

Habla Conmigo Papá: Fathers' Language Input to Latinx Infants

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Latinxes are the largest growing minority in the United States and many are bilingual, meaning that as a population they face distinct sociocultural and linguistic differences. Due to systemic disparities, Latinxes often experience an academic achievement gap (Padilla & Gonzalez, 2001; Reardon & Galindo, 2009). Language ability in early childhood is one of the single best predictors of school readiness and later school success, and the language input to which children are exposed is predictive of their later language ability (Golinkoff et al., 2019; Durham et al., 2007; Hart & Risley, 1995; Hirsh-Pasek et al., 2015; Hoff et al., 2012; Lee & Burkam, 2002; Weisleder & Fernald 2013). To better understand the relationship between language input and language outcomes cross-culturally, it is critical to study these children's naturalistic language environments and their parents' language input, along the demographic and sociocultural variabilities that they experience. In addition, research should examine father caregivers. Most research concerning children's language environments has focused on mothers, and this is arguably a limitation as it does not show the full picture. According to sociocultural and interactionist theories of language learning, children learn from all social interactions with caregivers, including those with fathers (Bruner 1983; Kuhl et al., 2003, 2007; Vygotsky, 1962). In this study we aimed to understand the early linguistic environments of Latinx infants by focusing on their fathers' language input and the potential sociocultural differences that may be related to language input in this population.

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1. Background

1.1. Quantity and Quality of Language Input

High quantity (number of words) and high quality of language input from caregivers is crucial for an infant's language learning. Starting in infancy, both the quality and quantity of parental language input are correlated with and are predictive of children's later language abilities (Golinkoff et al., 2019; Hart & Risley 1995; Hirsh-Pasek et al., 2015; Hoff et al., 2012; Ramírez-Esparza et al., 2017). However, the language environments of infants can vary greatly, and variability in language input from caregivers can have lasting effects (Hart & Risley, 1995). In recent years, emerging technologies such as LENA (Gilkerson & Richards, 2020) have provided an ecologically valid option for characterizing children's language environments via daylong recordings in naturalistic settings. The present study uses the LENA technology to consider the number of words that caregivers speak around and to their infants as a quantitative measure of language input, as well as caregivers' use of parentese as a qualitative measure of language input. Parentese is a style of speech characterized by an increase in pitch, an increase in pitch contours, slower tempo and elongated vowels (Fernald & Simon, 1984; Grieser & Kuhl, 1988). The use of parentese with infants, particularly in one-on-one (1:1) contexts, has been linked to better language outcomes (Ramírez-Esparza et al., 2014, 2017). This is because infants are able to focus and engage in frequent back and forth interactions with caregivers when parentese is directed at them in 1:1 situations (Ramírez-Esparza et al., 2009; Ramírez-Esparza, 2014; Ferjan Ramírez et al., 2020). To date however, most research that has examined language input from caregivers has focused exclusively on mothers, without considering paternal contributions.

1.2. Fathers' Language Input

Traditionally, fathers have been assumed to be less involved in childcare responsibilities and their children's development, while mothers have been considered to be the primary caregivers (Cabrera et al., 2018). As a result, mothers have been the focus of most studies involving parental language input (Ferjan Ramírez, 2022). Recent research demonstrates that, on average, fathers talk less overall compared to mothers (Gilkerson & Richards, 2009; Golinkoff & Ames, 1979; Pancsofar & Vernon-Feagans, 2006; Shapiro et al., 2021). For example, a recent study using the LENA technology on a sample of monolingual, non-Latinx infants found that fathers spoke on average 48% fewer words to their infants than mothers, illustrating a substantial gap in language input quantity between mothers and fathers (Shapiro et al., 2021). Interestingly, while fathers' input is significantly lower in quantity, it has been shown to uniquely correlate with child language outcomes (Majorano et al., 2013; Malin et al., 2014; Pancsofar & Vernon-Feagans, 2006; Pancsofar et al., 2010; Shapiro et al., 2021). For example, Pancsofar and Vernon-Feagans (2006) found that fathers', but not mothers', vocabulary diversity at 24 months predicted children's expressive language skills

at 36 months, even though fathers had produced fewer utterances, word types, wh-questions, and shorter conversational turns.

Parentese, previously called “motherese”, is known to be used by monolingual, non-Latinx North American fathers quite often, although less so than by mothers (Bergelson et al., 2018; Shapiro et al., 2021). Using the LENA technology, Shapiro et al. (2021) found that mothers used 52% more parentese than fathers after controlling for the presence of fathers in the home while the recordings were collected. However, they also found that fathers’ use of parentese correlated to children’s language outcomes in ways that mothers’ did not, suggesting that while there is a large discrepancy in the quantity of fathers’ and mothers’ language input, fathers’ input significantly contributes to children’s language development. Together, this suggests that fathers are unique and important contributors to their children’s language environments. However, very few of these studies have been conducted with culturally diverse samples, limiting the generalizability of their findings. Almost no research has specifically focused on Latinx fathers, even though there are cultural and linguistic aspects that are unique to this population and worthy of scientific investigation. For example, Latinx families are often bilingual or multilingual. Furthermore, compared to non-Latinx populations in the USA, they tend to be more talkative and social overall, with incipient research showing that this uniquely contributes to Latinx infants’ language development (Ramírez-Esparza et al., 2009, 2014).

1.3. Latinx Families’ Language Environments

The Latinx population in the United States is extremely diverse and is influenced by traditional Latinx culture and American culture, both of which come with distinct values and customs. To provide one example, Latinx families are characterized as abiding by the values of *familisimo* and *machismo* (Cabrera et al., 2008; Glass & Owen, 2010). *Familisimo* is the cultural view that supports a closeness and loyalty to one’s family and that one’s identity is rooted in family (Marín & Marín, 1991). *Machismo* is the cultural view that places importance on traditional gender roles which define men as being strong, masculine and dominant (Unger et al., 2002). At the same time, across many cultures, values are becoming increasingly egalitarian. Ideas of equal partnership in caretaking and working are now endorsed by many, and there is a weaker sense of strong familial ties (Cotter et al., 2011). Because they have many cultural influences, Latinx parents in the United States may have unique ways in which they communicate with their infants. For example, if some Latinx families abide by strict gender roles and *machismo*, it could be the case that Latinx fathers are less likely to interact linguistically with their children compared to non-Latinx fathers. Paternal interactions with infants could also be impacted by a high familial importance (*familismo*). A desire for a connected family could mean that fathers are more likely to interact with their infants.

Another interesting consideration when discussing the effects of gender and culture on language input is infant sex. Previous research on this topic within non-Latinx families reports conflicting results, with some studies reporting differences

in parental input and parental parentese based on infant sex, while other find no differences (for example, Johnson et al., 2014; but see Bergelson et al., 2018). To our knowledge, no research on this topic, particularly in relation to father input, has been conducted in Latinx families.

It is also important to examine the social context in which bilingual Latinx infants experience language input. Bilingual Latinx infants, like their monolingual non-Latinx peers, experience both standard, adult directed speech, and parentese in their homes. Furthermore, like their non-Latinx peers, they benefit significantly more from parentese compared to standard speech (Ramírez-Esparza et al. 2014, 2017). However, unlike their monolingual peers who benefit predominantly from parentese in 1:1 contexts, infants in bilingual Latinx families learn from parentese in both 1:1 *and* group situations (Ramírez-Esparza et al. 2017), which could be related to increased talkativeness in Latinx families (Ramírez-Esparza et al., 2009, 2014). More research is needed to fully understand these results.

1.4. The Present Study

Drawing knowledge from previous research focused on Latinx families and previous research focused on fathers' language input (Ramírez-Esparza et al., 2014, 2017; Shapiro et al., 2021), we recruited Latinx infants in bilingual (Spanish-English) families living with both their mother and father to explore three themes: (1) Maternal and paternal quantity of language input; (2) Maternal and paternal use of parentese; and (3) Maternal and paternal language input in relation to infant sex. We predicted that infants would hear a higher quantity of words and more parentese from their mothers compared to their fathers, as seen in previous research with non-Latinx families (Bergelson et al., 2018; Gilkerson & Richards, 2009; Golinkoff & Ames, 1979; Pancsofar & Vernon-Feagans, 2006; Shapiro et al., 2021). We also predicted that, as reported by Ramírez-Esparza and colleagues, the proportion of group parentese to 1:1 parentese will be higher than in previous research with non-Latinx monolingual samples. Finally, because of the adherence to gender roles in Latinx families, we explored the idea that there may be differences between boys and girls in the quantity of words and parentese that they hear.

2. Methods

2.1. Participants

Participating families were part of a larger research project on early interactions and language development. The criteria for inclusion in the present study were: infant age between 1 and 24 months; parents identify infant as being of Latinx descent; infant resides with their mother and father, father identifies as being of Latinx descent, infant is exposed to English and Spanish via direct interactions by live native speakers at home; infant was born full-term (within ± 14 days of due date), of normal birth weight (6-10 lbs), and had no major birth or postnatal complications. A total of twenty-eight participants met eligibility criteria and were included in our final study sample (15 girls; mean age: 13.4 mo,

range: 3.9 - 21.9 mo). Participants were socioeconomically diverse, ranging from lower to upper-middle-class families, with a mean Hollingshead Index of 46.9, and a range from 19 (e.g. neither parent has completed high school, both working in unskilled labor) to 66 (e.g. both parents with advanced degrees, working as professionals).

2.2. Language input assessment

Using the LENA technology, naturalistic daylong recordings were collected in infants' homes. The LENA device is a light-weight recorder that records everything that the child hears and produces (Gilkerson & Richards, 2020). LENA is supplemented by automated speech analyses and can be enhanced by manual (human) analyses to yield estimates of parental use of different speaking styles (i.e., parentese vs. standard speech) or different languages. Two LENA recorders and two LENA vests were sent to each family in the mail after agreeing on the recording dates via video-chat. Parents were instructed to record a "typical" weekend, defined as two consecutive days when both parents were home and not working. Parents were asked to start each recording in the morning when the infant woke up, and to turn off the recorder at night when the infant went to sleep. They were asked to go about their activities as usual.

2.3. LENA data preparation

The LENA data preparation procedures followed those outlined in the three published studies by Ramírez-Esparza and colleagues (2014, 2017), by Ferjan Ramírez and colleagues (2018, 2020, 2021, 2022) and Shapiro and colleagues (2021). Parent and child speech were quantified through a combination of automatic annotation by LENA software and manual (human) annotation (all variables are summarized in Table 1). Three research assistants, fluent in Spanish and English, followed the procedures outlined in Ramírez-Esparza and colleagues (2014, 2016, 2017), Ferjan Ramírez and colleagues (2018, 2020, 2021, 2022), and Shapiro and colleagues (2021) to manually annotate the data. Coders were tested independently with a training file from Ramírez-Esparza and colleagues (2014) and a training file from the present dataset, used to evaluate inter-coder reliability. The reliability analysis produced an average intra-class correlation of 0.91 (mother's language: 0.94; father's language: 0.90; mother's parentese: 0.94; father's parentese: 0.86; babbling: 0.86; CTs: 0.95) indicating effective training and reliable coding (see also Ramírez-Esparza et al., 2014, 2017; Ferjan Ramírez et al., 2018, 2020, 2021, 2022; Shrout & Fleiss, 1979). Because the LENA recordings varied in duration, projected 12-h values were used for all LENA automatic measures. The values for all "manual" variables are based on 100 30-s segments, which were annotated by humans as described above.

Table 1. Language variable names, types, and definitions

Variable name	Variable type	Variable definition
AWC	LENA	Total number of adult words heard by the child during the recording, estimated automatically by LENA and averaged over two recording days.
MAN	LENA	Total number of male adult words heard by the child during the recording, estimated automatically by LENA and averaged over two recording days.
FAN	LENA	Total number of female adult words heard by the child during the recording, estimated automatically by LENA and averaged over two recording days.
%Parentese total	Manual	Percent of segments where mother, father, or other adult spoke directly to the infant, parentese speech style was used (high pitch, larger pitch range), and one or more than one adult voice was recorded during the interval.
%Mother Parentese	Manual	Mother spoke directly to the infant, parentese was used, and one or more adult voices were recorded during the interval.
%Father Parentese	Manual	Father spoke directly to the infant, parentese was used, and one or more adult voices were recorded during the interval.
%Parentese Group	Manual	Mother, father or other adult spoke directly to the infant, parentese was used, two or more adult voices were recorded during the interval.
%Parentese 1:1	Manual	Mother, father or other adult spoke directly to the infant, parentese was used, and only one adult voice was recorded during the interval.

AWC = Adult Word Count; FAN = Female Adult Nearby words; MAN = Male Adult Nearby words. LENA = LENA estimate; Manual = manually coded.

2.4. Statistical analyses

Continuous variables were summarized as mean \pm standard deviation (SD). Means of FAN and MAN, then % mother parentese and % father parentese, then

% group parentese and % 1:1 parentese were compared using paired samples *t*-tests. Independent samples *t*-tests were used to compare means according to infant sex in the following variables: AWC, FAN, MAN, % parentese, % mother parentese, % father parentese, group parentese, and 1:1 parentese. An alpha level of 0.05 was used for all statistical tests.

3. Results

3.1. Theme 1: Maternal and paternal quantity of language input

Infants in the present sample heard an average of 19,348 words per day, which is 1.2x as many as the monolingual non-Latinx sample of a similar age studied by Shapiro and colleagues (Shapiro et al., 2021). Despite this, the language input gap between mothers and fathers persisted in the present sample. Moms spoke an average of 13,288 words a day and fathers spoke an average of 7,092 words a day ($t(27) = 6.6; p < 0.001$). Infants in our sample therefore heard 1.9x as many words from their mothers compared to their fathers (Figure 1.).

Table 2. Speech Variables and their distributions

Variable	Mean \pm SD
AWC	19348 \pm 8283
FAN	13288 \pm 4948
MAN	7092 \pm 4533
% Parentese total	50 \pm 19
% Mother Parentese	30 \pm 13
% Father Parentese	22 \pm 17
% 1:1 Parentese	25 \pm 13
% Group parentese	31 \pm 18

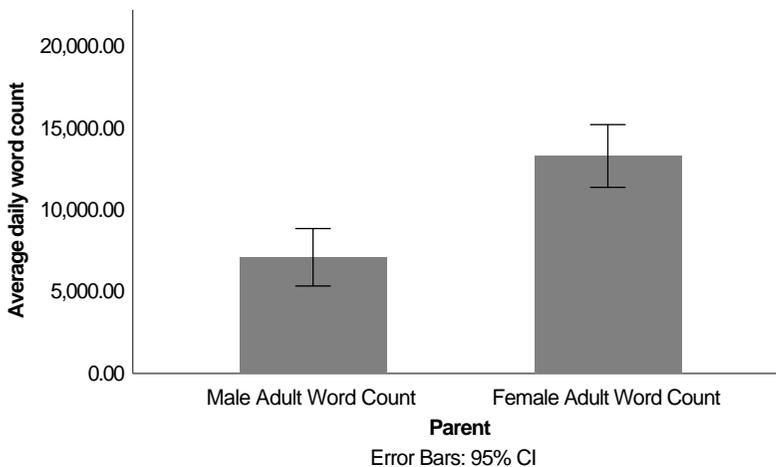


Figure 1. Comparison of Male and Female Adult Word Counts

3.2. Theme 2: Maternal and paternal use of parentese

Out of all 28 fathers in the sample, all that spoke in the manually analyzed intervals (27 out of 28) used parentese. This demonstrates that Latinx fathers adapt their speech in the interactions with their infants. As shown in Figure 2, infants in the present sample heard significantly more parentese from their mothers than their fathers ($t(27) = 2.4$; $p < 0.05$). However, it is important to note that this is not a relative comparison and that a lower input of parentese from fathers may be due to a decreased talkativeness overall.

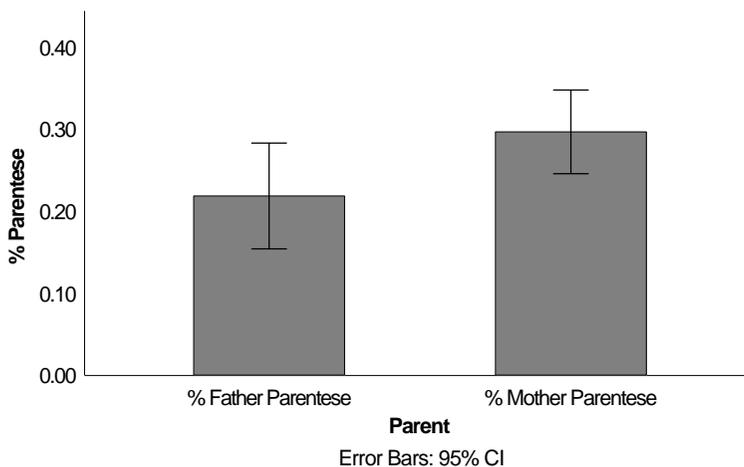


Figure 2. Parentese use by fathers and mothers

We next considered the social context of parentese use (i.e. group vs 1:1 interactions). Out of all of the annotated intervals in the present sample, 24.6% contained 1:1 parentese, and 30.8% contained group parentese. The difference between these two social contexts was not statistically significant ($t(27) = -1.33$, $p = 0.19$). Interestingly, Ramírez-Esparza et al. (2017) found that out of all annotated intervals in their sample, 24.7% contained 1:1 parentese and 20.3% contained group parentese. Thus, our results replicate the amount of 1:1 parentese reported by Ramírez-Esparza and colleagues and exceed the amount of group parentese that they reported.

3.3. Theme 3: Maternal and paternal language input in relation to infant sex

Our analyses of language input in relation to infant sex included the following variables: AWC, FAN, MAN, % parentese total, % mother parentese, % father parentese, % parentese 1:1 and % parentese group. Descriptive statistics for each variable are shown in Table 3.

Infant sex did not influence how many words the infants heard ($t(26) = 1.7$, $p = 0.1$), but in an analysis that separated maternal and paternal speech, we found that mothers spoke a marginally higher number of words to female infants than male infants ($t(26) = 1.7$, $p = 0.0980$). However, the same was not true for fathers (see table 3., $t(26) = 1.3$, $p = 0.20$).

Infant sex also did not influence how much overall parentese the infants heard ($t(26) = -0.75$, $p = 0.46$), nor did mothers or fathers alone differ in the quantity of parentese they used based on their infant's sex ($t(26) = -0.48$, $p = 0.63$) and ($t(26) = 0.048$, $p = 0.96$) respectively.

Next, we considered the social context of parentese use in relation to infant sex. When 1:1 and group parentese were examined separately, we found that male infants heard more 1:1 parentese than female infants ($t(26) = -3.0$, $p = 0.0063$) and female infants heard marginally more group parentese than male infants ($t(26) = 1.7$, $p = 0.0918$).

Table 3. Speech Variables and their distributions by infant sex

Variable	Mean \pm SD
AWC by infant sex	
Male	16583 \pm 5741
Female	21745 \pm 9531
FAN by infant sex	
Male	11624 \pm 3447
Female	14731 \pm 5677
MAN by infant sex	
Male	5893 \pm 2766
Female	8130 \pm 5530
% Parentese total by infant sex	
Male	53 \pm 14
Female	47 \pm 23
% Mother Parentese by infant sex	
Male	31 \pm 12
Female	29 \pm 14
% Father Parentese by infant sex	
Male	22 \pm 15
Female	22 \pm 19
% 1:1 Parentese by infant sex	
Male	30 \pm 10
Female	20 \pm 13
% Group Parentese by infant sex	
Male	27 \pm 14
Female	34 \pm 20

4. Discussion

This study is among the first to broaden the cultural scope of language input research while focusing on Latinx fathers. Using daylong LENA recordings, we found that Latinx fathers use fewer words and less parentese compared to mothers, as has been previously shown in non-Latinx samples (Gilkerson & Richards, 2009; Golinkoff & Ames, 1979; Pancsofar & Vernon-Feagans, 2006; Shapiro et al., 2021). In the present sample, this gap between mothers and fathers was observed despite the fact that infants heard a higher overall number of adult words compared to previous non-Latinx samples. Taken together, this demonstrates that the language input gap between mothers and fathers exists cross-culturally and should be considered an important factor when studying and addressing language input in Latinx and non-Latinx families.

While the quantity of language input we examined differs between mothers and fathers, our results support an evolving understanding that fathers are important language input contributors to their infants. For example, all fathers who spoke in the audio segments used parentese, suggesting that fathers adjust their language use and are sensitive to their infants, just like mothers. Thus, the focus of future research should not necessarily be on how fathers do not produce the same language as mothers but should aim to better understand how fathers uniquely contribute (possibly in ways that mothers do not) to their children's language learning. To do so may require a change in research perspective that is not solely informed by previous research done only with mothers. Instead, future studies should center an understanding of fathers' roles as caregivers and the contexts in which fathers feel the most comfortable with their infants.

The present studies replicated the results by Ramírez-Esparza and colleagues (2017) who showed that bilingual Latinx infants experience more group parentese than their non-Latinx peers, supporting the notion that cultural and social aspects can impact children's language environments. Interestingly, and unlike in the work by Ramírez-Esparza and colleagues (Ramírez-Esparza et al., 2017), the infants in our sample heard *more* group parentese than 1:1 parentese. Studies with larger samples should further look at how group vs 1:1 parentese impact infants' language learning. However, based on previous work by Ramírez-Esparza and colleagues (2017) bilingual Latinx infants, unlike their non-Latinx monolingual peers, learn just as well from parentese in both social contexts.

Results from theme 3 suggest that infant sex does not greatly affect the quantity of maternal or paternal language input, or the quantity of maternal or paternal parentese. However, we did find interesting results regarding how infant sex may affect the contexts in which they hear parentese. Specifically, female infants in our sample heard more group parentese than male infants, and male infants heard more 1:1 parentese than female infants. This difference in parentese context may demonstrate a difference in how caregivers interact with their infants based on infant sex. More research should be done to confirm these results.

4.1. Limitations and future directions

As in any other study, there are some limitations that should be considered. First, the present study sample was relatively small, so our results may not be largely generalizable. Also, the Latinx population is heterogeneous, and this variety was reflected in our sample. The families we recruited originate from many different countries and speak different amounts of Spanish and English in their homes. As a result, the cultural values, beliefs, and practices they cherish may vary greatly and their language input practices may differ as a result. It is also important to note that, while all families in the present sample were bilingual, we did not focus on bilingual language development in infants. Finally, while children's language outcome measures were not included in this analysis, we hope to expand this research in the future to understand how fathers' input in this population directly contributes to children's language learning.

We are excited to share this research because it contributes to the growing body of knowledge surrounding fathers' language input and provides evidence of a need for language input research to be conducted with diverse populations.

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