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The Impact of Non-Native Language Input on Bilingual Children's Language Skills

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Abstract: We assessed the impact of non-native language input on Spanish–English bilingual preschool-age children's language skills. Most participants (96%) had language skills within the average range. We examined whether the number of native English speakers, the number of non-native English speakers, the strength of foreign accent in English, intelligibility (percent intelligible utterances), syntax/morphology (mean length of utterance in morphemes), and grammatical errors were related to children's overall language skills. The results revealed that the number of native English speakers and intelligibility in English positively predicted children's language skills while the number of non-native English speakers and the strength of foreign accent in English negatively predicted children's language skills. None of the grammatical measures predicted children's language skills. These findings indicate that non-native input can be associated with less robust language skills, but non-native input is not in fact detrimental to language development for neurotypical preschool-age children given their within-average language scores.

Keywords: non-native input; accent; bilingualism

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1. Introduction

It has been well-established that the quality of language input plays an instrumental role in children's language development. This is equally true for children in monolingual (Hoff and Naigles 2002; Huttenlocher et al. 2010; Pan et al. 2005; Rowe 2012) and bilingual environments (Fernald 2006; Place and Hoff 2011; Unsworth 2016). However, children in bilingual environments are likely to be exposed to more variability in their language input (Unsworth 2016). That is, bilingual children's language input is divided between their two languages across contexts and communication partners (e.g., Hoff and Core 2013). One such source of variability related to the quality of language input is whether the input is provided by native or non-native speakers. Although some studies have indicated that exposure to non-native input, and specifically accented input, may benefit children's ability to adapt to various accents (Potter and Saffran 2017; Schmale et al. 2012, 2015; Schmale and Seidl 2009; Van Heugten and Johnson 2014), non-native input has also been shown to be less supportive of language acquisition compared to native input (Hoff et al. 2014; Place and Hoff 2011, 2016). However, the focus of prior work has been very young children, and it is unclear whether exposure to non-native input may also be less supportive for older children. Furthermore, previous work took a broad approach when defining non-native language input and relied on parent report vs. direct measures of input. In the present study, our aim was to examine the impact of non-native language input on preschool-age bilingual English–Spanish children's language skills and to do so by focusing on two prominent features of non-native input: accented input and the grammatical complexity of the input using both parent report and more direct measures of input quality.

1.1. Bilingual Language Environment

The language skills of children exposed to two languages are highly variable, and part of this variability stems from large fluctuations in the input in each language (Hoff and Core 2013; Hoff et al. 2012; Pearson et al. 1997; Unsworth 2016). These fluctuations appear both in the form of input quantity (Hoff et al. 2012) and input quality (Buac et al. 2014; Jia and Aaronson 2003; Jia and Fuse 2007; Paradis 2011; Place and Hoff 2011; Scheele et al. 2010). Broadly speaking, input quantity refers to the number of words or utterances spoken to the child (Anderson et al. 2021), while input quality refers to a broader range of linguistic characteristics. Rowe and Snow (2020) characterized input quality along three dimensions: interactive features which relate to social-pragmatic features, such as turn-taking and joint attention; linguistic features which focus on factors, such as lexical diversity and the grammatical complexity of the parental language; and conceptual features which refer to the topic of conversation. In general, all three dimensions have been strongly associated with children's language outcomes (see Anderson et al. (2021) for a recent metanalysis). The focus of the present paper is specific to the linguistic features of parental language input.

Studies assessing the quality of bilingual parental linguistic features have identified variables such as the primary caregiver's vocabulary skills and language mixing, as important predictors of children's language skills. One variable that has received relatively less attention, but has been shown to be associated with children's language development, is whether the language input is provided by a native or a non-native speaker (e.g., Hoff et al. 2014, 2020; Place and Hoff 2011, 2016; Unsworth et al. 2019), with native language input associated with better language outcomes, and non-native language associated with reduced language outcomes. This is a significant finding, given that the majority of bilingual children in the United States have at least one parent who is foreign born (Eilers et al. 2006) and that more than half of bilingual children in the U.S. have at least one parent who does not speak English very well (Murphey et al. 2014). These statistics are particularly relevant to Spanish–English bilingual children in the United States as these children compose the highest proportion of bilingual children in the U.S. Specifically, approximately 70% of dual-language learners in the U.S. are of Hispanic origin who speak Spanish with varying levels of English language abilities (U.S. Census Bureau 2015). Therefore, Spanish–English bilingual children in the United States are very likely to receive English language input from non-native speakers of English. The effects of non-native input, in particular, accented input and the grammaticality of the input and its effects on children's language development are discussed in the subsequent sections.

1.2. Non-Native Input

Defining non-native input is complex as nativeness is not a unitary construct. Rather, it depends on a number of complex factors, including age of acquisition, proficiency, and language use and history (refer to Cheng et al. (2021) for a comprehensive discussion of the definition of native speaker). Although non-native speakers are a heterogenous group, studies assessing the impact of non-native linguistic input on children's language outcomes recognize that non-native language input may differ from native language input on many features, including in phonology (e.g., Bosch and Ramon-Casas 2011; Fish et al. 2017; Housen et al. 2012), prosody (e.g., Takahashi et al. 2018), and grammar (e.g., Cook and Singleton 2014). Previous studies have generally taken a broad approach to defining non-native language input by classifying parents as either being native or non-native speakers of English. However, native-language input is a complex construct involving not only the native language status of the parent, but also the individual's language proficiency, which impacts phonology, prosody, and grammar (Hoff and Core 2013). That is, one can envision a scenario where the adults in a child's life are non-native speakers, but who are nonetheless highly proficient in their second language, and thus still provide high-quality language input to the child. The aim in the present study, therefore, was to move beyond this broad classification of adults in the child's life as native vs. non-native speakers of the target language (English), by also focusing on specific aspects of non-native input that may

give rise to the association between non-native input and children's language outcomes: phonological deviations (i.e., accented input) and grammatical weaknesses. Children as young as two years of age show sensitivity to phonological deviations (Bailey and Plunkett 2002; Ballem and Plunkett 2005; Swingley and Aslin 2000; Swingley and Aslin 2002) and to syntactic errors (Bernal et al. 2010; Brandt-Kobele and Höhle 2014; Oberecker and Friederici 2006). It is therefore feasible to ask whether the presence of phonological deviations and the quality of syntactic input have consequences for children's language outcomes.

1.3. Accented Language Input

Broadly speaking, accent can be defined as systematic variations in speech production often characterized by differences in phonological and suprasegmental features (Celce-Murcia et al. 1996) as a result of a foreign accent (i.e., non-native) or regional dialect. Accented input can vary on the degree of intelligibility or the listener's ability to understand the speaker's message (Celce-Murcia et al. 1996). However, there are many individual differences such that a speaker may have a noticeable accent but, nonetheless, be clearly intelligible to the listener. Due to these nuances, it is not surprising that studies have demonstrated varying results when it comes to the effect of accent on language processing and comprehension. Several studies have shown that adults (Adank et al. 2009; Floccia et al. 2006; Kraljic et al. 2008; Munro and Derwing 1995) and children (Barker and Turner 2015; Mulak and Best 2013; Nathan and Wells 2001; O'Connor and Gibbon 2011) experience consistent processing (Adank et al. 2009; Floccia et al. 2006; Gass and Varonis 1984) and comprehension (Barker and Turner 2015; Mulak and Best 2013; Nathan et al. 1998; Van Heugten et al. 2015) costs when listening to an accented speaker. Yet, other studies have demonstrated that exposure to foreign or regional accents does not necessarily always result in costs. For example, exposure to a foreign or regional accented input, life-long or brief, may benefit children's ability to adapt to various accents (Potter and Saffran 2017; Schmale et al. 2012, 2015; Schmale and Seidl 2009; Van Heugten and Johnson 2014). Although these previous studies considered the effect of accented input on children's linguistic performance, the present study is the first to specifically assess the impact of accented input in children's environment on their overall language development.

1.4. Grammaticality

Another body of research has focused on grammaticality, albeit from a different theoretical perspective. Literature assessing the impact of telegraphic speech, characterized by omission of function words and morphological markers, on children's language has shown negative consequences for children's language development (Bredin-Oja and Fey 2014; Fernald and Hurtado 2006; Kedar et al. 2006; Lew-Williams and Fernald 2007), although some studies found no such effects (Fraser 1972; Willer 1974). Notably, although there is a long history of research documenting the slow acquisition of grammatical constructions in second-language adult learners (Andersen and Shirai 1994; Collins 2005; Dietrich et al. 1995; Montrul and Slabakova 2003), and although non-native speakers are more likely than native speakers to make grammatical errors (Cook and Singleton 2014), ungrammaticality has received little attention as a characteristic of non-native input that may have an impact on children's language outcomes. One exception to this is a recent study by Altan and Hoff (2018), who assessed the frequency of complex grammatical structures in the language input of English–Spanish bilingual mothers who were non-native speakers of English compared to monolingual native English-speaking mothers. All children in the study were 2 years and 6 months old. The results revealed that non-native English speakers used significantly fewer complex grammatical structures and produced more grammatical errors in child-directed speech. However, it is unclear whether these differences in child-directed speech between native and non-native English-speaking mothers would impact children's language development.

Given the literature on the generally less optimal characteristics of accent and ungrammaticality, it could be expected that exposure to these particular two aspects of non-native

input would have an impact on language development. However, none of the previous work has considered this possibility. Instead, previous studies assessed the impact of non-native input on children's language development by taking three approaches: (1) calculating a measure of language "richness", which has usually been defined as a sum of children's experiences with media and native-English speaking friends and parents (Bohman et al. 2010; Jia and Aaronson 2003; Jia and Fuse 2007; Paradis 2011; Scheele et al. 2010); (2) obtaining a parent's self-rating of English proficiency (Hammer et al. 2012; Paradis 2011); and (3) counting the number of non-native vs. native English speakers in the child's environment (Place and Hoff 2011, 2016).

1.5. The Effect of Non-Native Input on Children's Language Development

Several studies have assessed the impact of non-native input on bilingual children's English vocabulary skills (Place and Hoff 2011, 2016). Place and Hoff (2011) demonstrated that neurotypical two-year-old Spanish–English bilingual children who were exposed to non-native speakers of English had lower English vocabulary skills in comparison to children who were exposed to native English speakers. In another study, Place and Hoff (2016) extended these findings to 2;6-year-old Spanish–English bilingual children also demonstrating a positive correlation between the amount of English language exposure by a native English speaker. Hoff et al. (2014) extended these findings to four-year-old children and demonstrated that English use at home was a strong predictor of children's English language skills, only when one parent was a native English speaker but not when neither parent was a native English speaker. Similarly, Paradis (2011) demonstrated that home exposure to English from parents who were non-native speakers of English did not predict bilingual children's English language skills, while English exposure from native speakers outside of the home and from the media did positively predict children's English language skills. The authors attributed these findings to mother's low proficiency in English by positing that "input from non-proficient speakers does little to enhance children's acquisition of the L2 [English]" (Paradis 2011, p. 231). A recent longitudinal case study focused on a single aspect of English grammar, English possessive. Specifically, Babatsouli and Nicoladis (2019) demonstrated that a bilingual child was able to successfully learn English possessives from her non-native English-speaking mother and had English possessive knowledge comparable to her monolingual peers. However, the focus of the study was not on the native vs. non-native input but on language input and usage frequency, therefore the extent of the mother's non-native English language status is unknown.

A few studies have taken a more fine-grained approach to defining non-native input, considering both the frequency of such input and the language proficiency of the non-native speakers as factors in children's language outcomes (Hoff et al. 2020; Unsworth et al. 2019). Unsworth et al. (2019) found that non-native input from highly proficient speakers was more beneficial to children's language development than non-native input from less proficient speakers. Recently, Hoff et al. (2020) confirmed these findings in their study of 2.5-year-old Spanish–English bilingual children. They found that child-directed speech provided by more proficient non-native mothers was more beneficial to children's language skills compared to non-native mothers with less English proficiency. Thus, the level of proficiency of the non-native speaker, not merely non-native status, appears to be a significant predictor of children's language skills. In the present study, we considered not only the native language status of the individuals in the child's environment but also the amount of time each individual spends using each language with the child as predictors of children's language skills, similar to Unsworth et al. (2019). A weighing procedure was used when considering the effect of accent. This procedure took into consideration the percent of time each individual used English with the child and the amount of time each individual interacted with the child during a typical week. In our study, parent proficiency was operationalized objectively through grammaticality measures obtained via a parent language sample.

1.6. The Current Study

The current study assessed the relationship between non-native language input and bilingual Spanish–English children's language skills. To measure children's language skills, the *Preschool Language Scale, Fifth Edition Spanish* (PLS-5 Spanish, Zimmerman et al. 2012) assessment tool was used. This assessment tool provides a score for children's total language knowledge across both English and Spanish. Specifically, this assessment tool uses conceptual scoring where children are first assessed in Spanish and then any item that a child responded to incorrectly in Spanish is re-administered in English. Numerous studies have shown that bilingual children score below their monolingual peers when their performance is only assessed in English, while their performance is on par with their monolingual peers when their total language skills are assessed (Bedore et al. 2005; de Abreu et al. 2013; Hemsley et al. 2010; Hoff et al. 2012; Junker and Stockman 2002; Kan and Kohnert 2005; Paez 2008; Pearson 1998). Therefore, the present study assessed the impact of non-native English input on children's total language skills. This approach assessed whether non-native input would impact overall language development, whereas in previous studies, the association between non-native input and language development has only been assessed for English specifically. Non-native input was measured in English only because most English–Spanish bilingual children in the U.S. receive non-native input in English and native input in Spanish (Eilers et al. 2006; Murphey et al. 2014). Indeed, in the current sample, 65% of the children received non-native input in English from one of the parents and only 14% of the children received non-native input in Spanish from one of the parents.

Two approaches were taken to assess non-native input. First, in line with Place and Hoff (2011, 2016), a parent report was used to assess the number of native English speakers, the number of non-native English speakers in the child's environment, and the strength of foreign accent in the child's environment. Moving beyond these broad, self-reported indexes of non-native input, the present study zeroed-in specifically on accented input and the grammatical complexity of the input. Specifically, a short, 5 min language sample was collected from the primary caregivers and monolingual listeners were recruited to rate the primary caregivers' extent of foreign accent in English. The language samples were analyzed using the Systematic Analysis of Language Transcripts (SALT; Miller and Iglesias 2012) to obtain data regarding the grammatical complexity of the primary caregivers' English language skills.

Following previous work, a positive relationship was expected between the number of native English speakers and children's language skills and an inverse relationship between the number of non-native English speakers and children's language skills (Place and Hoff 2011, 2016). Given previous work indicating that high levels of parental English language skills are positively associated with children's English language skills (Buac et al. 2014; Paradis 2011; Paradis and Jia 2017), a positive relationship was expected between primary caregivers' grammatical complexity and children's language skills. However, there was a possibility that a relationship between primary caregiver's grammatical complexity and children's language skills would not be observed because previous work has demonstrated that home exposure to English from immigrant parents did not predict bilingual children's English language skills, while English exposure from native speakers outside of the home did positively predict children's English language skills (Paradis 2011).

2. Materials and Methods

2.1. Participants

All data collection took place at the Waisman Center in Madison, WI. Children were recruited from the Madison Metropolitan School district and the greater Madison metropolitan area as part of a larger research study. A total of 57 English–Spanish bilingual children were recruited, however only 49 children were retained for the current study (M_{Age} = 4.86, *SD* = 0.59; range: 4.00–5.83; 18 boys and 31 girls). Data from eight children were not used due to the following reasons: three children were excluded because they did not attend all

of the required testing sessions resulting in extensive missing data, one child was excluded due to extensive exposure to a third language early in life, and four children were excluded because the parents did not complete all of the required assessment tools resulting in extensive missing data. Primary caregivers were interviewed to obtain information about each child's language acquisition history, educational background, and medical background. Per parent report, all children were neurotypical. All children passed a bilateral hearing screening at 20 dB at 1000, 2000, and 4000 Hz using an Earscan 3 audiometer. Socioeconomic status was indexed by averaging the total number of years of education of the child's parents. In the event that the child had only one primary caregiver, that primary caregiver's total years of education were taken to index socioeconomic status. Parent education ranged widely, but most children had parents with some post-secondary education (M = 14.41, SD = 4.46, range: 4.5–22 years).

The parents provided demographic information about their children. Most of the children, 94%, were identified as Hispanic, while the remaining 6% were identified as non-Hispanic. The racial backgrounds of the children were as follows: 28 children were identified as White, 17 parents selected "Other" and indicated "Hispanic/Latino" as their race, 1 parent listed "Venezuelan," 1 child was identified as having more than 1 race, and 2 parents did not disclose their child's race. Of the 49 children, 39 were born in the United States, 2 children were born in Puerto Rico, 2 children were born in Chile, 1 child was born in Venezuela, 1 child was born in Costa Rica, 1 child was born in Honduras, 1 child was born in Mexico, 1 child was born in Spain, and 1 child was born in Uruguay.

All children were bilingual English–Spanish speakers. Most of the children learned Spanish from birth (*Mean* = 0.16 months, SD = 0.82) and English around the age of 10 months (*Mean* = 10.37 months, SD = 15.10). For 14 of the children, the parents listed English as the child's first language; for 32 of the children, Spanish was listed as the first language; and for 3 of the children parents listed both English and Spanish as the children's first languages. For 21 of the children, English was listed as the child's dominant language; for another 21 children, Spanish was listed as the dominant language; and for 7 of the children, both English and Spanish were listed as dominant languages. The parents provided information about current daily language use and exposure. Children were exposed to English 46.23% (SD = 15.62%) of the time in a typical week and 53.76% (SD = 15.62%) of the time to Spanish. For 12 children, parents indicated that they spoke mostly English, 18 children spoke mostly Spanish, and 19 children spoke both English and Spanish. With regard to the language(s) children heard at home, 5 parents indicated that their child mostly heard English, 32 indicated that their child mainly heard Spanish, and 12 indicated that their child heard both English and Spanish. Of the 49 parents, 13 were native speakers of English while 36 were non-native speakers of English. For the second parent, 12 were native speakers, 32 were non-native speakers, and 5 children had only 1 primary caregiver listed.

Lastly, the parents provided general information about their child's exposure to accents outside of the home. Thirty-two parents reported that their children primarily heard Spanish-accented English only from parents and other family members who resided with the child, including grandparents, siblings, and cousins on a daily basis. Five parents reported that their children were exposed to Spanish-accented English from family friends. Five parents reported that their children heard Spanish-accented English from teachers/support staff. One parent indicated that their child was briefly exposed to Spanish-accented English from individuals in the greater community and six parents did not elaborate on their child's brief exposure to Spanish-accented English outside the home.

2.2. Materials

Standardized measures. Children's language skills were assessed using the *Preschool Language Scale, Fifth Edition Spanish* (PLS-5 Spanish, Zimmerman et al. 2012). The PLS-5 Spanish is an omnibus language assessment tool and it provides three standard scores: Auditory Comprehension, Expressive Communication, and Total Language. The Auditory Comprehension subtest is composed of items designed to assess receptive language skills,

such as comprehension of basic concepts, vocabulary, morphology, syntax, and emergent literacy. The Expressive Communication subtest is composed of items designed to assess expressive language skills, such as vocabulary, morphology, prepositions, sentence structure, and emergent literacy skills. The Total Language score provides an overview of the child's overall language skills (expressive and receptive). The PLS-5 Spanish uses conceptual scoring such that children are first administered all items in Spanish and each incorrect response is re-administered in English, resulting in a score that is representative of children's overall language knowledge. This is a valid assessment method as bilingual children have distributed vocabulary/language knowledge (Bedore et al. 2005; Pearson 1998; Teoh et al. 2012). Standard procedures outlined in the PLS-5 Spanish manual were followed for administration and scoring. The assessment was initially administered in the child's preferred/dominant language and any incorrect responses were re-administered in the second language. Children's non-verbal intelligence was assessed using the *Leiter International Performance Scale*, *3rd Edition* (Leiter-3, Roid et al. 2013). Table 1 presents the group means for each measure.

Table 1. Participant characteristics.

	Group Performance Mean (SD)
n	49
Gender	18 boys, 31 girls
Age (years)	4.86 (0.59)
Socioeconomic Status	14.41 (4.46)
Non-Verbal IQ	103.04 (6.84)
Receptive Language	111.94 (14.36)
Expressive Language	108.10 (14.35)
Total Language	110.92 (15.01)
English Age of Acquisition (months)	10.37 (15.10)
Spanish Age of Acquisition (months)	0.16 (0.82)
English Daily Exposure (%)	46.23 (15.62)
Spanish Daily Exposure (%)	53.76 (15.62)

Note. Two children scored more than 1 standard deviation below the mean on the language assessment.

Non-native input variables. To assess non-native input, two approaches were taken. First, each parent completed a questionnaire, the Summary of Exposure to Accent Questionnaire (SEA-Q; the full questionnaire can be found in the Supplemental Documents), which was specifically designed for the present study to gather information about the extent of non-native input in children's environment. This questionnaire required parents to list all individuals in the child's environment, how often they interacted with the child in a typical week, all languages that each individual spoke, whether they were a native or non-native speaker of each language, the percent of time they interacted with the child using each language, and the strength of foreign accent in each language. This questionnaire was used to extract the following variables pertaining to non-native input: the number of non-native English speakers, the number of native English speakers, and the strength of foreign accent in English. The strength of foreign accent in English was calculated as a weighted score. Specifically, a weighted score was used to account for variability in input because, even if a caregiver spoke English with a strong foreign accent, this individual may not have used English often and/or may not have interacted with the child on a daily basis. To take this variability into account, the following formula was used to obtain a weighted strength of accent in English for each individual, and then an overall average score was calculated for each child: (Proportion of time spent using English when interacting with child * Strength of accent in English)/(number of days the person interacts with child ÷ 7 days of the week). Table 2 shows the correlation analyses between the variables.

Table 2. Pearson's correlations for the self-report measures.

	Number Native English Speakers	Number Non-Native English Speakers	Weighted Self-Rating Accent
Number Native English Speakers	--	−0.67 ***	−0.37 **
Number Non-Native English Speakers	−0.67 ***	--	0.35 *
Weighted Self-Rating Accent	−0.37 **	0.35 *	--

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Second, for a sub-sample of the children, the parents provided a short language sample. Specifically, 30 (23 mothers and 7 fathers) out of the 49 parents were comfortable speaking English and were willing to provide a short language sample. The parents were asked to speak about their child for up to five minutes. Parents spoke about topics such as their child's favorite book, favorite movie, things the child liked to do, or any other topics related to their child. These language samples were used to obtain ratings of the parents' foreign accent in English and indexes of grammatical complexity. Out of the 30 parents, 23 were non-native English speakers while 7 were native English speakers.

To obtain ratings of foreign accent, the language samples were spliced into single sentences and normalized to 70 dB using Praat (Boersma and Weenink 2015). Any confidential information, such as the child's name, school name, or any other potentially identifying information, was spliced out of the sentences. Three sentences from each parents' language sample were extracted for this analysis. The sentences were matched in length (±2 words). Research has shown that it is important to include samples from native speakers in an accent rating task (Flege and Fletcher 1992). Therefore, in addition to the bilingual parents' sentences, an additional 20% of the samples were sentences from native English speakers. These were not native English-speaking parents of children participating in the present study; these were samples from monolingual English-speaking parents participating in the larger-scale study. These ratings were not analyzed. To obtain ratings of parents' foreign accent in English, 39 monolingual English speakers were recruited. The raters were all undergraduate university students (M_{Age} = 21.06, *SD* = 1.93; 30 females and 9 males). The raters listened to 3 blocks of sentences, each block contained 36 sentences, 1 from each bilingual parent making a total of 30 sentences and 6 from native monolingual English speakers serving as control sentences. The control sentences were not analyzed and all control sentences received an accent rating of 0. Then, the raters indicated the strength of accent for each sentence on a 10-point scale with 0 being "none, no accent" and 10 being "pervasive accent." The ratings from each participant were averaged across the three blocks to obtain an average accent score for each parent.

Additionally, the language samples were used to assess parents' grammatical complexity in English. Entire language samples were used. Each language sample was transcribed and analyzed using the Systematic Analysis of Language Transcripts (SALT; Miller and Iglesias 2012). Many different variables can be obtained from SALT regarding the language structures used. For the present study, information relating to intelligibility, syntax/morphology, and errors were used. Percent intelligible utterances was used as another measure that relates to accent. Mean length of utterance in morphemes and percent of utterances with grammatical errors were used as measures of syntax/morphology. An error was defined as any error in an utterance, which included a grammatical omission or error, such as pronoun errors, tense errors, etc.

2.3. Analyses

Linear regression models were constructed using the lme4 (Bates et al. 2015) package in *R* (version 3.5; R Core Team 2018). The models included Total Language standardized score from the PLS-5 Spanish as the outcome variable. Total Language score was used because it correlated highly with both the expressive language (r = 0.96, $p < 0.001$) and receptive language (r = 0.95, $p < 0.001$) subtests. Children's non-verbal intelligence skills, measured by the *Leiter-3*; socioeconomic status, measured by averaging parents' total years of education;

and percent exposure to English, calculated by dividing the number of hours children heard English by the total number of hours children were awake in a typical week, served as control variables. Children's non-verbal intelligence was entered as a covariate because it significantly correlated with children's language skills ($r = 0.49$, $p < 0.05$). Children's socioeconomic status was entered as a covariate because SES is strongly correlated with children's language outcomes (e.g., Hart and Risley 1995) and it was significantly correlated in the present dataset ($r = 0.41$, $p < 0.05$). Children's exposure to English was entered as a covariate because the amount of language input positively predicts children's language skills (Hoff and Naigles 2002; Huttenlocher et al. 2010; Fernald 2006; Pan et al. 2005; Rowe 2012; Unsworth 2016), and we aimed to examine whether input quality contributed to children's language outcomes over and above the amount of language exposure. All control variables were centered.

For the self-ratings provided by the parents, three different linear regression models were constructed to assess whether (1) the number of native English speakers, (2) the number of non-native English speakers, and (3) the average weighted strength of accent in English impacted children's language skills. For the subset of children whose parents were able to provide a language sample, four different models were constructed to assess whether (1) the parents' foreign accent in English, as perceived by monolingual English speakers, (2) percent intelligibility in English, (3) complexity of syntax/morphology use in English, and (4) grammatical errors in English impacted children's language skills.

Following Unsworth et al. (2019), we also used a stepwise variable selection procedure where we first entered into the model all control variables and the variable of interest for each model. Then, after running the full model, the non-significant variables were removed in order to construct the most parsimonious model. Then, we conducted a goodness of fit assessment using *ANOVAs* in R. If the *ANOVA* revealed a *p*-value that was less than 0.05, the more complex model was considered to be significantly better than the reduced model. If the *p*-value was higher than 0.05, then the reduced model was considered a better fit than the more complex model. For all models, the simpler model was always a better fit.

3. Results

3.1. Self-Report Ratings

For all three models, percent of English exposure was not a significant predictor, thus it was removed from the models resulting in SES and non-verbal IQ as control variables. Model 1 assessed the impact of the number of native English speakers in the child's environment. The number of native speakers in the children's environment ranged from zero to four native speakers ($M = 1.04$, $SD = 1.14$). The model revealed that, after taking into account children's non-verbal intelligence and SES, the total number of native English speakers was not a significant predictor of children's language skills ($\beta = 2.50$, $p = 0.16$). Model 2 assessed the impact of the number of non-native English speakers in the child's environment. The number of non-native speakers in the children's environment ranged from zero to five ($M = 1.86$, $SD = 1.27$). After taking into account children's non-verbal intelligence and SES the total number of non-native English speakers was a significant predictor of children's language skills ($\beta = -2.82$, $p = 0.04$). Model 3 assessed the impact of weighted strength of accent in English of the individuals in the child's environment. The strength of accent ranged from 0 to 6.17 ($M = 1.13$, $SD = 1.45$). The model revealed that, after taking into account children's non-verbal intelligence and SES, the weighted strength of foreign accent in English ($\beta = -2.78$, $p = 0.03$) was a significant predictor of children's language skills. Table 3 presents the full model details and Figure 1 presents a visual representation of the regression models.

Table 3. Linear regression models for the self-report variables.

	Estimate	Standard Error	*t*-Value
Model 1: Total Number of Native English Speakers			
Intercept	108.31	2.52	42.91 **
Number of Native Speakers	2.50	1.75	1.43
Non-Verbal IQ	0.88	0.27	3.21 **
SES	0.90	0.42	2.14 *
$R^2 = 0.38$, Adjusted $R^2 = 0.34$, $F(3, 45) = 9.13$, $p < 0.001$; Cohen's $f^2 = 0.61$			
Model 2: Total Number of Non-native English Speakers			
Intercept	116.16	3.08	37.76 ***
Number of Non-Native Speakers	2.82	1.38	−2.05 *
Non-Verbal IQ	0.98	0.25	3.87 ***
SES	0.96	0.39	2.42 *
$R^2 = 0.40$, Adjusted $R^2 = 0.36$, $F(3, 45) = 10.23$, $p < 0.001$; Cohen's $f^2 = 0.68$			
Model 3: Weighted Foreign Accent in English			
Intercept	114.05	2.21	51.67 ***
Weighted Accent	−2.78	1.25	−2.22 *
Non-Verbal IQ	0.87	0.26	3.35 **
SES	0.91	0.40	2.30 *
$R^2 = 0.41$, Adjusted $R^2 = 0.37$, $F(3, 45) = 10.6$, $p < 0.001$; Cohen's $f^2 = 0.71$			

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

3.2. Accent Rating and Language Complexity

Linear regression analyses were conducted to assess the impact of primary caregivers' foreign accent in English as rated by native English-speaking adult listeners, intelligibility, morphology/syntax, and errors in English language input on children's language skills. For each model below, the percent of English exposure was not a significant predictor in the full model; therefore, to calculate the most parsimonious model, the non-significant variable was removed from the full models. Model 1 assessed the impact of strength of accent in English as rated by monolingual, English speakers. This accent score was weighted as in the self-report ratings analysis to account for the percent of time the primary caregiver spent interacting with the child in English and to account for the number of days in a typical week the primary caregiver interacted with the child. The accent ratings without weighing ranged from 0.32 to 7.09 ($M = 3.79$, $SD = 2.35$) and the weighted strength of accent ranged from 0 to 2.51 ($M = 0.81$, $SD = 0.77$). The model revealed that, after taking into account children's non-verbal intelligence and SES, the strength of foreign accent in English ($\beta = -9.32$, $p = 0.01$) was a significant predictor of children's language skills. Please note that the parent's accent self-rating and their accent as perceived by monolingual listeners correlated significantly ($r = 0.79$, $p < 0.001$).

Table 4 presents the correlation matrix for the grammatical complexity variables. Model 2 assessed the impact of parents' intelligibility in English. Intelligibility was assessed by percent intelligible utterances and ranged from 91.9% to 100% ($M = 98.32\%$, $SD = 2.5\%$). The model revealed that, after taking into account children's non-verbal intelligence and SES, the percent of intelligible words in English ($\beta = 2.06$, $p = 0.02$) was a significant predictor of children's language skills.

Model 3 assessed the complexity of parents' syntax/morphology using the mean length of utterance in morphemes, which ranged from 6.82 to 19.05 ($M = 11.06$, $SD = 3.17$). Two parents were outliers with scores of 18.86 and 19.05; thus, these participants were removed from the analysis. The model revealed that, after taking into account children's non-verbal intelligence and SES, the mean length of utterance in morphemes in English ($\beta = 0.82$, $p = 0.27$) was not a significant predictor of children's language skills. Please note that the results were the same when the two outliers were included in the analysis.

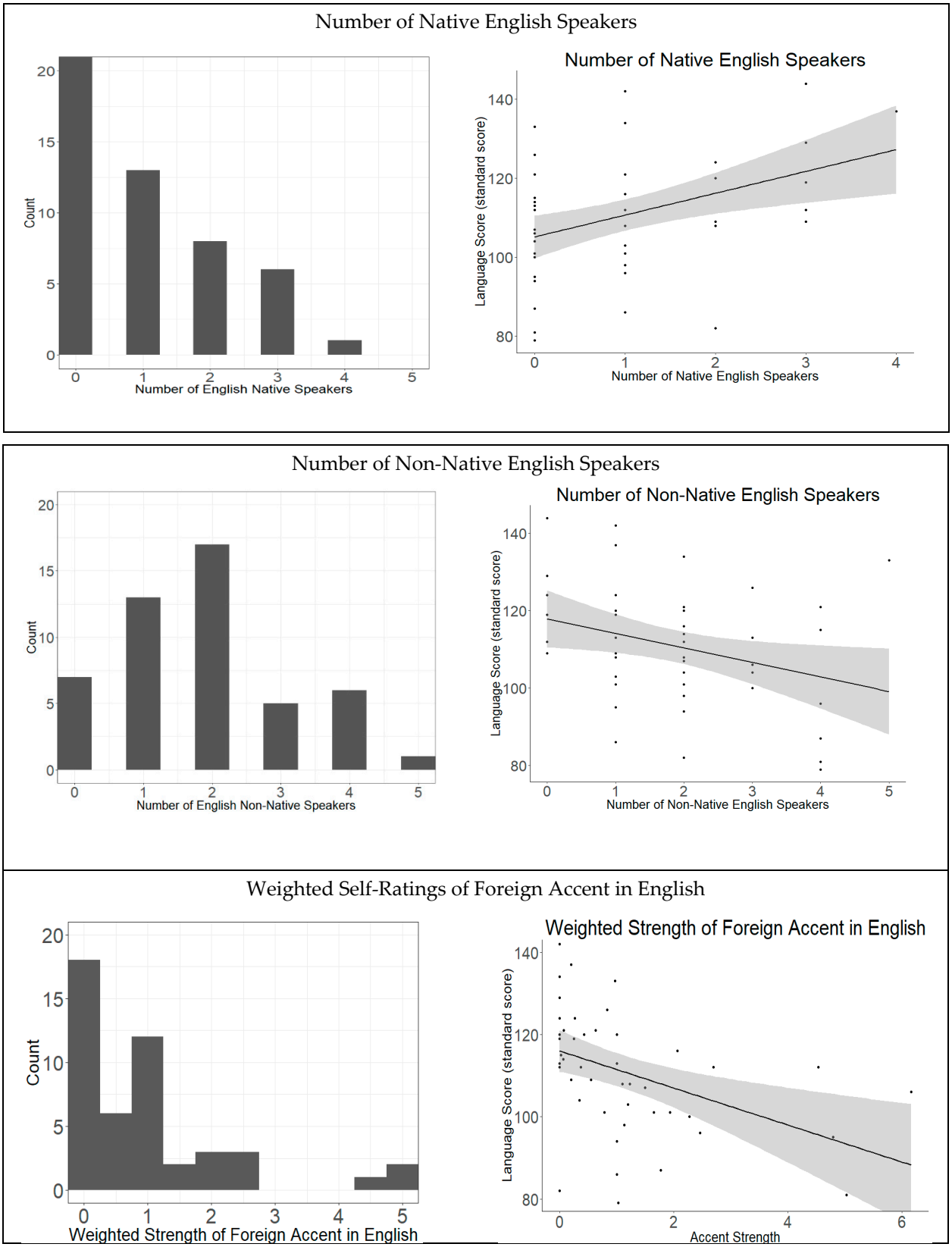

Figure 1. Visual representation of regression models for the self-report analyses.

Table 4. Pearson's correlations for the grammatical complexity variables.

	Intelligibility	MLU in Morphemes	Percent Errors	Weighted Accent
Intelligibility	--	0.30	0.02	−0.35
MLU in morphemes	0.30	--	−0.02	0.04
Percent errors	0.02	−0.02	--	0.06
Weighted Accent	−0.35	0.04	0.06	

Note. Intelligibility and weighted accent were marginally correlated ($p = 0.07$).

Model 4 assessed the impact of errors in the input using the percent of utterances with errors, which ranged from 0 to 50% ($M = 13.15\%$, $SD = 13.25\%$). The model revealed that, after taking into account children's non-verbal intelligence and SES, the percent of utterances with errors in English ($\beta = 0.08$, $p = 0.64$) was not a significant predictor of children's language skills. The results remained the same when all of the variables of interest were weighted to account for variability in the percent of time the caregiver interacted with the child in English. Recall that seven of the parents were native English speakers; therefore, the data were re-analyzed including only the 23 parents who were non-native English speakers. The results did not change. Table 5 presents the full model details and Figure 2 shows a visual representation of the regression models.

Table 5. Linear regression models for grammatical complexity and accent ratings.

	Estimate	Standard Error	*t*-Value
Model 1: Weighted Foreign Accent in English Rating			
Intercept	118.41	3.49	33.93 ***
Weighted Accent Rating	−9.32	3.31	−2.81 **
Non-verbal IQ	0.92	0.27	3.37 **
SES	1.16	0.72	0.12
$R^2 = 0.69$, Adjusted $R^2 = 0.65$, $F(3, 22) = 16.51$, $p < 0.001$; Cohen's $f^2 = 2.2$			
Model 2: Intelligibility			
Intercept	−91.20	84.71	−1.08
Percent Intelligible Utterances	2.06	0.86	2.40 *
Non-verbal IQ	0.98	0.27	3.61 **
SES	1.88	0.57	3.26 **
$R^2 = 0.58$, Adjusted $R^2 = 0.53$, $F(3, 24) = 11.28$, $p < 0.001$; Cohen's $f^2 = 1.4$			
Model 3: Morphology/Syntax			
Intercept	102.41	8.59	11.92 ***
MLU in Morphemes	0.82	0.74	1.11
Non-verbal IQ	1.05	0.29	3.57 **
SES	1.55	0.62	2.49 *
$R^2 = 0.51$, Adjusted $R^2 = 0.45$, $F(3, 24) = 16.51$, $p < 0.01$; Cohen's $f^2 = 1.04$			
Model 4: Errors			
Intercept	110.50	3.32	33.24 ***
Percent Utterances with Error	0.08	0.18	0.48
Non-verbal IQ	1.17	0.30	3.95 **
SES	1.67	0.63	2.64 *
$R^2 = 0.49$, Adjusted $R^2 = 0.43$, $F(3, 24) = 7.71$, $p < 0.01$; Cohen's $f^2 = 0.96$			

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

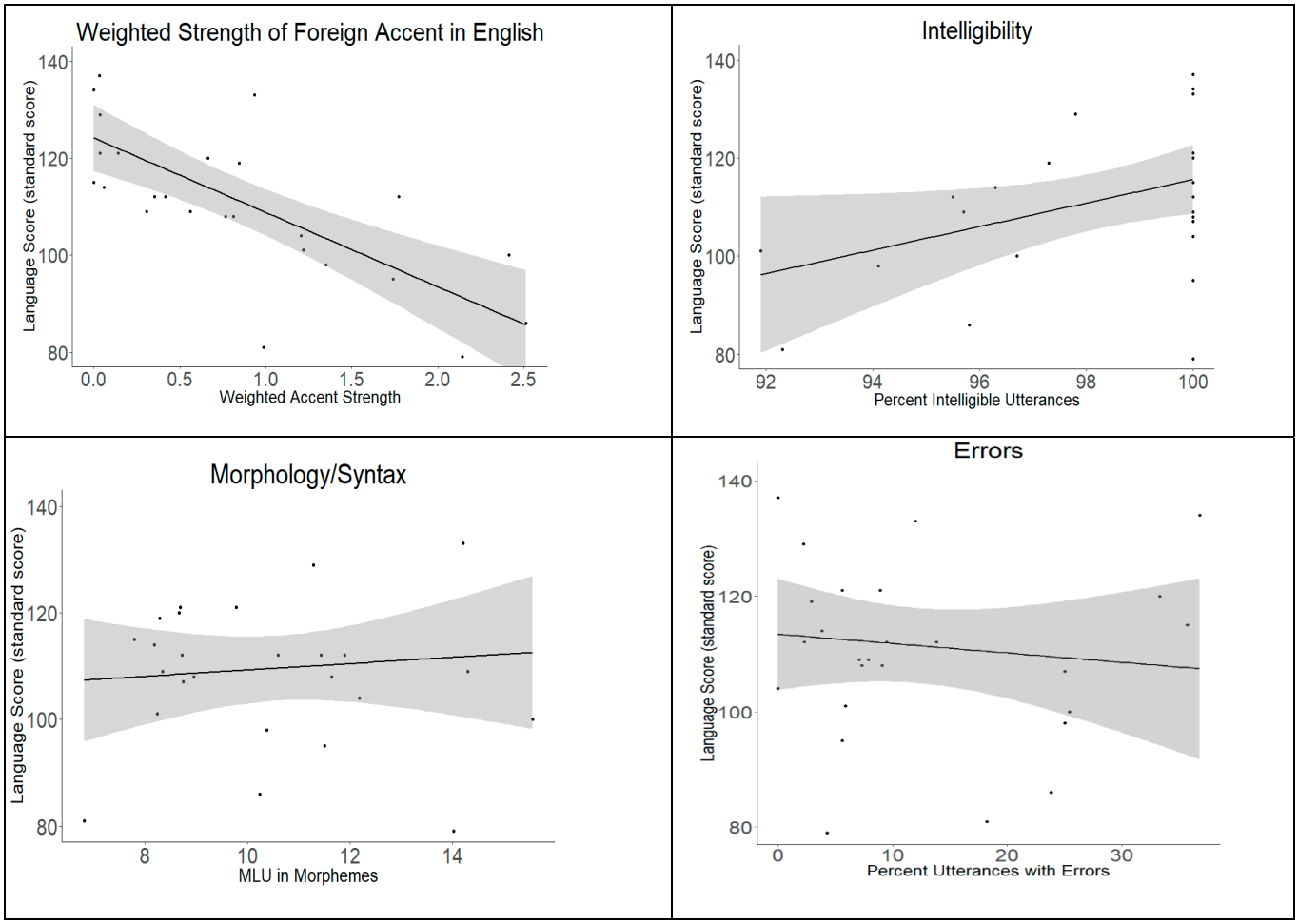

Figure 2. Accent ratings and grammatical complexity.

4. Discussion

Given that in the early years of development, children receive most of their linguistic input from their caregivers, it is not surprising that the quality of the caregivers' language has been consistently linked to young children's language development. The present study assessed one very salient aspect of language quality common to bilingual children—non-native input—and its association with language outcomes. Most studies have taken a broad approach when assessing this relationship, focusing on native-language status of the individuals in bilingual children's environment. These prior studies also tested very young children. The present study assessed two specific characteristics of non-native input, accent and grammatical complexity, and their association with pre-school English–Spanish bilingual children's language skills. The results revealed that even at the ages of four and five years, and even for children whose language skills fall within the average range (as they did in this study), accented input still had an inverse relationship with language skills. In contrast, grammatical complexity of parental language input was not associated with children's language skills in the present study.

4.1. The Effect of Accented Language Input on Children's Language Skills

Current findings demonstrated that some aspects of non-native language input may be less optimal for children's language development than others. First, when a broad approach was taken to assess the native language status of individuals in children's environment (in line with Place and Hoff 2011, 2016), prior findings were replicated, such that the presence of more non-native speakers in the child's environment was associated with lower language skills. The novel contribution of the present study is the finding that it is accented

input *specifically* that appears to be associated with children's language development: the stronger the foreign accent in English of the individuals in the child's environment, the lower the children's language skills. This was true when primary caregivers provided self-ratings of their own foreign accent in English and that of other individuals in the child's environment, as well as when monolingual listeners judged the primary caregivers' foreign accent in English.

These results, demonstrating that accented input may be less supportive of children's language development than non-accented input, extend previous experimental work, which has shown that accented language input induces processing (Adank et al. 2009; Floccia et al. 2006; Gass and Varonis 1984) and comprehension (Barker and Turner 2015; Mulak and Best 2013; Nathan et al. 1998; Van Heugten et al. 2015) costs. However, previous literature has also shown that monolingual children were able to adapt to accented input such that, even after two short minutes of accented exposure, children's processing of accented input improved (Potter and Saffran 2017; Schmale et al. 2012, 2015; Schmale and Seidl 2009; Van Heugten and Johnson 2014). It is therefore surprising that accented input continues to be associated with pre-school-age bilingual children's language skills, as these children have been exposed to accented input for most of their lives, per parent report. In fact, parents were asked to indicate whether or not their child has ever been exposed to Spanish-accented English, and all but one parent indicated that their child has experienced life-long exposure to Spanish-accented English. Our interpretation of the persistent association between accented input and language outcomes we observed is that pre-school-age children are still receiving the majority of their input from their primary caregivers. Thus, it may not be until well into the school-age years that non-native input will no longer be associated with children's language skills. This hypothesis must be assessed in future work. Further, even though accented input had an inverse relationship with language development, all but two children in the present study had language scores within the average range.

One finding of note is that socioeconomic status (SES) and non-verbal intelligence consistently predicted children's language outcomes across all regression models. The strength of the SES and non-verbal IQ effects outstrips the effect of accented input and is in line with many previous studies that have linked SES and IQ to language outcomes in young children (e.g., De Cat 2021; Hoff 2003). Unfortunately, our models were not powered to detect interactions among SES, non-verbal IQ, and accented input, and it will be the goal of future studies to examine whether the effect of accented input may be modulated by both environmental and child-level factors. Future studies should specifically assess the impact of accented input on language outcomes in children from a variety of SES backgrounds and representing a range of IQ abilities.

Another point of note is that the present study relied on the *PLS-5 Spanish*, which took into account children's Spanish and English knowledge. Because *PLS-5 Spanish* scores rely on children's performance in both English and Spanish, it is most likely that the relationship between accented input in English and the *PLS-5 Spanish* scores is driven by children's performance on the items on the test administered in English. The mechanism by which accented English input would influence Spanish language skills is not apparent, although an indirect relationship is possible (for instance, weaker skills in English may interfere with the ability to scaffold the acquisition of Spanish upon the skills already established in English). However, it would nonetheless be beneficial to assess the impact of English accent input on English and Spanish language skills separately. Given that our language measure is an omnibus language assessment that crosscuts all language domains, including vocabulary/grammar and expressive/receptive language, it is difficult to pinpoint exactly what aspect(s) of language accented input may have a particular effect on. Future studies must take this into account and systematically assess the impact of non-native input on each domain of language. Further, the literature would benefit from longitudinal work assessing the impact of accented input on bilingual children's language development. The longitudinal case study by Babatsouli and Nicoladis (2019) is a positive indication that

children can learn from non-native input over time. We also show that children do indeed learn from non-native input as confirmed by their within average range language scores. However, the specific non-native status of the parent in the longitudinal case study was not defined, therefore, further longitudinal work is necessary to build on the findings of the present study focusing on accented input to determine if there is an age at which accented input in the home ceases to be associated with children's language development. Studies are also necessary to determine whether there is a threshold with regard to how many non-native speakers there are in the child's environment, and how strong the non-native speaker's accent is. Is it the case that having one non-native speaker in the child's environment has the same effect on language as having multiple non-native speakers? Likewise, is it the case that being exposed to non-native speakers with a slight accent has the same effect on language as being exposed to non-native speakers with a heavy accent? It is also important to assess who the speakers are in the child's environment who speak with an accent. In the present study, for completeness purposes, we included all individuals who regularly interacted with the child participating in the study. However, looking closely at the accent data, the average rating of siblings' accent was 1.62 in English and 1.09 in Spanish on a scale of 0 (no accent) to 10 (pervasive), indicating that it is very likely that siblings will have native-like speech patterns. A crucial finding in the present study is that accent *specifically*, and not other aspects of non-native input, was associated with children's language outcomes.

4.2. The Effect of Grammatical Complexity on Children's Language Skills

In the present study, language samples were collected from primary caregivers and three characteristics of their language output were assessed, including intelligibility, syntax/morphology, and grammatical errors. Only primary caregivers' intelligibility in English predicted children's language skills such that primary caregivers who were more intelligible tended to have children with higher language skills. The other variables did not serve as predictors of children's language skills. This is surprising given that the literature on monolingual children has demonstrated that parents who used more diverse syntactic structures had children with better vocabulary skills (Huttenlocher et al. 2010; Pan et al. 2005; Rowe 2012). Further, Altan and Hoff (2018) demonstrated that even bilingual mothers who considered themselves near-native English speakers had less complex grammatical input compared to monolingual English-speaking mothers. More recently, Hoff et al. (2020) showed that child-directed speech provided by more proficient non-native mothers was more beneficial to children's language skills compared to non-native mothers with less English proficiency. Thus, as also pointed out by Unsworth et al. (2019), the level of English proficiency of the non-native speakers appears to play an important role in determining how supportive non-native language input may be to children's language development.

One main difference between these prior studies and the present study is that the language samples used in the present study were not samples of child-directed speech. Instead, parents were asked to spend up to five minutes talking about their child to the investigator. It is therefore possible that the language samples used in the present study do not entirely capture the language parents would use when addressing their child. Future work, where language samples of child-directed speech are analyzed for grammatical properties and examined in relation to children's language outcomes, is necessary to fully delineate the role of parents' grammatical skills in relation to children's language development. However, it is noteworthy that in one previous study (Buac et al. 2014), a relationship was observed between parents' English vocabulary skills (measured via a standardized assessment) and children's English vocabulary skills, despite the fact that the parent measure was *not* collected in the context of a parent–child interaction.

Another possible explanation for these findings may be in line with previous studies that have shown a lack of a relationship between parental use of English in the home and children's English language skills (e.g., Duursma et al. 2007; Gutierrez-Clellen and Kreiter 2003; Hammer et al. 2009; Paradis 2011). For example, Hammer et al. (2009)

demonstrated that for Spanish–English bilingual children who attended Head Start, the mother's use of English in the home was not related to children's English languages skills. The authors posited that the English exposure outside the home (i.e., Head Start) was sufficient for children's English development resulting in a lack of association between maternal English use in the home and children's English language skills. This possibility also applies to the present findings. That is, given the fact that the children in the present study were pre-school age, it may be the case that even if non-native speakers of English in the child's environment do not provide grammatically rich input, children may be receiving grammatically rich input outside of the home. However, this explanation is unlikely given that a significant relationship was observed for accented input. Another possible explanation for the findings is that the present study used a measure of total language skills as the outcome variable, and this measure took into account both children's English and Spanish language skills. In the previous work with five- to seven-year-old children (Buac et al. 2014), the relationship between parent's and children's vocabulary skills only held for English language skills and this relationship was only observed within English and not across languages. Therefore, future work should assess this relationship in a within-language context. Further, in the present paper, the relationship between parents' grammatical complexity and children's broad language skills was assessed. Future work focusing on a more fine-grained analysis of children's grammatical skills and its association to parent's grammatical complexity is required.

It is interesting that primary caregivers' intelligibility in English was the only objectively derived significant predictor of children's language skills. This finding is not surprising given that the present study also demonstrated a strong association between accented input and children's language skills. Accented input may be less intelligible, resulting in processing and comprehension difficulties. In fact, the percent of intelligible utterances moderately correlated with primary caregiver's accent ratings ($r = -0.35$) such that the higher the percent of intelligible utterances, the lower the accent rating. Therefore, at least for four- and five-year-old Spanish–English bilingual children, accented input, but not grammatical complexity, appears to be associated with children's language skills.

5. Conclusions

In summary, the results reveal that accented input has an inverse relationship with pre-school-age children's language skills. Given that previous research demonstrates adaptation effects even after a short period of exposure to accented input (Potter and Saffran 2017; Schmale et al. 2012, 2015; Schmale and Seidl 2009; Van Heugten and Johnson 2014), this finding is somewhat surprising. Given that the children in the present study had life-long exposure to accented input, it would be expected that they would have accommodated to this aspect of their input with time. Yet, the present findings demonstrate that bilingual children do not appear to be able to accommodate to accented input in their environment and that non-native language input continues to play a significant role in children's language development even into the pre-school-age years. It is likely that other variables related to input quality, such as parents' language skills and interaction styles, may also play a role in these findings. Future studies should assess the interaction between factors, such as interaction style, interaction context, and accent. For example, the grammar used by non-native speakers may be impacted by the interaction context, such as during book-reading. Thus, future work should carefully document the contexts in which non-native input is provided. Although this is not a longitudinal study, the present study suggests longer-term repercussions of accented input as almost all parents indicated that their child has had life-long exposure to accented input. Future work is needed to consider whether the effect of non-native input continues to shape language development as children become more exposed to a variety of speakers outside of home. The results of the present study also lend themselves to a number of other avenues for future research questions. Specifically, are there child-specific factors that may augment the negative impact of accented input? We considered non-verbal IQ as a covariate, but

other cognitive skills may interact with the influence of accented input. Ultimately, all but two children scored within the average range on the language assessment, suggesting that accented input may result in less optimal learning, but yields successful learning, nonetheless. The subsequent step would be to assess whether accented input influences language development differently for children from varying backgrounds, such as children from various socioeconomic backgrounds, children with developmental language disorder, and children across the spectrum of neurodiversity.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets generated during the current study are available from the corresponding authors on reasonable request.

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