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Brief Report

Developmental changes in maternal education and minimal exposure effects on vocabulary in English- and Spanish-learning toddlers

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ABSTRACT

The current research follows up on two previous findings: that children with minimal dual-language exposure have smaller receptive vocabularies at 16 months of age and that maternal education is a predictor of vocabulary when the dominant language is English but not when it is Spanish. The current study extends this research to 22-month-olds to assess the developmental effects of minimal exposure and maternal education on direct and parent-report measures of vocabulary size. The effects of minimal exposure on vocabulary size are no longer present at 22 months of age, whereas maternal education effects remain but only for English speakers.

Introduction

The current research follows up on two previous findings. First, children with minimal dual-language exposure have smaller receptive vocabularies at 16 months of age in the language of greatest

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exposure (i.e., dominant language) relative to their monolingual peers. Second, maternal education is a predictor of vocabulary when the dominant language is English but not when it is Spanish (DeAnda, Arias-Trejo, Poulin-Dubois, Zesiger, & Friend, 2016). We extend this research to 22-month-olds to determine whether these patterns hold 6 months later using both direct and parent-report measures of vocabulary size. The overarching aim of this study was to contrast the effects of maternal education and minimal dual-language exposure on lexical development in English learners in the United States and Spanish learners in the United States and Mexico.

Socioeconomic status and maternal education

Socioeconomic status (SES) reflects a range of factors, including education, income, and occupational prestige. In some studies of early language, researchers employ a broad measure of SES incorporating these factors. In other studies, researchers employ maternal education as a proxy for SES; maternal education is the component of SES that is most closely related to parenting (Hoff, Laursen, & Tardif, 2002) and is correlated with vocabulary development during early childhood (Dollaghan et al., 1999; Hoff, 2003). Furthermore, in one study of Venezuelan mothers, maternal education, controlling for childhood SES and maternal age, accounted for 30% of the variance in maternal communication (LeVine, LeVine, Schnell-Anzola, Rowe, & Dexter, 2012).

In English monolinguals, children from higher SES families have larger vocabularies on average than their lower SES peers by 18 months of age, a gap that widens by 24 months (Fernald, Marchman, & Weisleder, 2013) consistent with findings in language, literacy, and academic achievement (e.g., Hoff, 2013; Oller & Eilers, 2002). In English, the relation between SES and early language is mediated by maternal input (Hart & Risley, 1995; Hoff, 2003; Vernon-Feagans et al., 2008); SES predicts quantity and quality of maternal input, which correlates with early language.

The effects of SES and maternal education on vocabulary in Spanish-speaking children are less clear. One early study took place in the Mexican city of Cuernavaca during the early 1980s when female educational opportunities had been recently expanded (Richman, Miller, & LeVine, 1992). Maternal education was predictive of maternal responsiveness in mothers who had attained between 1 and 9 years of schooling. Specifically, more educated mothers were more likely to respond verbally to looks and vocalizations from their 10- and 15-month-old infants than were less educated mothers. In a follow-up study, LeVine et al. (2012) assessed a subset of these children when they were roughly $2^1/_2$ years old on four abilities: pointing to named parts of their bodies, identifying common objects (e.g., cup), following simple commands, and identifying the function of common objects (e.g., drink). These abilities were positively correlated with maternal education and with maternal responsiveness at 15 months of age.

In more recent findings, maternal education did not explain vocabulary growth in comprehension or production from 13 to 30 months of age on the Inventarios de Habilidades Comunicativas (IDHC; Jackson-Maldonado et al., 2003), a parent-report measure of Spanish vocabulary acquisition. The IDHC was normed on Spanish-learning children in Mexico whose mothers' education ranged, in large part, from no high school to college/university education. Similarly, DeAnda, Arias-Trejo et al. (2016) found that whereas maternal education was related to receptive vocabulary size in English-learning toddlers at 16 months of age, this was not the case for same-age Spanish-learning peers. Finally, Hurtado, Marchman, and Fernald (2008) found no effect of SES on expressive vocabulary, word processing, or maternal input in Spanish-learning toddlers at 18 and 24 months but did find an effect of maternal input on vocabulary at 24 months. In Dominican, Mexican, and African American children, Tamis-LeMonda, Song, Leavell, Kahana-Kalman, and Yoshikawa (2012) found an effect of maternal language at 24 months but found no effect of maternal education. Nevertheless, in another study, quantity of child-directed speech at 19 months did predict vocabulary and word processing 6 months later in Spanish-learning children (Weisleder & Fernald, 2013). Whereas the relation between maternal input and early language appears to be similar across studies and languages, the relation between maternal education and early vocabulary has not been found consistently.

One concern is that design considerations may contribute to this inconsistency in findings. For example, although a small sample size and low SES may have had limited detection of effects in Hurtado et al. (2008), the Jackson-Maldonado et al. (2003) study employing a larger, more

educationally diverse sample did not find an effect of maternal education on early Spanish vocabulary. Thus, sample size and SES distribution do not necessarily explain this inconsistency. However, there are two other possibilities. First, it is possible that even low levels of maternal education boost both maternal responsiveness and the acquisition of basic concepts (e.g., LeVine et al., 2012; Richman et al., 1992). In contrast, studies that have not found an effect of maternal education on the early vocabulary of Spanish learners use much broader measures of word knowledge, including different word classes and levels of difficulty. Relatedly, one commonality in many studies (e.g., Hurtado et al., 2008; Jackson-Maldonado et al., 2003; but cf. DeAnda, Arias-Trejo et al., 2016) is the use of parent report, which varies with culture (Hamilton, Plunkett, & Schafer, 2000) and SES (e.g., Feldman et al., 2000). Therefore, a second possibility is that broader cultural and SES effects on parent reporting mask the effect of maternal education on vocabulary. The current study overcomes this potential limitation by supplementing parent report with direct assessment of early vocabulary.

DeAnda, Arias-Trejo et al. (2016) speculated that maternal education may become explanatory later in Spanish speakers relative to English speakers. This idea follows from the observation that the effect of maternal input has not been found before 24 months of age in Spanish speakers (Hurtado et al., 2008; Tamis-LeMonda et al., 2012). It may be the case that the influence of both maternal education and maternal input emerge later in Spanish samples. In contrast to the previous studies, by the time Mexican American children are 4 years of age, maternal education and acculturation influence maternal interaction style (Livas-Dlott et al., 2010). Clarifying the relations among SES, maternal language, and child vocabulary is crucial; low-SES Latino children are at greater academic risk by the time they enter kindergarten relative to their White peers (Galindo & Fuller, 2010).

Minimal language exposure

Given that language exposure and expressive vocabulary are positively associated (e.g., Hoff et al., 2012; Pearson, Fernandez, Lewedeg, & Oller, 1997), of interest is how unbalanced exposure (i.e., minimal exposure to the nondominant language) affects dominant language vocabulary. At 16 months of age, toddlers from mid- to high-SES families with 80% exposure to English or Spanish had smaller dominant language vocabularies than children with 100% exposure (DeAnda, Arias-Trejo et al., 2016). Conversely, at 30 months of age toddlers from mid- to high-SES families with only 60% exposure to English possessed English vocabulary not statistically distinguishable from that of their monolingual peers (Cattani et al., 2014), and by 5 years children from high-SES families with English language exposure as low as 35% were not statistically distinguishable from their monolingual peers (Thordardottir, 2011). These findings suggest that the effect of minimal dual-language exposure on dominant language vocabulary narrows over time. This does not necessarily indicate that the majority language vocabulary of dual-language learners is equivalent to that of their monolingual peers; many dual-language learners perform well below their monolingual peers even at the thresholds reported above. Of interest in the current study was whether the influence of minimal dual-language exposure on dominant language acquisition narrows over time irrespective of majority status.

Study aims

This investigation follows up on previously studied English and Spanish learners 6 months later, at 22 months of age (DeAnda, Arias-Trejo et al., 2016). In the previous study, maternal education effects were present in English learners but not in Spanish learners at 16 months of age in their dominant language. Furthermore, children with only 20% or less dual-language exposure had smaller receptive vocabularies relative to their monolingual peers.

Our first aim was to investigate whether the vocabulary gap between children from high- and low-maternal education families is consistent over time in English learners. The second aim was to assess whether effects of maternal education on vocabulary emerge later in Spanish speakers. The third aim was to examine whether the difference in vocabulary size between monolingual children and those with minimal dual-language exposure narrows by 22 months of age.

Method

Participants

English learners in the United States

A total of 71 English-learning toddlers (37 girls; M_{age} = 23;1 [months;days], range = 21;6–25;12) from a large city in the southwestern United States participated. Of these 71 children, 28 had 100% English exposure and 43 had at least 80% exposure to English from birth (M = 94%, SD = .07). Average maternal education was some college (M = 15.4 years, SD = 2.08, range = 12–18), identical to the same sample at 16 months of age. Children were recruited through birth records, flyer postings, and community events.

Spanish learners in the United States

A total of 56 Spanish-learning toddlers (29 girls; M_{age} = 23;20, range = 21;0–27;15) from a large city in the southwestern United States participated. Of these 56 children, 4 had 100% Spanish exposure and 52 had at least 80% exposure to Spanish from birth (M = 90%, SD = .07). Average maternal education was 1 year of college (M = 13.09 years, SD = 0.32, range = 6–18) as compared with 12.6 years for the same sample at 16 months of age. Children were recruited using the methods above and tested in the same lab.

Spanish learners in Mexico

A total of 26 Spanish monolingual children from a large city in Mexico (Spanish exposure = 100%) were recruited for the current study (11 girls; M_{age} = 22;22, range = 20;27–24;24). Average maternal education for this sample was 2 years of college (M = 14.65 years, SD = 2.29, range = 8–18), identical to the same sample at 16 months of age. Children were recruited through flyer postings and tested in a lab in a large metropolitan city in Mexico. This sample was recruited to control for the language status of Spanish-speaking children in the United States and to evaluate effects over a broader range of maternal education. See Table 1 for a summary of exposure and maternal education demographics.

Measures

Language exposure assessment tool

The interview-based Language Exposure Assessment Tool (LEAT; DeAnda, Bosch, Poulin-Dubois, Zesiger, & Friend, 2016) yields four measures of exposure: hours per day, hours per week, percentage

Table 1
Descriptive statistics for maternal education and exposure categories across English and Spanish learners.

	M	*SD*	Range	*n*
English learners				
Maternal education				
≥4 years of college	16.9	0.96	16–18	44
<4 years of college	13.1[a]	1.13	12–15	27
Language exposure				
100% exposure to English	100	0	100	43
80–99% exposure to English	94[b]	6.50	80–99	28
Spanish learners				
Maternal education				
≥4 years of college	16.4	1.44	16–18	35
<4 years of college	11.57[a]	2.63	6–15	47
Language exposure				
100% exposure to Spanish	100	0	100	30
80–99% exposure to Spanish	89[b]	7.02	80–99	52

Note. Values with the same superscript differ at $p < .05$. All children in the monolingual groups had 100% exposure to English or Spanish, respectively, thereby resulting in absent measures of distribution shape (i.e., *SD* and range).

exposure, and a parent estimate. The parent estimate is independent from the estimates derived from careful weighting of the child's language exposure and, thus, provides a check on how well the LEAT is capturing the child's language environment. Internal consistency across these measures is excellent (Cronbach's $\alpha = .96$). Percentage exposure predicts relative vocabulary size in bilingual toddlers above and beyond maternal education, age, and parent estimates. Exposure to English and Spanish was determined by weighting hours of exposure by duration of exposure from birth for each input source.

Computerized comprehension task

The English and Spanish adaptations of the Computerized Comprehension Task (CCT) were employed to assess vocabulary comprehension (Friend & Keplinger, 2008; Friend, Schmitt, & Simpson, 2012). The English CCT was developed and tested in the United States, whereas the Spanish CCT was developed and tested in the United States and Mexico. Both adaptations yield good test–retest reliability ($r = .70$), and the English CCT converges with parent-reported vocabulary ($r = .64$). Test–retest reliability is good across languages, and responses on the CCT are nonrandom (Friend & Keplinger, 2008; Friend & Zesiger, 2011; Hendrickson, Mitsven, Poulin-Dubois, Zesiger, & Friend, 2015). Both adaptations have excellent internal consistency across forms (English: Cronbach's αs = .91 and .95, respectively; Spanish: Cronbach's αs = .94 and .90, respectively; DeAnda, Arias-Trejo et al., 2016).

The CCT consists of 4 training, 41 test, and 13 reliability forced-choice trials. The assessment is experimenter controlled. Image pairs were matched for word difficulty, part of speech, category, and visual salience. Pairs of images appear on a touchscreen monitor following the first mention of the target word in a prompt (e.g., "Where is the shoe? Touch shoe."). Vocabulary size is operationalized as the sum of target touches across trials.

MacArthur–Bates communicative development inventory

The MacArthur–Bates Communicative Development Inventory (MCDI; Fenson, Marchman, Thal, Dale, Reznick, & Bates, 2006), a widely used parent-report measure, was used to assess vocabulary production. The Words and Gestures (WG) and Words and Sentences (WS) versions were used at 16 and 22 months of age, respectively. The MCDI has strong internal consistency, test-retest reliability, and convergent validity (Fenson et al., 1994). The Inventarios del Desarollo de Habilidades Comunicativas (IDHC; Jackson-Maldonado et al., 2003) were used to assess Spanish vocabulary. Like the MCDI, the IDHC has strong internal consistency, test-retest reliability, and good concurrent validity. To assess vocabulary change on the MCDI/IDHC from 16 to 22 months of age, we used expressive vocabulary raw scores. We calculated a difference score based on the 396 words in common across the WG and WS forms. This subset of items was highly correlated with the full WS forms [MCDI: $r(71) = .99$, $p < .001$; IDHC: $r(79) = .95$, $p < .001$].

Procedure

Participants completed identical visits at 16 and 22 months of age. Children completed the CCT on their parent's lap. Parents wore sound-cancelling headphones and blacked-out glasses to prevent cueing. Following the CCT, parents completed the MCDI/IDHC. All children were assessed in their dominant language only. Following Gutierrez-Clellen and Kreiter (2003), Pearson et al. (1997) and Fiestas and Peña (2004), we did not assess nondominant language vocabulary due to exposure levels sufficiently low (6–11%) to invalidate assessment.

Categorization of maternal education and exposure

All children were assigned to either the higher maternal education group if mothers completed at least 16 years of schooling or the lower maternal education group if mothers completed less than 16 years. This demarcates college completion, is supported by previous investigations on maternal education effects on early language (e.g., Hoff, 2003), and corresponds to the median maternal education across samples. Furthermore, this categorization resulted in a relatively even split in both the English- and Spanish-learning samples. The difference in educational attainment between the Spanish learners ($M = 11.6$ years) and English learners ($M = 13.1$ years) in the lower maternal education group was

significant, $t(71) = 3.89$, $p < .001$. Maternal education did not differ significantly across samples for the higher maternal education groups (see Table 1; $p = .06$).

To examine the influence of minimal exposure on vocabulary, children were split into monolingual and dual-language groups. Average dual-language exposure was 6% lower in English speakers than in Spanish speakers, $t(96) = 4.67$, $p < .001$. Finally, maternal education and exposure were uncorrelated in both samples ($ps > .17$).

English learners

For the higher maternal education group, education was equivalent to college completion ($n = 43$; $M = 16.9$ years, range = 16–18). For the lower maternal education group, education was equivalent to 1 year post-high school ($n = 27$; $M = 13.09$ years, range = 12–15).

Spanish learners

An omnibus analysis of covariance (ANCOVA) with maternal education, exposure, and age at the 22-month visit as covariates, CCT form (2), sex (2), and test site (United States or Mexico) as between-participants factors, and CCT comprehension and MCDI production as dependent measures revealed an effect of age, $F(1, 74) = 16.19$, $p < .001$, $\eta_p^2 = .18$, and no other significant effects (all $ps > .19$). Thus, the Mexican and U.S. samples were combined to exploit the full range of maternal education (6–18 years) and exposure (0–20%). The higher maternal education group had an average of 16.4 years of schooling ($n = 35$, range = 16–18 years). The lower maternal education group had an average of 11.57 years of schooling ($n = 47$, range = 6–15 years).

Results

English learners

CCT and MCDI scores spanned the full range of the scales (CCT: $M = 26.76$, $SD = 7.70$, range = 0–39; MCDI: $M = 48.53$, $SD = 28.86$, range = 1st–98th percentile) and were normally distributed. Scores on the CCT converged with MCDI production at 22 months, $r(71) = .41$, $p < .001$, even when controlling for maternal education, $r(71) = .37$, $p = .002$. Internal consistency on the CCT was excellent across forms (Cronbach's αs = .86 and .96, respectively), and immediate test–retest reliability was good, $r(65) = .61$, $p < .001$. An independent t test revealed no effect of form ($p = .36$). To evaluate vocabulary growth from 16 to 22 months, difference scores were calculated for the CCT and MCDI, yielding (for each measure) an estimate of how many words toddlers knew at 22 months relative to 16 months from the same initial set (see Table 2). Vocabulary growth and size were correlated at 22 months across measures [CCT: $r(71) = .643$, $p < .001$; MCDI: $r(71) = .38$, $p < .001$].

Receptive vocabulary

We conducted an ANCOVA on CCT scores with maternal education and exposure groups as between-participants factors and age as the covariate. There was a significant main effect of maternal education, $F(1, 65) = 9.47$, $p = .003$, $\eta^2 = .08$, replicating the previously reported effect at 16 months and no other significant effects ($ps > .10$). The maternal education disparity observed in receptive vocabulary at 16 months was also observed in expressive vocabulary at 22 months. We examined vocabulary growth using an identical model but with the CCT difference score as the dependent variable. This model yielded no significant effects (all $ps < .11$; see Table 2 for descriptive statistics).

Expressive vocabulary

Parallel analyses on MCDI scores mirrored the receptive vocabulary findings. There was a marginal effect of maternal education, $F(1, 65) = 3.26$, $p = .08$, $\eta^2 = .05$, but no effect of exposure and no interaction ($ps > .29$). For vocabulary growth, there were no significant effects ($ps > .19$). Across receptive and expressive vocabulary, neither maternal education nor exposure predicted the number of new words that children acquired between 16 and 22 months of age. Nevertheless, a maternal education disparity in vocabulary size remained at 22 months.

Table 2
Means (and standard deviations) for MCDI and CCT vocabulary size at 16 and 22 months of age for English and Spanish learners.

	Expressive vocabulary (MCDI/IDHC)		Receptive vocabulary (CCT)	
	16 months	22 months	16 months	22 months
English learners				
Maternal education				
≥4 years of college	49.49 (57.90)	274.28 (171.13)	13.30 (7.90)	29.09 (6.36)
<4 years of college	27.48 (21.73)	202.48 (131.03)	9.17 (6.76)	24.19 (7.46)
Language exposure				
100% exposure to English	50.04 (56.31)	267.30 (171.67)	13.26 (7.91)	27.56 (8.20)
80–99% exposure to English	22.92 (13.69)	220.14 (137.27)	8.6 (6.32)	25.68 (7.18)
Overall	40.63 (47.82)	248.70 (159.65)	11.64 (7.68)	26.82 (7.81)
Spanish learners				
Maternal education				
≥4 years of college	20.30 (35.98)	165.80 (211.76)	8.90 (5.00)	18.77 (9.28)
<4 years of college	42.67 (63.20)	179.98 (182.51)	9.36 (6.52)	17.29 (7.72)
Language exposure				
100% exposure to Spanish	42.78 (66.57)	187.32 (136.29)	10.04 (6.82)	18.68 (8.06)
80–99% exposure to Spanish	24.47 (36.54)	168.04 (223.14)	8.03 (4.48)	17.46 (8.69)
Overall	35.12 (56.45)	175.51 (194.74)	9.20 (6.01)	17.90 (8.39)

Note. MCDI, MacArthur–Bates Communicative Development Inventory; IDHC, Inventarios del Desarollo de Habilidades Comunicativas; CCT, Computerized Comprehension Task.

Spanish learners

CCT and MCDI scores spanned nearly the full range of the scale (CCT: $M = 18.12$, $SD = 8.20$, range = 1–38; IDHC: $M = 31.04$, $SD = 28.11$, range = 1st–93rd percentile). Scores on the CCT correlated with MCDI vocabulary production, $r(81) = .27$, $p = .02$, even when controlling for maternal education, $r(81) = .28$, $p = .01$. Internal consistency on the CCT was excellent across forms (Cronbach's αs = .87 and .97, respectively), immediate test–retest reliability was good, $r(63) = .62$, $p < .001$, and there was no effect of form ($p = .23$). Vocabulary growth and size at 22 months were significantly correlated across measures [CCT: $r(71) = .749$, $p < .001$; IDHC: $r(84) = .780$, $p < .001$].

Receptive vocabulary

An ANCOVA with age as a covariate, maternal education and exposure groups as between-participants factors, and CCT score at 22 months as the dependent variable was conducted. There were no significant effects (all ps > .23) for this model and no significant effects for vocabulary growth (all ps > .19).

Expressive vocabulary

Parallel analyses on the IDHC yielded marginal effects of age, $F(1, 77) = 3.87$, $p = .05$, $\eta^2 = .05$, and exposure, $F(1, 77) = 3.86$, $p = .05$, $\eta^2 = .05$, but no effect of maternal education ($p = .37$) and no interaction ($p = .62$). With respect to growth, there was an effect of age, $F(1, 72) = 4.65$, $p = .03$, $\eta^2 = .06$ (see Table 2), and a marginal effect of exposure, $F(1, 72) = 4.12$, $p = .05$, $\eta^2 = .05$, but no other significant effects (all ps > .47).

Discussion

Our first goal was to investigate whether the maternal education gap in vocabulary size observed at 16 months of age in English learners (DeAnda, Arias-Trejo et al., 2016) is maintained 6 months later at 22 months. Indeed, at 22 months, children with more educated mothers had larger receptive *and* expressive vocabularies relative to children with less educated mothers. Consistent with the

Huttenlocher, Waterfall, Vasilyeva, Vevea, and Hedges (2010) finding of an SES gap in language sample lexical diversity from 26 to 46 months, we found that a gap in vocabulary size as a function of maternal education is present earlier, between 16 and 22 months. Furthermore, this finding is consistent with Fernald et al.'s (2013) report of a gap in vocabulary size and speed of processing as a function of SES by 18 months. Direct measures of vocabulary, processing speed, and lexical diversity converge in revealing a performance gap over time for children from high-SES versus low-SES households. In the current study, the effect of maternal education was consistent across receptive and expressive vocabulary and across direct and parent-report assessments (cf. Fernald et al., 2013).

Our second goal was to assess whether maternal education acquires explanatory power, similar to that observed in English speakers, later in Spanish speakers. Maternal education effects were not present at 22 months of age in Spanish speakers across receptive and expressive vocabulary and across direct and parent-report assessments. One conclusion that we can draw is that the inconsistency of findings on the role of maternal education in early Spanish vocabulary cannot be attributed to the use of parent report. Rather, across direct and parent-report measures, the effect of maternal education is present for English vocabulary but not Spanish vocabulary during the second year of life. The possibility remains that maternal education supports children's learning of basic concepts (e.g., LeVine et al., 2012; Richman et al., 1992) but might not account for vocabulary acquisition more broadly (e.g., inclusive of both early and later emerging nouns, verbs, and descriptive and function words) in Spanish speakers during the first 2 years (Hurtado et al., 2008; Jackson-Maldonado et al., 2003). Our findings suggest that the influence of maternal education on early vocabulary does not emerge in the same way across Spanish- and English-learning toddlers.

We consider three complementary explanations. First, the effect of maternal education may emerge later still for Spanish learners with the emergence of a relation between maternal education and other parenting behaviors. For example, in Dominican, Mexican, and African American mothers, maternal education is related to maternal referential language at 2 years of age but not earlier (Tamis-LeMonda et al., 2012), and both maternal education and acculturation influence parenting style in Mexican American mothers by the time children are 4 years of age (Livas-Dlott et al., 2010).

A second related possibility is that culture influences the timing and style of parent–infant interaction. For example, Tamis-LeMonda, Kuchirko, and Song (2014) reported that maternal responsiveness to children's attention bids varies with culture. Thus, cultural variation in parenting practices may contribute to variation in early vocabulary development.

Finally, both the number of years that mothers have lived in the United States and maternal vocabulary growth (in Spanish or English) predict children's vocabulary growth from 2 to 5 years of age, but maternal education does not (Tamis-LeMonda et al., 2014). Thus, maternal vocabulary may hold greater explanatory power than maternal education with regard to early language outcomes.

Our final goal was to investigate whether our previous finding of an attenuation of dominant language vocabulary size at 16 months of age as a function of minimal dual-language exposure is reduced by 22 months across languages. We found that the gap in receptive and expressive vocabulary was no longer present even though relative language exposure remained unchanged. By 22 months, children are comparable in their dominant language vocabulary size (either Spanish or English) to their monolingual peers. This suggests that the exposure threshold to achieve monolingual vocabulary in the dominant language of exposure declines rapidly during early childhood.

Summary and conclusion

This study contributes to our understanding of the influence of language exposure and maternal education on early vocabulary in two languages. Our findings extend previously documented effects of maternal education in English language production to the receptive domain, influencing language acquisition as early as 16 months of age. However, the effect of maternal education on vocabulary acquisition in Spanish-learning toddlers is less clear. It is possible that this effect emerges later in Spanish speakers and that cultural factors may mediate the explanatory power of SES with regard to earlier language outcomes. This is of particular interest given the importance of SES to academic achievement in Latino children. In contrast, the effects of relative language exposure apply across

languages. Children with minimal dual-language exposure caught up to their monolingual peers in their dominant language by 22 months despite having a significantly smaller receptive vocabulary at 16 months. The current findings highlight the effects of maternal education and the changing influence of language exposure on early acquisition developmentally and across languages.

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Supplementary material

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