultural values and practices might either increase or attenuate the influence of education on parenting practices and child-directed language. For example, education attained in English-speaking countries may increase overall knowledge of child

development and of the importance of promoting children’s language skills, whereas education attained in other languages and cultural contexts may not highlight this issue to the same extent. Furthermore, as argued by DeAnda and colleagues (2016), maternal level of schooling may have a larger effect in cultures – or when speaking languages – that value individualism, verbal communication and self-expression (Kuchirko & Tamis-LeMonda, 2019), as Anglo-American culture. In this context, environments contain an abundance of objects, and mothers treat infants as conversational partners, instructing, modeling, and encouraging their play with toys (Tamis-LeMonda, Kuchirko, Escobar, & Bornstein, 2019). Mothers also frequently use language as a tool to teach infants about the world (Tamis-LeMonda & Song, 2012) and their “‘didactic’ or ‘referential’ language – characterized by descriptions of objects, repetition of novel words, questions, and imitation of infant vocalizations – functions to impart knowledge and elicit participation from infants” (Kuchirko & Tamis-LeMonda, 2019: 31).

However, in cultures that value collectivism, cooperation and obedience – as Mexican culture, mothers, irrespective of their level of education, may be more interested in using language to socialize their children about politeness, respect, and collaboration, with less focus on ‘intensive’ language instruction. Indeed, Kuchirko and Tamis-LeMonda (2019: 33) found that Latinx mothers used more regulatory language with their infants than African-American and European-American mothers, a language practice that specifically reflected “a cultural value of *respeto*, roughly translated as proper demeanor” and taught children to be “‘tranquilo’ (i.e., calm), obedient, and respectful.” Latinx mothers also relied more on gestural forms of communication such as touch than other ethnic groups, teaching, praising, and loving their children physically rather than verbally. Several studies of Spanish monolingual infants and toddlers in the U.S. and Mexico that have used a range of assessments and SES metrics have also

documented no relation between SES/maternal education and children's receptive, expressive, and word processing skills (Hurtado et al., 2008; Jackson-Maldonado et al., 2003; Tamis-LeMonda et al., 2012), providing support for this interpretation. Thus, maternal education might play a different role in English and Spanish development due to language input differences attributable to such cultural practices.

Alternatively, the results of this study may be related to the role of English as the majority language. Specifically, the English input that children receive from other sources in the environment – teachers, siblings, media, etc. – may interact with maternal education, producing a combined effect on English outcomes but not on Spanish ones. Indeed, English and Spanish tend to be used in different contexts and serve different functions among immigrant bilinguals in the U.S. (Baker & Wright, 2017): English is the language of schooling and of the wider society; the functions it serves and the variety of interlocutors it provides may produce more language learning opportunities and elicit lexically richer and grammatically more complex speech. On the other hand, Spanish is the language of the home, a context that may be characterized by simpler language, a more limited variety of interlocutors and result in flatter development (Hoff et al., 2018). Although our participants lived in primarily Spanish-speaking neighborhoods and had not experienced extensive exposure to the English-speaking community, it is possible that their English skills had already been affected by the role of English as the majority language. This is particularly plausible given that a link between maternal education and performance in English as a majority language has been documented across a wide range of ages and bilingual groups (Gathercole et al., 2016).

Finally, while we found no link between maternal school attainment and children's Spanish skills in a homogeneous sample of Mexican-origin mothers with limited education, it is

possible that such link exists at higher levels of schooling or in certain Latinx groups. Indeed, the mothers in Hoff et al.'s (2018) study, in which maternal education in Spanish was related to children's Spanish vocabulary, were college-educated women living in South Florida, a region characterized by large numbers of educated Cuban-Americans who benefit from greater acculturation, human capital, social acceptance, and community institutions than Mexican Americans in Southern California (Portes & Rumbaut, 2001). On the other hand, the studies that found no link between maternal education and children's Spanish outcomes focused on Mexican-American participants (DeAnda et al., 2016; Friend et al., 2017) and on more heterogeneous samples (Hammer et al., 2012) with more limited education (i.e. high school or less). Yet, as shown by Kuchirco and Tamis-LeMonda (2019), broad classifications of ethnicity and race mask important differences in parenting and language practices among different Latinx groups, which vary widely on race, culture, SES, country of origin, level of acculturation, and patterns of immigration. In particular, Kuchirco and Tamis-LeMonda (2019) found that Mexican mothers spoke more Spanish, used more gestures, had lower levels of education and of years living in the U.S. than Dominican mothers, factors that affected how they interacted with their children. Thus, we cannot exclude the possibility that maternal education may affect Spanish outcomes in other Latinx groups or with increased education.

A final important result of this study was that whereas English skills grew significantly over one year for children of more and less educated mothers, more limited growth was observed in Spanish; indeed, Spanish phonological and lexical measures remained quite unchanged between 3;6 and 4;6. This finding confirms the results of previous studies that document an accelerated growth in English after entering preschool but a deceleration in the development of Spanish among dual language learners growing up in the U.S. (Hoff, Quinn & Giguere, 2017;

Hoff et al., 2018; Montanari et al., 2018; Montanari et al., 2019; Ruiz-Felter, Cooperson, Bedore, & Peña, 2016; Hammer, Lawrence & Miccio, 2008). Despite this uneven development, there was no significant interaction of child age and maternal education for either English or Spanish language measures, suggesting that age and maternal education effects were independent of each other. This means that increased English skills did not mitigate the impact of maternal education on English outcomes found at 3;6. Likewise, limited growth in Spanish did not reveal a link between maternal level of schooling and linguistic performance as at preschool entry. Taken together, these results confirm that the link between maternal education and English outcomes may persist even with increased competence, while Spanish outcomes may be unaffected by maternal level of schooling even in the case of more limited development.

Educational Implications

The results of this study have important educational implications. Since even low levels of maternal education seem to affect children's English skills, educators, administrators, and policy makers should make a deliberate effort to obtain information on the parental educational background of young dual language learners and create interventions that promote English language and literacy among children from disadvantaged backgrounds and their families. Intervention should begin as early as possible, possibly in infancy, in order to limit the gap in English skills that are already evident in the first years of life. Special services should be provided not only to children but also to parents and caregivers, who would benefit from learning about child and language development and how to effectively engage children in language and literacy-related activities. Furthermore, since maternal education-related differences in children's English outcomes appear to persist throughout childhood, even with increased language competence and education, children and families from low-SES backgrounds should be provided

special English language and literacy intervention throughout the entire period of schooling, from infancy to adolescence. Such targeted intervention may not completely dissipate the early impact of limited maternal education on English abilities; yet, as early differences in oral language skills typically translate into progressively larger differences in language and literacy skills at later ages, it might help reduce the widening achievement gap between low- and high-SES students that has been documented in the literature (National Assessment of Educational Progress, 2013).

Conclusion, Limitations and Future Research

In conclusion, this study documented maternal education-related differences in the English and Spanish outcomes of low-SES, Mexican-origin Spanish-English bilingual preschoolers. The contribution of maternal education on English skills was evident even in the case of limited education as the mothers in this study had either completed primary or secondary school. Most importantly, although all mothers had completed their education in Spanish in Mexico, children of more educated mothers performed significantly better on all English measures than children of less educated mothers, suggesting that the language in which the mothers had attained their schooling did not mediate the relationship between maternal education and children's English outcomes. Contrary to this finding, maternal education was not related to children's Spanish outcomes as phonological, lexical and morpho-syntactic abilities were similar for children whose mothers had completed 6 versus 12 years of schooling in Spanish. We speculated that the association between maternal education and children's language outcomes may be complex and mediated not only by a variety of factors including the level of maternal acculturation and the status of each language, but also by the cultural values and practices associated with particular languages. Since Mexican culture values collectivism, cooperation and obedience, we

hypothesized that, when speaking Spanish, Mexican mothers, irrespective of their education, may have been more interested in socializing their children about politeness, respect, and collaboration than in expanding their vocabularies and self-expression abilities. Therefore, maternal education may play a different role in English versus Spanish development due to language input differences attributable to distinct cultural practices.

Although this study contributes to the expanding literature on the relationship between maternal education and children's linguistic performance, it has four limitations that should be considered when interpreting the results and planning future research. First, the sample in this study was small, limiting the generalizability of its findings. While past research with bilinguals as well as with Mexican-origin Spanish-speaking monolingual children has revealed similar findings, there are also a few larger-scale studies that have documented maternal-education-related differences in the lexical and grammatical abilities of Spanish-speaking children (Auza-Benavides, Peñaloza & Murata, 2019; Levine, Levine, Schnell-Anzola, Rowe & Dexter, 2012). We argued that since Latinx groups vary tremendously in terms of race, culture, SES, country of origin, level of acculturation, and patterns of immigration as well as parenting and language practices, it is possible that maternal education is related to children's Spanish language skills only in certain Latinx groups. Thus, future research should compare maternal education-related effects not only in larger samples but also in different Latinx groups.

Furthermore, our study only focused on mothers with limited education, possibly limiting detection of effects of higher education. Hoff (2003) 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 (in English), and Hoff and colleagues (2018) also found that mothers who attained a college degree in Spanish did increase their children's Spanish

vocabulary, suggesting that higher education may override cultural practices. Therefore, future research should examine this issue involving mothers with a wider range of educational backgrounds, possibly from no schooling to post-graduate degrees. In addition, since we only documented developmental changes within one year, future studies should examine language outcomes as related to maternal schooling over a longer period of time, possibly documenting changes from age 2, when home language should be even more dominant, to age 3, when exposure to English in preschool begins, to the onset of formal schooling in kindergarten. It is particularly important that future studies be longitudinal because only this methodology can reveal whether English exposure and instruction in the school setting can ultimately mitigate the strength of the link between maternal education and English abilities.

Despite these limitations, this study makes a meaningful contribution to the debate on the role of maternal education on Spanish-English bilingual children's language outcomes, suggesting that this role may not be universal but rather dependent on the cultural values and practices associated with particular languages.

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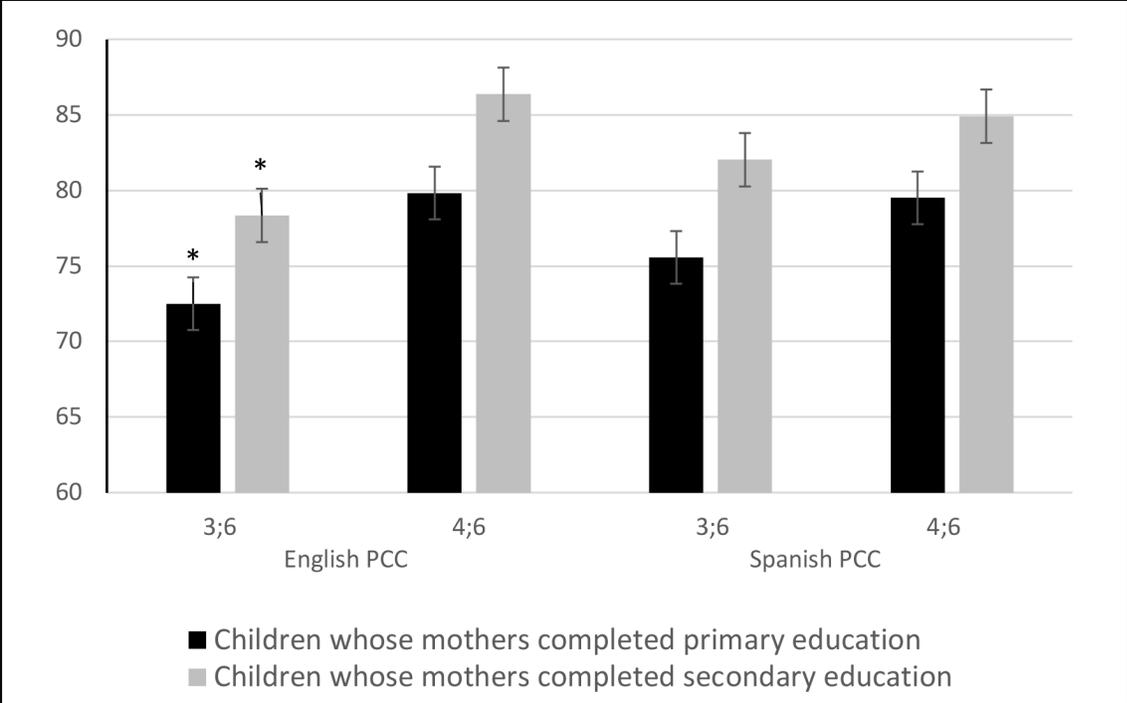


Figure 1. Percent of Consonants Correct-Revised (PCC-R) in English and Spanish at age 3;6 and 4;6 for children whose mothers completed primary education and children whose mothers completed secondary education (* = significant difference between groups).

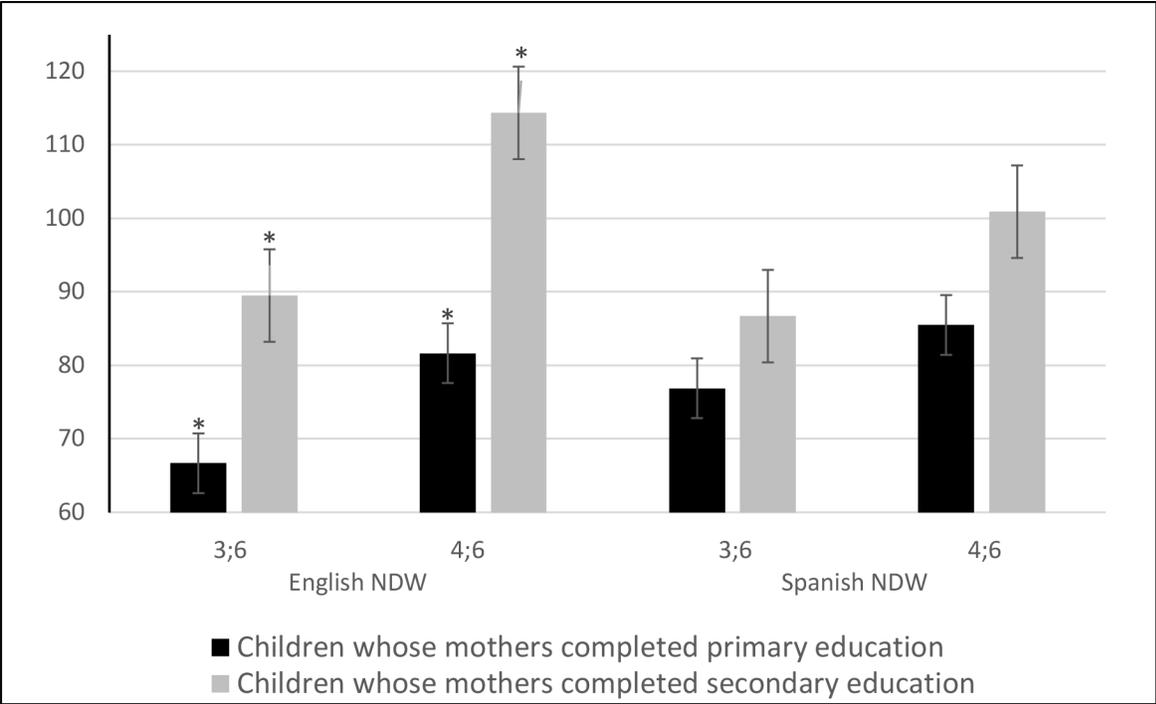


Figure 2. Number of Different Words (NDW) in English and Spanish at age 3;6 and 4;6 for children whose mothers completed primary education and children whose mothers completed secondary education (* = significant difference between groups).

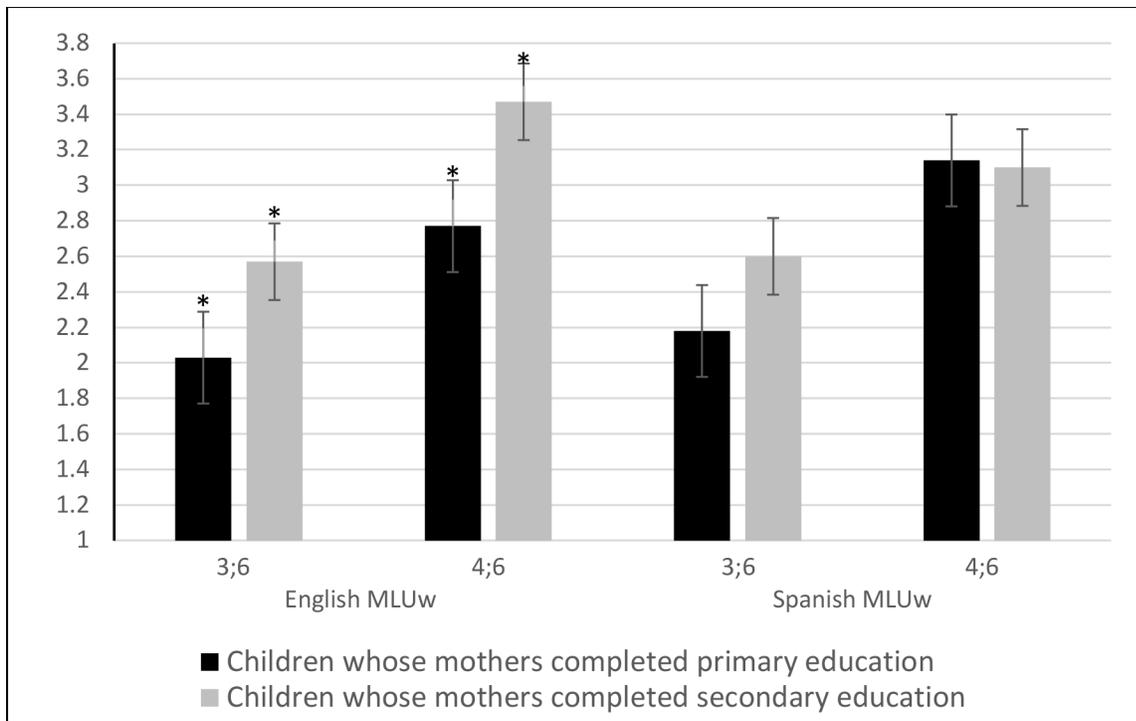


Figure 3. Mean Length of Utterance in words (MLUw) in English and Spanish at age 3;6 and 4;6 for children whose mothers completed primary education and children whose mothers completed secondary education (* = significant difference between groups).

Table 1. Participants and mothers' demographic and language use variables.

ID#	Gender	Age	Siblings	Home Language	L1	L2	Mother's Education	Mother's Origin and Place of Education	Years in the US	Occupational Status	Acculturation Index	Mother-to-Child Language
001	M	3;8	Yes	Spanish	Spanish	English	Primary	Michoacán (Mex)	20	Non-employed	-2.154	Mostly Spanish
002	M	3;9	Yes	Spanish	Spanish	English	Primary	Oaxaca (Mex)	14	Non-employed	-3.688	Spanish only
003	M	3;6	Yes	Spanish	Spanish	English	Primary	Guadalajara (Mex)	10	Employed	-2.267	Spanish only
004	M	3;7	Yes	Spanish	Spanish	English	Primary	Guadalajara (Mex)	21	Non-employed	-2.597	Spanish only
005	F	3;2	Yes	Spanish	Spanish	English	Primary	Puebla (Mex)	10	Non-employed	-1.846	Mostly Spanish
006	F	3;11	Yes	Spanish	Spanish	English	Primary	Zacatecas (Mex)	8	Non-employed	-2.448	Spanish only
007	M	3;11	Yes	Spanish	Spanish	English	Primary	Oaxaca (Mex)	14	Non-employed	-3.688	Spanish only
008	M	3;4	Yes	Spanish	Spanish	English	Primary	Michoacán (Mex)	12	Non-employed	-0.294	Spanish only
009	F	4;2	Yes	Spanish	Spanish	English	Primary	Oaxaca (Mex)	9	Non-employed	-2.941	Spanish only
010	M	4;1	Yes	Spanish	Spanish	English	Primary	Guerrero (Mex)	10	Non-employed	-2.511	Mostly Spanish
011	M	3;7	Yes	Spanish	Spanish	English	Secondary	D.F (Mex)	13	Non-employed	-1.032	Spanish only
012	F	3;9	No	Spanish	Spanish	English	Secondary	Guadalajara (Mex)	22	Employed	-0.095	Mostly Spanish
013	M	3;10	Yes	Spanish	Spanish	English	Secondary	Michoacán (Mex)	20	Non-employed	-2.041	Mostly Spanish
014	M	4;0	No	Spanish	Spanish	English	Secondary	Puebla (Mex)	6	Non-employed	-1.452	Spanish only
015	F	3;5	Yes	Spanish	Spanish	English	Secondary	D.F (Mex)	6	Non-employed	-1.054	Mostly Spanish
016	M	3;2	Yes	Spanish	Spanish	English	Secondary	Puebla (Mex)	12	Non-employed	-2.357	Spanish only
017	F	3;2	Yes	Spanish	Spanish	English	Secondary	Michoacán (Mex)	5	Employed	-2.629	Spanish only
018	M	3;8	Yes	Spanish	Spanish	English	Secondary	D.F (Mex)	18	Non-employed	-1.262	Mostly Spanish
019	M	3;11	Yes	Spanish	Spanish	English	Secondary	Michoacán (Mex)	22	Non-employed	-1.081	Spanish only
020	M	3;11	Yes	Spanish	Spanish	English	Secondary	Nayarit (Mex)	6	Non-employed	-3.285	Spanish only