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Maternal Cultural Orientation and Speech Sound Production in Spanish/English Dual Language Preschoolers

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Abstract: Empirical work has shown that maternal education is related to children's language outcomes, especially in the societal language, among Spanish-English bilingual children growing up in the U.S. However, no study thus far has assessed the links between maternal cultural orientation and children's speech sound production. This paper explores whether mothers' orientation to American (*acculturation*) and Mexican culture (*enculturation*) and overall linear acculturation are related to children's accuracy of production of consonants, of different sound classes, and of phonemes shared and unshared between languages in both English and Spanish at age 4;6 (4 years and 6 months). The results reveal a link between maternal acculturation and children's segmental accuracy in English, but no relation was found between mothers' enculturation and children's speech sound production in Spanish. We interpreted the results in English as suggesting that more American-oriented mothers may have been using more English with their children, boosting their English production abilities and promoting English speech sound development. At the same time, we speculate that the results in Spanish were possibly due to the high and homogeneous levels of Mexican orientation among mothers, to language input differences attributable to distinct cultural practices, or to the status of Spanish as a minority language.

Keywords: maternal acculturation; maternal enculturation; speech sound production; Spanish-English bilingual preschoolers

1. Introduction

Considerable empirical work has demonstrated that maternal characteristics such as maternal education are strong predictors of language outcomes in young dual language learners. Specifically, a large body of work has shown that maternal education is related to children's phonological, lexical, and grammatical measures throughout development, especially in the societal language, among Spanish-English bilingual children growing up in the U.S. (Bohman et al. 2010; De Anda et al. 2016; Friend et al. 2017; Hammer et al. 2012; Hoff et al. 2018; Montanari et al. 2020; Place and Hoff 2016). For instance, De Anda et al. (2016) found that maternal educational attainment was significantly related to the English comprehension and production vocabularies of infants growing up in English-dominant bilingual homes, and these results were replicated by Friend et al. (2017) when the same children were tested at 22 months of age. In another study, Place and Hoff (2016) also documented positive correlations between maternal education and English comprehension, productive vocabulary, and, additionally, grammatical skills in Spanish-English bilingual children at 30 months of age. Furthermore, in a more recent investigation comparing the speech and language skills of Spanish-English bilingual children whose mothers had completed secondary school vs. children whose mothers had only attended primary school, Montanari et al. (2020) found that the children of more educated mothers performed

significantly better than children of less educated mothers not only on English lexical and grammatical measures but also on speech sound production at age 3;6 (3 years and 6 months), suggesting that maternal level of schooling affects not only children's language but also speech abilities.

Interestingly, the majority of previous studies have found 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. Specifically, while research has shown clear links between maternal education and children's English outcomes, mothers' school attainment has not been found to be related to Spanish outcomes, at least in De Anda et al. (2016), Friend et al. (2017), and Place and Hoff (2016). By controlling the language in which mothers received their education, Hoff et al. (2018) found that maternal school attainment in English was significantly related to children's English but not to Spanish vocabulary between 30 and 60 months, and maternal level of education in Spanish predicted children's Spanish but not English lexical skills between the same ages. In contrast, all mothers in Montanari et al. (2020) were educated in Spanish in Mexico, and therefore, the language in which the mothers had received their education did not explain the differences in English speech and language outcomes between children of more and less educated mothers.

Montanari et al. (2020) speculated that characteristics other than the language of mothers' schooling may mediate the relationship between general maternal education and children's English abilities. As noted by the authors (p. 12), "acculturation, language experiences, and literary practices may differ in homes where mothers have completed more schooling, irrespective of the language in which such schooling has occurred". For example, more educated mothers may be more acculturated to Anglo-American culture, and, therefore, they may engage their children more in language and literacy learning opportunities in English than less educated mothers. Although all mothers in Montanari et al. (2020, p. 5) exhibited a "Very Mexican Orientation" according to the Acculturation Rating Scale for Mexican Americans-II (ARSMA-II, Cuéllar et al. 1995) and acculturation scores for more and less educated mothers were not statistically different, it is possible that the more educated mothers promoted their children's English skills to a greater extent than the less educated ones.

Unfortunately, very few studies have examined Spanish-English bilingual children's language outcomes as related to mothers' levels of *acculturation* (i.e., orientation to American culture) and *enculturation* (i.e., orientation to Latino culture) (Gonzales et al. 2004). Boyce et al. (2013) examined the relationship between different maternal factors, including maternal acculturation, and Spanish-English dual language learners' total vocabulary size (i.e., including both English and Spanish words) at 24 and 36 months. The authors found that both maternal acculturation and home language/literacy environment were each related to children's total vocabulary at 24 months. Moreover, a positive significant correlation was found between maternal acculturation measured at 24 months and children's total word knowledge at 36 months. Cote and Bornstein (2014) similarly examined the relationship of maternal acculturation to the productive vocabularies of bilingual American 20-month-old children born to Korean, Japanese, and South American immigrant mothers from Argentina, Colombia, and Peru. The authors found that mothers' acculturation level when their child was five months of age was positively related to his/her vocabulary size in English at 20 months. Path analyses further demonstrated that exposure to English partially mediated the relation between mothers' acculturation level and children's English vocabulary size in that mothers who were more acculturated to American culture exposed their children to more English, which, in turn, resulted in larger English vocabularies for their children. On the other hand, more enculturated immigrant mothers (i.e., more oriented to their heritage culture) exposed their children more to their heritage language, which, in turn, resulted in larger vocabularies in that language for their children. Heritage language exposure fully mediated the effect of acculturation on heritage language vocabulary size.

While these studies have documented a link between maternal cultural orientation and children's language outcomes, no research thus far has examined whether mothers' levels of acculturation and enculturation also affect children's ability to produce speech sounds in both English and the heritage language. As pointed out above, maternal characteristics such as socio-economic status (SES) and maternal education have been found to affect not only language but also speech outcomes in both monolingual and bilingual children. For instance, Campbell et al. (2003) found that English monolingual children whose mothers had attained limited education were 2.5 times more likely to display speech delay compared to children of more educated mothers. Similarly, in a large sample of almost 1500 monolingual English-speaking children from Australia (Eadie et al. 2015), the prevalence of speech sound disorders was partially predicted by SES and maternal education, and children whose mothers had a college or postgraduate degree were half as likely to have a speech sound disorder compared to children whose mothers had completed less than 12 years of schooling. Montanari et al. (2020) further found that children of more educated mothers had higher English consonant accuracy than children of less educated mothers at age 3;6. However, the English speech sound production abilities of both groups of children were no longer different one year later after one year of exposure to English in the preschool setting, and maternal education was not related to children's Spanish phonological accuracy at either age.

It is the goal of this study to examine the link between children's English and Spanish speech sound production skills during the preschool years and (a) maternal orientation to American culture (acculturation), (b) maternal orientation to Mexican culture (enculturation), and (c) maternal linear acculturation, a single measure of cultural orientation that takes both American and Mexican orientation into account (Cuéllar et al. 1995). We focus on preschoolers at age 4;6 to explore (1) whether speech sound production in English is related to mothers' American orientation and overall acculturation at an age when prior work suggests that maternal education no longer plays a role and (2) whether maternal orientation to Mexican culture and overall acculturation, unlike educational attainment, are linked to children's ability to produce speech sounds in Spanish at an age when children have begun their own acculturation process through preschool.

In order to assess whether maternal cultural orientation contributes differently to the production of distinct English and Spanish sounds, we base our analysis on the speech production measures that have been widely used to assess bilingual phonological skills in previous studies and to identify typical and atypical development (e.g., Bunta et al. 2009; Cooperson et al. 2013; Fabiano-Smith and Goldstein 2010a, 2010b; Gildersleeve-Neumann et al. 2008, 2009; Goldstein and Bunta 2012; Goldstein et al. 2010; Keffala et al. 2020; Kehoe and Girardier 2020; Montanari et al. 2018; Ruiz-Felter et al. 2016): (a) overall accuracy of consonant production ("Percentage of Consonants Correct-Revised", PCC-R, Shriberg et al. 1997), (b) accuracy of production of different sound classes, and (c) accuracy of production of phonemes "shared" and "unshared" between English and Spanish. Shared phonemes include segments that are phonetically similar (despite differences in fine phonetic detail) and present in both languages such as stops, most nasals (/m/ and /n/), and some fricatives (/f/ and /s/). Unshared phonemes include language-specific segments that do not have phonetically similar equivalents in the other language, such as the Spanish trill or English /v/, /θ/, or /z/. Previous research has shown that Spanish L1 children successfully rely on many Spanish consonants in their acquisition of phonetically similar segments in L2 English, producing shared sounds with significantly higher accuracy than unshared sounds (Montanari et al. 2018; Scarpino 2011). Indeed, according to the *Unified Competition Model* (MacWhinney 2005), phonological properties that are common across languages—such as shared segments—produce frequent and reliable speech cues, leading to rapid development—or *positive transfer* (Goldstein and Bunta 2012)—of these properties in both languages. On the other hand, properties that are unique across languages—such as unshared sounds—produce less frequent and less strong cues, leading to *negative transfer* and protracted development with these segments (Goldstein and Bunta 2012). Importantly,

the observed developmental benefits of phonologically shared categories do not preclude cross-linguistic interactions from taking place at the phonetic level. Indeed, there is an abundance of evidence that similar but non-identical L2 sounds are equated with their closest L1 counterparts, resulting in merged representations (e.g., Aoyama et al. 2004; Simonet 2010), in line with Flege's *Speech Learning Model* (SLM, Flege 1995; Flege and Bohn 2021). However, since the present study is situated within an auditory-based approach to children's phonological development and focuses on shared versus unshared *phonemes*, children's realizations in terms of fine phonetic detail are not considered here.

Therefore, based on MacWhinney's (2005) model, we predicted that maternal acculturation—if mediated by language use—may be more strongly correlated with children's accuracy with English-only phonemes than with items shared between Spanish and English since the acquisition of the former depends exclusively on English input. Likewise, mothers' Mexican orientation—and possibly increased Spanish use—should be more strongly related to children's accuracy with Spanish-only phonemes than with common segments based on the premise that the former are uniquely acquired through exposure to Spanish.

2. Materials and Methods

2.1. Participants

The data for this study come from a larger longitudinal investigation of dual language development in low-SES Spanish L1/English L2 bilingual preschoolers from Southern California. We focused on the same 20 children from Montanari et al. (2020) as well as 17 additional children (for a total of 37 children, 21 girls, and 16 boys) at age 4;6 (range: 4;0–5;2) for whom both speech sound production and maternal acculturation data were available. Information collected through a detailed parent questionnaire administered in Spanish indicated that all children were developing typically and had no hearing, speech, language, cognitive, or neurological deficits. All children were born in the U.S. but came from Spanish-speaking, Mexican-origin families who had been living in Los Angeles County for approximately 14 years (range = 6–24). Spanish was the primary home language, the language spoken by each mother to her child, and the children's native language. However, all participants were born in the U.S.; thus, they had also been exposed to English as a second language through siblings, the media, the Head Start program they had been attending for a year, and the larger community. All children were from low-SES backgrounds as evidenced by their participation in the Head Start program, which is aimed at promoting school readiness among children from low-income families. Indeed, all children's mothers had limited education with one-third of them having attained only six years of schooling (*educación primaria*, "primary education") and the remaining having completed high school (*la escuela preparatoria*) in Spanish in Mexico. All mothers rated their Spanish as "native" and "their strongest language", whereas their proficiency in English was predominantly rated as "limited". The vast majority of the mothers were not employed at the time of the study and thus took care of their child.

2.2. Data Collection: Materials

The children's speech sound production abilities were assessed by examining phonological accuracy in single-word samples elicited with the phonology subtest of the Bilingual English Spanish Assessment (BESA; Peña et al. 2014), a standardized, norm-referenced test that has been widely used to assesses phonological skills in Spanish-English dual language learners and identify typical and atypical development (Bunta et al. 2009; Cooperson et al. 2013; Fabiano-Smith and Goldstein 2010a, 2010b; Goldstein and Bunta 2012; Goldstein et al. 2010; Montanari et al. 2018; Ruiz-Felter et al. 2016). The test contains 31 target items for English and 28 target items for Spanish that are elicited through high-quality pictures. These items vary in length and lexical stress pattern and target all English and Spanish consonants (except for /ʒ/ in English) in different word positions, for a total of 47 English consonant tokens (15 plosives, 9 nasals, 12 fricatives, 3 affricates, and 8 approximants) and

54 Spanish consonant tokens (14 plosives, 7 nasals, 17 fricatives, 1 affricate, 3 flaps, 6 trills, and 6 approximants). Note that the Spanish consonantal inventory is more limited than the English one, as it only displays the voiced and voiceless labial, dental and velar stops, three nasals[1] (/m, n, ɲ/), the fricatives /f, s, β[2], ð, ɣ, x/, the affricate /tʃ/, the alveolar flap and trill, and the approximants /l, w, j/ (Goldstein 2001).

Mothers' acculturation and enculturation levels were assessed by the Acculturation Rating Scale for Mexican Americans-II (ARSMA-II, Cuéllar et al. 1995), a measure that allows for the independent assessment of an individual's involvement with Anglo-American culture ("acculturation") and Mexican culture ("enculturation"). The ARSMA-II contains two scales that can be used separately. Scale 1 measures Anglo-American orientation (AOS) and Mexican orientation (MOS). Scale 2 measures the concepts of marginality and separation. For the purpose of this study, only Scale 1 was used. This scale includes 30 questions assessing the following cultural domains: (1) language use and preference; (2) ethnic identity and classification; (3) cultural heritage and ethnic behaviors; and (4) ethnic interaction. The AOS contains 13 questions and the MOS 17 questions. Each question is scored on a Likert scale from 1 (*not at all*) to 5 (*extremely often or almost always*). For each participant, a mean AOS score is calculated by adding the scores of the 13 items and dividing the sum by 13. Similarly, a mean MOS score is obtained by adding the scores of the 17 items and dividing it by 17. Higher AOS and MOS scores represent higher orientation to American and Mexican culture, respectively, whereas lower scores represent less cultural orientation. Besides giving an acculturation and enculturation score, the ARSMA-II also generates a linear continuous measure of acculturation that can be obtained by subtracting the mean MOS score from the mean AOS score. This single cultural orientation measure places an individual within one of five acculturative categories along a continuum. Level 1 represents a "Very Mexican Orientation" (mean < −1.33); Level 2 represents "Mexican Oriented to Approximately Balanced Bicultural" individuals (mean ≥ −1.33 and ≤ −0.07); Level 3 represents a "Slightly Anglo Oriented Bicultural" orientation (mean > −0.07 and <1.19); Level 4 represents a "Strongly Anglo Oriented Bicultural" orientation (mean ≥ 1.19 and <2.45); and Level 5 represents "Very Assimilated or Anglicized Individuals" (mean > 2.45) (Cuéllar et al. 1995). Reliability and test–retest reliability for ARSMA-II scales are high as indicated by correlations for the AOS and MOS −0.83 and 0.88, respectively (Cuéllar et al. 1995). Correlations between acculturation scores from the original ARSMA and those from the ARSMA-II have further revealed strong construct and concurrent validity as well as high convergent validity for the ARSMA-II, suggesting that it is a valid and reliable measure to assess acculturation among Mexican-Americans (Jimenez et al. 2010).

2.3. Data Collection: Procedure

The BESA was administered at the preschool in the fall of children's second year in the Head Start program. Children were asked to name the object depicted in each picture. In the case of no response, children were first given prompts, and then they were allowed to provide a delayed imitation, as in previous studies (e.g., Cooperson et al. 2013; Fabiano-Smith and Goldstein 2010a, 2010b; Gildersleeve-Neumann et al. 2008, 2009; Goldstein and Bunta 2012; Goldstein et al. 2010; Keffala et al. 2020; Montanari et al. 2018; Ruiz-Felter et al. 2016), since only negligible differences have been found between spontaneous and imitated responses in single-word phonology tests (Goldstein et al. 2004). Each session was administered in one language at a time by different research assistants who were native speakers of English and Spanish and only interacted with the child in the language of testing. Half the children were administered the BESA in Spanish first, while the other half were tested in English first.

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[1] Although the velar nasal exists in Spanish as a conditional allophone, we followed previous studies (e.g., Montanari et al. 2018; Fabiano-Smith and Goldstein 2010b) and did not code it as a sound shared between English and Spanish because it is phonemic in English but allophonic in Spanish.

[2] Although the spirants /β, ð, ɣ/ are typically considered allophones of /b, d, g/, we included them in the analysis in line with most recent studies (Montanari et al. 2018; Fabiano-Smith and Goldstein 2010b), since these sounds have been argued to constitute the underlying form and not the phonetic realization of the stops (Barlow 2003).

Samples were recorded using an Edirol R-09HR High-Resolution WAVE/MP3 recorder and a desktop microphone close to the child. Each sample was independently transcribed by the first author and by two separate Spanish/English bilingual research assistants in narrow phonetic transcription, using the conventions of the International Phonetic Alphabet (International Phonetic Association 1999). Inter-rater reliability, calculated for 100% of the target consonants, was 96% for Spanish and 94% for English. 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. The consensus transcriptions were used for the analysis.

The children's mothers were administered the ARSMA-II in Spanish (Cuéllar et al. 1995) at the beginning of the study (when the children were three and a half on average). Trained Spanish-speaking research assistants administered the assessment at the preschool site after having obtained the mothers' consent for their and their child's participation.

2.4. Analyses

Overall consonant accuracy was calculated in terms of Percent of Consonants Correct-Revised (PCC-R) (Shriberg et al. 1997), a widely used and recognized tool in both research and clinical settings to assess phonological skills in dual language learners and differentiate between typical and atypical development (Goldstein and Bunta 2012; Goldstein et al. 2010; Keffala et al. 2020; Montanari et al. 2018; Ruiz-Felter et al. 2016; Scarpino 2011). PCC-R indicates the percentage of consonant sounds that were articulated correctly out of the total number of targeted consonants. However, speech sound distortions and sounds that differ in fine phonetic details, which are common in speech sound development and are not as indicative of speech sound disorder as omissions and substitutions, are not coded as errors as long as they match the adult target in terms of place, manner of articulation, and voicing. The goal of this measure, indeed, is to examine the extent to which children's productions match the adult target on *auditory* grounds—even if fine phonetic details may differ (see Shriberg et al. 1997 and Keffala et al. 2020 for a discussion). PCC-R was also calculated for different sound classes (stops, fricatives, nasals, etc.) and for phonemes shared between Spanish and English, that is, segments that are "phonetically similar" (Flege 1981) and present in both languages (/p, b, t, d, k, g, m, n, f, s, ð, tʃ, l, w, j/), and for unshared phonemes, that is, sounds that exist only in English (/ŋ, v, z, ʃ, θ, h, dʒ, ɹ/) or in Spanish (/ɲ, β, ɣ, x, r, ɾ[3]/), as in Fabiano-Smith and Goldstein (2010b) and Montanari et al. (2018). As in previous studies, we compared the children's productions to adult targets in the varieties spoken by the children: American English and Mexican Spanish (as outlined in Goldstein 2001).

We first calculated descriptive statistics in order to show the means and standard deviations for children's phonological accuracy scores in English and Spanish and mothers' AOS, MOS, and linear acculturation scores. Then, correlation analyses between children's phonological accuracy measures in English and Spanish and (a) maternal AOS scores, (b) maternal MOS scores, and (c) mothers' linear acculturation scores were run using the Statistical Package for the Social Sciences (SPSS Statistics Version 26). Separate analyses were run for each language, that is, Pearson correlation coefficients were computed for mothers' AOS and linear acculturation scores and children's English PCC-R, their accuracy with English stops, fricatives, nasals, affricates, approximants, and with shared and unshared phonemes. Likewise, separate correlation analyses were run between maternal MOS and linear acculturation scores and children's Spanish PCC-R, their accuracy with Spanish stops, fricatives, nasals, affricates, flaps, trills, approximants, and with shared and unshared phonemes. The alpha level was adjusted for multiple comparisons throughout using the Holm–Bonferroni method (Holm 1979).

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[3]　Note that although the flap exists in English as an allophone of /t/ and /d/, we coded it as a Spanish-only sound, in line with Fabiano-Smith and Goldstein (2010b) because it is phonemic only in Spanish.

3. Results

3.1. Children's Phonological Accuracy in English and Spanish

Table 1 shows children's phonological accuracy in English and Spanish for all consonants, for different sound classes, and for phonemes shared and unshared between English and Spanish. Children produced around 80% of all consonants accurately in both languages, and they displayed higher mean accuracy rates for early-developing sounds (i.e., stops and nasals) than late-developing segments (i.e., fricatives in English, trills and flaps in Spanish) in line with the results of previous studies (Fabiano-Smith and Goldstein 2010b; Montanari et al. 2018; Ruiz-Felter et al. 2016). Accuracy levels were more uniform for early-acquired consonants, whereas, as shown by the large standard deviations, children differed widely in how good they were at producing late-acquired segments. Accuracy rates were significantly higher for phonemes common to both English and Spanish than for unshared segments in both languages, confirming the possible transfer of phonologically similar structures from one language to the other. With the exception of fricatives and affricates, whose accuracy of production was almost 20 percentage points lower in English than in Spanish, speech sound production abilities were comparable in Spanish and English after a year of preschool for this sample of Spanish L1/English L2 bilingual children.

Table 1. Children's phonological accuracy in English and Spanish for all consonants (PCC-R), for different sound classes, and for shared and unshared phonemes (in %).

	English		Spanish	
	Mean	*SD*	**Mean**	*SD*
PCC-R	81.3	7.9	80.5	9.2
Stops	91.8	7.8	90.5	10.7
Fricatives	59.8	13.1	76.0	10.3
Nasals	94.0	6.7	98.5	5.6
Affricates	81.5	29.3	100	0.0
Approximants	87.4	15.1	90.9	13.4
Flaps	-	-	78.8	33.0
Trills	-	-	34.2	36.7
Shared Phonemes	86.4	7.5	89.4	8.6
Unshared Phonemes	60.3	12.3	53.2	16.9

3.2. Mothers' Acculturation, Enculturation, and Overall Linear Acculturation

Table 2 reports mothers' mean acculturation (AOS), enculturation (MOS), and overall linear acculturation scores. The acculturation and enculturation scores suggest that mothers were more oriented to Mexican than to Anglo-American culture. The mean linear acculturation score for the sample shows that mothers had, on average, the lowest level of acculturation to Anglo-American culture or a "Very Mexican Orientation" (scores lower than −1.33, Cuéllar et al. 1995), a categorization that reflects their status as recent immigrants in a region characterized by a large Mexican community. As shown by the standard deviations and ranges, mothers differed substantially in how much they were oriented to American culture, whereas they were more uniform in their Mexican orientation.

Table 2. Mothers' mean Anglo-American orientation (AOS), Mexican orientation (MOS), and linear acculturation scores, standard deviations, and ranges.

	Mean	*SD*	Range
AOS	2.42	0.88	1.00–4.23
MOS	4.40	0.47	3.18–5.00
Linear Acculturation	−1.98	1.1	−3.69–1.05

3.3. Maternal Acculturation and Children's English Speech Sound Production

Table 3 shows the results of the correlation analyses between maternal Anglo-American orientation (AOS scores) and children's phonological accuracy measures in English. The results show moderate positive correlations between maternal American orientation and children's (1) English PCC-R ($r = 0.519$, $p = 0.001$, adj. $\alpha = 0.007$), (2) accuracy with English stops ($r = 0.449$, $p = 0.005$, adj. $\alpha = 0.008$), (3) accuracy with English approximants ($r = 0.583$, $p = 0.000$, adj. $\alpha = 0.0056$), and (4) accuracy with phonemes unshared between English and Spanish ($r = 0.521$, $p = 0.001$, adj. $\alpha = 0.006$). The magnitude of association was based on Evans' (1996) account: 00–0.19: "very weak"; 0.20–0.39: "weak"; 0.40–0.59: "moderate"; 0.60–0.79: "strong"; 0.80–1.0: "very strong". Weak to moderate positive correlations were also found between maternal American orientation and children's accuracy with fricatives and shared phonemes. However, these correlations were not statistically significant given the Holm–Bonferroni adjusted alpha levels. Overall, the results suggest that mothers with higher Anglo-American orientation had children who were more accurate in the production of overall English consonants, stops, approximants, and sounds specific to English. However, this pattern did not hold across the board, since mothers' AOS scores were not related to children's accuracy with the other segments.

Table 3. Bivariate correlations between maternal Anglo-American orientation (AOS) scores and children's English phonological accuracy measures; *** = significant effect (Holm–Bonferroni adjusted).

	r-Value	**p-Value**	**Adjusted α-Level**
PCC-R	0.519	*** 0.001	0.008
Stops	0.449	*** 0.005	0.01
Fricatives	0.395	0.015	0.013
Nasals	−0.004	0.982	0.05
Affricates	0.106	0.533	0.025
Approximants	0.583	*** 0.000	0.006
Shared Phonemes	0.372	0.023	0.017
Unshared Phonemes	0.521	*** 0.001	0.007

Table 4 shows the results of the correlation analyses between maternal linear acculturation scores and children's phonological accuracy measures in English. Similar to the previous analysis, the results show moderate positive correlations between maternal linear acculturation and children's (1) overall English consonant accuracy ($r = 0.471$, $p = 0.003$, adj. $\alpha = 0.008$), (2) accuracy with English approximants ($r = 0.500$, $p = 0.002$, adj. $\alpha = 0.006$), and (3) accuracy with unshared phonemes ($r = 0.502$, $p = 0.002$, adj. $\alpha = 0.007$), suggesting, again, that increasing maternal acculturation was related to children's higher accuracy with English consonants in general, with approximants, and with segments specific to English. Weak to moderate positive correlations were also found between maternal linear acculturation and children's accuracy with stops, fricatives, and shared phonemes, but again, these correlations did not reach statistical significance due to the Holm–Bonferroni adjusted alpha levels. On the other hand, accuracy with nasals and affricates did not appear at all related to mothers' overall acculturation level.

Table 4. Bivariate correlations between maternal linear acculturation scores and children's English phonological accuracy measures; *** = significant effect (Holm–Bonferroni adjusted).

	r-Value	p-Value	Adjusted α-Level
PCC-R	0.471	*** 0.003	0.008
Stops	0.400	0.014	0.01
Fricatives	0.350	0.034	0.013
Nasals	0.046	0.789	0.05
Affricates	0.189	0.262	0.025
Approximants	0.500	*** 0.002	0.006
Shared Phonemes	0.347	0.035	0.017
Unshared Phonemes	0.502	*** 0.002	0.007

3.4. Maternal Enculturation and Children's Spanish Speech Sound Production

Table 5 shows the results of the correlation analyses between maternal Mexican orientation (MOS) and linear acculturation scores and children's phonological accuracy measures in Spanish. Unlike in English, mothers' Mexican orientation and their overall acculturation level were not related to any of the children's phonological accuracy measures in Spanish. These results suggest that maternal cultural orientation and children's Spanish speech sound production were independent of each other.

Table 5. Bivariate correlations between maternal Mexican orientation (MOS) scores and linear acculturation scores and children's Spanish phonological accuracy measures.

	Mexican Orientation (MOS)		Linear Acculturation	
	r-Value	p-Value	r-Value	p-Value
PCC-R	0.015	0.931	0.262	0.117
Stops	0.016	0.925	0.205	0.225
Fricatives	0.122	0.474	0.115	0.497
Nasals	0.012	0.943	0.049	0.771
Affricates	-[1]	-	-[2]	-
Approximants	−0.101	0.551	0.153	0.367
Flaps	−0.028	0.871	0.083	0.625
Trills	−0.065	0.704	0.198	0.241
Shared Phonemes	−0.069	0.685	0.248	0.139
Unshared Phonemes	0.022	0.896	0.207	0.219

[1,2] These correlations could not be computed since all children achieved 100% accuracy with Spanish affricates.

4. Discussion

The purpose of this study was to examine the link between English and Spanish speech sound production skills at age 4;6 and (a) maternal acculturation, (b) maternal enculturation, and (c) overall maternal linear acculturation, which takes both American and Mexican orientation into account (Cuéllar et al. 1995). Specifically, we focused on (1) whether mothers' American orientation and overall acculturation were related to children's accuracy of production of English consonants, of different sounds classes, and of phonemes shared and unshared between English and Spanish, and (2) whether maternal orientation to Mexican culture and overall acculturation were linked to children's segmental accuracy with Spanish consonants, with different sounds classes, and with shared and unshared phonemes.

Similar to the findings of previous work that documented differences in the speech and language outcomes of children of more vs. less educated mothers (De Anda et al. 2016; Friend et al. 2017; Hammer et al. 2012; Hoff et al. 2018; Montanari et al. 2020; Place and Hoff 2016), we found that children's overall segmental accuracy in English and their production accuracy with English stops, approximants, and English-specific phonemes were positively and moderately correlated with their mothers' levels of American orientation. Likewise, overall English consonant accuracy and accuracy with approximants and with unshared phonemes were also positively and moderately correlated with maternal linear acculturation scores. These results suggest that mothers who were more acculturated when their children began preschool had children with better English speech production abilities one year after the children had begun attending the program. Although the mothers in this study had, on average, a "Very Mexican Orientation" and reported to be using primarily Spanish with their children, their orientation to American culture differed substantially, and it is possible that those mothers who were more American oriented may have socialized their children more into American culture and language, boosting their production abilities and promoting their overall speech sound development in English.

Interestingly, Montanari et al. (2020) found that children of more educated mothers had higher speech sound production accuracy in English than children of less educated mothers only at preschool entry, at age 3;6, but not after one year of preschool attendance. In contrast, in the present study, maternal levels of acculturation were related to children's speech outcomes even at age 4;6, after the children had been exposed to the language and culture of the school for a full year. It is possible that these different findings are due to the studies' differing methodologies and Montanari et al.'s (2020) small sample, as this study compared speech outcomes in children of more and less educated mothers in only 20 participants. In addition, since substantial information on consonant sounds is available even in input that is not particularly frequent or diverse (Dollaghan et al. 1999), one year of preschool may have been enough to close the gap in speech outcomes between children of more and less educated mothers, especially since all mothers had limited education (half completed primary school, the other half secondary school). On the other hand, links between maternal acculturation and children's speech outcomes may persist long-term or emerge with a delay. Indeed, Boyce et al. (2013) documented a positive significant correlation between maternal acculturation measured at 24 months and children's total word knowledge at 36 months. Similarly, Cote and Bornstein (2014) found that mothers' acculturation level when their child was five months of age was positively related to his/her vocabulary size in English at 20 months. In the present study, maternal acculturation was measured when children were at preschool entry, at age 3;6, whereas children's speech sound production was assessed a year later, when they were four and a half. Thus, we speculate that mothers who were more American-oriented at the beginning of preschool possibly socialized their children more into American culture during their children's first year of school, using more English but also exposing them more to English-language activities inside and outside the home. It is also possible that more acculturated mothers had higher levels of English proficiency than less acculturated ones. Taken together, these maternal behaviors and characteristics might have enhanced children's overall production abilities and phonological development in English by the second year of preschool.

It is important to point out, however, that maternal acculturation was not related to all phonological measures in English. For instance, children's accuracy levels with fricatives and shared phonemes were moderately linked to maternal acculturation, but these correlations did not reach statistical significance. On the other hand, the production of nasals and affricates appeared to be completely independent of mothers' American orientation. Accuracy with nasals was overall high and uniform, and ceiling effects may have masked possible relations. On the other hand, children displayed most variation in their production of affricates (some children had 100% accuracy, while others had 0%), and this large variation may have also obscured possible links. Regardless, while our findings

demonstrate a relationship between the majority of children's English segmental accuracy measures and maternal acculturation, we cannot ascertain why this pattern did not hold across the board, and it is possible that a combination of more than one factor came into play.

Most importantly, as we hypothesized, mothers' acculturation scores were particularly related to children's accuracy of production of English-specific phonemes, which require English input for their development. That is, mothers who were more American-oriented had children who were better at producing phonemes that only exist in English, sounds that could not have emerged through the positive transfer of phonetically similar sounds from Spanish and, according to the *Unified Competition Model* (MacWhinney 2005), produce less frequent and less strong cues that lead to negative transfer and protracted development (Goldstein and Bunta 2012). This result suggests, again, that more acculturated mothers possibly created an environment in which children had more access and exposure to English—and to possibly less accented English—both inside and outside the home, promoting their accuracy of production and acquisition of these unique segments.

In contrast to the results for English, none of the children's phonological accuracy measures in Spanish were related to their mothers' Mexican orientation or linear acculturation scores. These results suggest that increased maternal enculturation was not linked to higher speech sound production abilities in Spanish at age 4;6. These findings are interesting as they reflect the same pattern found in studies of maternal education, which has been found to be related to children's English but not to their Spanish speech and language outcomes. Montanari et al. (2020) speculated that maternal education may have a different impact on children's English and Spanish outcomes due to differences in cultural practices. Specifically, maternal education may be more related to children's language skills in individualistic cultures—such as American culture—that value verbal communication and self-expression and where education places an emphasis on the importance of fostering children's language skills (De Anda et al. 2016; Kuchirko and Tamis-LeMonda 2019). On the other hand, cultures that value collectivism, cooperation, and obedience—such as Mexican culture—may promote the importance of teaching children about politeness, respect, and collaboration rather than placing emphasis on "intensive" language instruction. While our results do not allow us to draw any conclusions as to how cultural factors may mediate the relationship between maternal cultural orientation and children's speech sound production, we do not exclude the possibility that our contrasting findings for English and Spanish are related to differences in cultural practices. At the same time, it is important to point out that the mothers in our study had overall high and homogenous levels of Mexican orientation, as shown by the standard deviations and ranges in Table 2, and these fairly uniform Mexican orientation scores may have obscured any possible relation with children's segmental accuracy measures in Spanish. After all, larger studies that have examined the link between maternal heritage culture orientation and children's heritage language vocabulary have indeed documented links between the two (Cote and Bornstein 2014). Thus, we do not exclude that this could be the case also for speech outcomes in larger and more heterogeneous samples of Mexican-American mothers and children.

Finally, as we speculated in Montanari et al. (2020), we do not rule out that our findings are due to the role that English plays as the societal language in the context of this study. Recall that children were in their second year of preschool and, therefore, had already begun their own process of acculturation. This means that they were hearing extensive English input in the environment and this may have interacted with maternal acculturation, producing a combined effect on English but not on Spanish speech sound production. Indeed, extensive sociolinguistic work suggests that children's language skills are ultimately more affected by societal language input than maternal input (Labov 2014). Although our participants were only four and a half, one year in the preschool program had dramatically increased their exposure to English as the societal language and, in turn, expanded their English phonological skills and overall language abilities (Montanari et al. 2018). By age 4;6, children had also learned how to use their languages in school and the

community and become aware of the majority status of English and the minority status of Spanish (Montanari et al. 2019). Thus, it is possible that the children's English skills had been affected by societal input in English as the majority language. 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), we speculate that the same may be true for maternal acculturation.

5. Conclusions

In conclusion, this study documented a link between maternal American orientation and overall acculturation and children's speech sound production in English, but it found no relation between mothers' orientation to Mexican culture and children's segmental production in Spanish. We speculated that the results in Spanish may have been due to the high and homogeneous levels of Mexican orientation among mothers, to language input differences attributable to distinct cultural practices, or to the status of Spanish as a minority language. At the same time, we interpreted the results in English as suggesting that more American-oriented mothers may have been socializing their children more to American culture, and they may have been exposing them more to English-language activities inside and outside the home and to native or near-native English input, therefore boosting their English production abilities.

Although this study contributes to the expanding literature on the relationship between maternal cultural orientation and children's linguistic performance, it has several limitations that should be considered when interpreting the results and planning future research. First, our sample was of moderate size, limiting the generalizability of its findings. In particular, our study only focused on mothers with high and homogenous levels of Mexican orientation and with Spanish as their native language, which might have possibly limited the detection of links with children's phonological skills. Since Latinx groups vary tremendously in terms of race, culture, SES, country of origin, patterns of immigration, levels of acculturation and enculturation, proficiency levels in Spanish and English, and parenting and language practices, it is possible that maternal enculturation is related to children's speech sound production in Spanish in some Latinx groups but not in others. Likewise, maternal acculturation was not related to all phonological measures in English, but we do not exclude the possibility that larger and more diverse samples would reveal such links. Thus, future research should explore mothers' cultural orientation and children's speech and language outcomes in larger samples, in different Latinx groups, and among mothers with a wider range of English and Spanish proficiency and acculturation and enculturation levels, possibly from very Anglo-oriented (and dominant in English) to very Mexican-oriented (and dominant in Spanish). A related limitation is that we did not directly assess mothers' Spanish and English proficiency levels. Language competence in the native language and in the language of the host country—in constant fluctuation during immigration—may directly affect maternal cultural orientation and practices. Thus, future studies should directly measure this important variable and examine its link to children's speech and language outcomes. At the same time, since we largely speculated on maternal cultural practices and their possible effects on children's segmental accuracy, future studies should also collect more in-depth ethnographic information through maternal interviews and observations of parent–child interactions in order to reveal whether maternal cultural orientation does indeed affect child socialization patterns.

The second limitation of this study regarded the analyses. First, children's segmental accuracy was assessed via phonetic transcription, a method that does not necessarily capture fine phonetic detail since it relies on the investigator transcribing the speech "as heard". Recall that our study positions itself within the literature that examines phonological skills in moderately sized samples of bilingual children using single-word samples often elicited with the Bilingual English Spanish Assessment (Peña et al. 2014) and transcribed phonetically (e.g., Bunta et al. 2009; Cooperson et al. 2013; Fabiano-Smith and Goldstein 2010a, 2010b; Gildersleeve-Neumann et al. 2008, 2009; Goldstein and Bunta 2012; Goldstein

et al. 2010; Keffala et al. 2020; Montanari et al. 2018; Ruiz-Felter et al. 2016). While the goal of these studies is to examine the extent to which children's productions match the adult target based on *auditory* grounds, irrespective of fine phonetic details, future studies should increase the sophistication of the analyses by employing instrumental methods such as acoustic analyses. Indeed, acoustic analyses produce an objective, physical measurement of the acoustic signal, and can thus reveal the degree to which children's productions match the adult targets phonetically rather than phonologically. Furthermore, even if maternal acculturation was related to children's speech sound production in English, the results do not imply that the former was the cause for the latter. Thus, future research should also expand the types of analyses and explore more in-depth how maternal cultural orientation contributes to bilingual children's speech outcomes.

Future studies should also focus on a wider range of child language proficiency measures. Recall that previous studies have documented maternal-education-related differences in children's vocabulary and grammatical abilities—but not in phonological skills—at age 4;6 (Montanari et al. 2020). Thus, it is important to assess whether mothers' acculturation and enculturation have a different impact on different measures of child language ability—from speech sound production to vocabulary to grammatical skills. Future studies should also be longitudinal to assess whether English exposure and instruction in the school setting ultimately reduce the strength of the link between maternal acculturation and English abilities while strengthening the relationship between mothers' heritage language orientation and child heritage language skills. Indeed, since most acculturation studies have focused on toddlers (Cote and Bornstein 2014) and preschoolers (Boyce et al. 2013), it is unclear whether the link between maternal cultural orientation and child speech and language outcomes remains steady throughout childhood or whether it decreases over time with increasing societal input (Labov 2014) and at what point this relationship becomes decoupled, perhaps due to ceiling effects in speech and language development.

Despite these limitations, this study makes an original contribution to the understudied topic of maternal cultural orientation and its link to children's speech and language outcomes, with important educational implications. Since the emergence of preliteracy skills is dependent upon speech perception and production abilities that are developed in early infancy and childhood (Nittrouer and Burton 2005), educators, administrators, and policymakers should make a deliberate effort to obtain information on the degree of acculturation of young dual language learners' mothers and create interventions that promote English language and literacy among children from less acculturated families. As early differences in oral language skills typically translate into progressively larger differences in language and literacy skills at later ages, intervention should begin as early as possible, possibly in infancy, in order to improve children's English outcomes by school entry and increase dual language learners' educational achievement. It is hoped that this study will serve as the springboard for more investigations on the crucial role that immigrant mothers' identity reshaping process plays on children's overall linguistic abilities.

Data Availability Statement: The data presented in this study are not publicly available since IRB and informed consent protocols under which the data were collected do not allow for the data to be publicly shared.

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