

Infant-Directed Speech in Bilingual Parents

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## Abstract

Infants are exposed to rich language when parents talk to them. Infant-directed speech (IDS) or “baby talk” is characterized by simplified utterances, higher pitch, slower rate of speech, and longer pauses. However, most of what is known about IDS is from studies of monolinguals; this leaves the question of whether the same characteristics hold true for infants acquiring more than one language. The purpose of this study is to explore both infant-directed speech and adult-directed speech (ADS) in bilingual parents. Infants from 8-to-20-months and their parents participated in several interactive tasks. These tasks allowed us to compare how parents talk to their own infant using IDS compared to speech to another adult. It is important to better understand the role IDS plays in bilingual language acquisition and the ways that it might differ from monolingual IDS.

## **Infant-Directed Speech in Bilingual Parents**

From birth, bilingual and monolingual infants are exposed to their caregivers' speech. An infant whose parents are English-speaking individuals, will only be exposed to English. The infant will hear a set of sounds that will help them understand and acquire the English language. However, a majority of infants worldwide are not learning just one set of sounds and words; the majority of individuals worldwide learn more than one language (Grosjean, 2012). Bilingualism can be defined as the ability to understand and communicate in two languages (Garcia, 1986). For many people, bilingualism begins very early in life, as infants hear two languages through their parents and caregivers. There is evidence that shows that bilingual infants can successfully navigate both languages. Core, Hoff, Rumiche, and Señor (2013) tested 23-to-30-month-old Spanish-English bilinguals' total vocabulary size, including all the words known across both languages. The results indicate that total vocabulary size showed a similar rate of growth with bilinguals and monolinguals. This provides evidence indicating that bilingual infants are able to acquire both languages in early development without having a delay in comparison to monolinguals.

Infant-directed speech (IDS) is a speaking style often used by parents. The characteristics associated with IDS include longer pauses, higher pitch, greater pitch range, and a slower rate of speech in comparison with adult-directed speech (ADS) (Fernald & Mazzie, 1991; Fernald & Simon, 1984; Fernald et al., 1989; Garnica, 1977; Grieser & Kuhl, 1988). Evidence suggests that children prefer to listen to IDS over ADS (Fernald, 1985). Moreover, infants learn better from IDS than ADS. For example, Graf Estes & Hurley (2013) demonstrated that IDS with variation in prosody can promote word learning with 17-month-old infants. The exaggerated prosody that is used in IDS contributes to infants being more attentive to IDS labels than to ADS labels.

Thiessen, Hill, and Saffran (2005) proposed that infants are also better able to learn word boundaries from statistical cues given in IDS prosody than ADS. This suggests that IDS can provide information in speech that promotes word segmentation. Thiessen et al. (2005) and Graf Estes & Hurley (2013) provide examples of infants learning better from IDS than ADS.

Most of the literature on IDS has been based on studies of English-speaking monolinguals (Albin & Echols, 1996). However, there is limited research that has been conducted with bilingual participants using IDS. A study by Fish, Garcia-Sierra, Ramirez-Esparza, and Kuhl (2017) demonstrated that Spanish-English speaking bilinguals exaggerate voice onset time (VOT) with stop consonants in IDS, while using Spanish-like properties in English and English-like properties in Spanish. There is also evidence that bilingual caregivers show more variability in IDS in comparison to English monolingual caregivers. Danielson, Seidl, Onishi, Alamian, and Cristia (2014) found that French-English speaking bilingual caregivers produce distinct pitch and duration patterns in IDS in English and French. The studies demonstrate that the characteristics of IDS are present in different languages. This suggests that distinct patterns are accessible to infants who are exposed to two languages through the speech of bilingual speakers. Bilingual parents continue to use this register even though they speak in two languages with their infants. This also shows that the literature available with bilingual infant-directed speech studies is limited and there are aspects of bilingual IDS that we do not understand thoroughly.

The parent's use of two languages while directing their speech to their infants has also raised questions how code switching in IDS might affect infants. Code switching is defined as "any kind of discourse in which words originating in two different language systems are used side-by-side" (Backus, 2005). This is an interesting subject because bilingual parents who use

IDS can code switch between languages when they are using this register. Bail, Morini, and, Newman (2015) tested Spanish-English speaking bilingual caregivers to address the “parent code-switching” behavior its relationship with the language development of the infant. This study demonstrated that bilingual parents code switch between languages more often than assumed during IDS, suggesting that the use of code switching can facilitate lexical acquisition (Bail et al., 2015). Bilingual parents will use repetition with their infants suggesting that this phenomenon occurs in bilingual language acquisition. Other research on code switching with adults has shown that speakers who code switched produced a higher pitch and greater vowel duration in comparison to those that didn’t (Olson, 2012). Speakers hyper-articulated words which were used in both languages and the participants code switched (Olson, 2012). The use of code switching in IDS may help the infants understand and acquire their languages.

The present study investigates IDS with Spanish-English bilingual parents and English-speaking monolingual parents. The goal of this research is to understand the role bilingual parents play in infant bilingual language acquisition and how their speech directed to an infant may help the infant understand both languages. We included a monolingual English speaking condition in order to compare how parents adjust their speech across IDS to ADS when they speak only one language. This will allow us to test whether there are acoustic characteristics of IDS that are only present in bilinguals. In the experiment, parents and their infants engage in several interactive tasks that were conducted in IDS and ADS in order to collect speech samples. For the parent-child interaction, we provided toys and books that the parents used with their infants. For the adult-directed speech interaction, we provided toys and a list of descriptions of certain toys. In our analyses, we focus on the acoustic characteristics of word pitch and duration because these are two of the most well studied characteristics of IDS. We predicted that

bilinguals and monolinguals will have a higher pitch and longer word duration in IDS and ADS. We are interested in investigating Spanish-English bilinguals to know if they have a more substantial difference IDS and ADS than monolinguals since they are teaching their infants two languages.

## **Method**

### **Participants**

Participants were parents of 8 typically developing Spanish-English bilinguals and 8 English monolinguals ranging in age from 8-to-20-months. Eight mothers participated in the bilingual condition and 7 mothers and 1 father were part of the monolingual condition. Parents reported children to be full term without developmental delays or hearing loss. In a structured interview, the participating bilingual parents reported to be native Spanish speakers and reported acquiring English when they entered grade school. All children were born in the United States and the Spanish-English bilingual infants were born to bilingual households.

### **Measures of Spanish and English Exposure**

A **Language Mixing Questionnaire** was administered to the bilingual parents to measure their proficiency in each language and the frequency of code switching. The form asks specific questions about contexts in which Spanish or English are used. The form also provides examples where the parent marks on a scale of “*Not at all true of me*” to “*Very true of me*”. The questions that are given to the parents are like the following: “*I often start a sentence in English and then switch to Spanish*”, “*I often start a sentence in Spanish and then switch to speaking English*”. These statements provide information about the common use of code switching of parents and their proficiency in both languages.

We conducted a **Language Background Interview** about the infant's language exposure. The parent is asked to describe a typical week of the child's waking hours excluding nap times. Then, they are asked to provide a list of individuals who spent at least an hour on a regular basis with the infant and the infant's exposure of Spanish and English with each person. This allows us to collect data on the language exposure and language environment of the infant.

The **MacArthur Bates Communicative Development Inventory** (Fenson, Dale, Reznick, Thal, Bates, Hartung, and Reilly, 1993), a parent-report measurement, is used to assess the communication skills of infants. The forms, Words & Gestures and Words & Sentences (Fenson et al., 1993) and the Spanish version Palabras & Gestos and Palabras & Enunciados (Jackson-Maldonado, Thal, Fenson, Marchman, Newton, and Conboy, 2003) are used to measure the Spanish and English communicative development of the infants. Words & Gestures is for 8-to-18-month olds. Words & Sentences is for 16-to-30-month olds. The Spanish versions have the same age range as the English versions. These forms were implemented in the study to collect the parents reports on their children's ability on language specifically looking at vocabulary. These forms were sent home prior to the study appointment. Parents were given a gift card for the completion of the forms.

### **Infant-directed speech stimuli**

**Object naming.** There are two versions of the stimuli used in this experiment, one for bilinguals and one for monolinguals. For the Spanish-English bilingual condition, we chose ten objects for parents to label and use to play with their infants. As shown in Figure 1, the Spanish and English names were written on each item and parents were instructed to use those labels when interacting with their infant. The words used in Spanish versions were *perro*, *gato*, *caballo*,

*vaca, pelota, carro, pato* and *león* and the English versions were *dog, cat, horse, cow, ball, train, car, bird, duck and lion*. For the English monolingual condition, we used the same objects, but they only had one label on the bottom in English.



**Figure 1. Infant-directed speech stimuli**

**Book reading.** As shown in Figure 2, we used three types of bilingual books for the bilingual infants. *My Colors, My World/Mis Colores, Mi Mundo* by Maya Christina Gonzalez, *¿Ha visto a mi gata? / Have You Seen My Cat?* by Eric Carle and *Clean-up Time/ Momento de Arreglar* by Elizabeth Verdick were used as stimuli. The books are a mixture of infant books since the age range for the study is from 8-to-20-months. The bilingual books used a variety of code switching such as intra-sentential and inter-sentential code switching. We provided the parents with three different books to read to their infant as options. We modified the books for the monolingual condition by excluding the Spanish portions of each book and scanning the books to create a modified version of the bilingual book.





## **Figure 2. Infant-directed speech stimuli**

### **Adult-directed speech stimuli**

**Object naming.** For the labeling task of the ADS sample, we used the same objects in IDS object naming task, as shown in Figure 1. Parents were told to provide a brief description of the object to the experimenter using the labels.

**Fun facts.** We designed a task called “Fun Facts” which consists of a list of 9 descriptions of objects or animals the parent reads to the experimenter. For the Spanish-English bilingual condition, the lists use intra-sentential codeswitch in Spanish and English. Sentences like “*This animal can sleep standing up or laying down. Puede ser un animal doméstico o salvaje (it could be a domesticated or wild animal)*” are part of the sheet. In the English monolingual condition, the stimuli are modified to only be English only descriptions. Sentences like “*This animal can sleep standing up or laying down. It could be a domesticated or wild animal*”. An illustration sheet, which contains pictures of the 9 descriptions is used by the experimenter to select the item corresponding to the description. Parents were told to read those descriptions out loud to the experimenter.

### **Procedure**

A Spanish-English bilingual experimenter conducted the study and after giving the instructions in English, the experimenter asks the parent if they had any questions using code switching in Spanish. By using both languages while interacting with the parent throughout the experiment, we can enhance the use of bilingual speech from parents. In the IDS portion, the parent and the infant are seated on a mat in an interactive room. Participants are audio-recorded

using a lavalier microphone attached to a recording device. The microphone is placed on the parent's shirt and is kept on for all of the interactive tasks. The entire session is recorded which allow for later speech analysis.

The order in which the participants complete the IDS and ADS tasks are counterbalanced. In the object labeling task, the parents are given a bin with 10 objects to play with their infant for 6 minutes in total. The experimenter shows the parent the label(s) on the bottom of the toys and instructs the parent to use them while providing a brief explanation of the object to the infant. The experimenter informs the parent that after the 6 minutes are done, the experimenter will come back and give them instructions for the next task. In addition, the experimenter explains that a timer for 4 minutes is set up and when they hear the sound go off, they should start putting the objects in the bin while interacting with the infant. Before leaving the room, the experimenter code switches English and Spanish while asking the participant if they have any questions and then exits the room. This code switching between experimenter-parent is present at the end of each task during the IDS portion. In free play task, participants are given the same toys in the bin, they are shown the label(s) on the bottom on each object. They are reminded to use those labels while interacting with the infant and also told the task is 6 minutes long. A timer will go off after 4 minutes to signal when to can start putting the toys away while interacting with their infant. The experimenter exits the room. In the book task, the experimenter exchanges the objects for three books. The parent continues to sit on a mat with their child and the books are placed in front of them. The parent is instructed to choose a book to read to their infant from those three options. For the bilingual parents, the experimenter continues to explain that the books use both languages, Spanish and English, and that parents should use both languages when reading the book to their infant. The experimenter again tells the parent that the task is 6 minutes

long. If they finish one of the books, they can continue reading the others. We encourage bilingual speech from bilingual parents by emphasizing the bilingual labels of the objects during the different interactive tasks. The books that are provided to our bilingual parents, elicit the use of both languages while interacting with their infant during the book task.

For the English monolingual condition, they performed the same tasks. However, there are some changes that distinguish the tasks from the bilingual condition. In IDS, in the object labeling task, the parent is shown the object's label in English on the bottom of the object and is instructed to use that label when interacting with the infant. For free play task, the parent is told to play with their infant how they would normally play at home. For the book task, the parent and infant are given a set of three different English monolingual books in exchange with the toys in the bin. Those books are placed in front of the participants while they are given instructions on the task. Participants are told to choose a book to read to their infant and if they finish that book, they can read another one.

### **Adult-directed speech**

The parent is brought to the testing room and asked to wear again the audio recorder again. For the fun facts task, the experimenter puts a sheet that contains the lists of descriptions of different objects in front of the parent and proceeds to get the illustration sheet and places it in front of the experimenter. Then, the parent is given a brief description of the sheet that is in front of them and are told the task is 6 minutes long. The participant is instructed using Spanish and English to read those descriptions to the experimenter and the experimenter will try to match the description to one of the illustrations from the sheet. For the monolingual version, the descriptions are only in English.

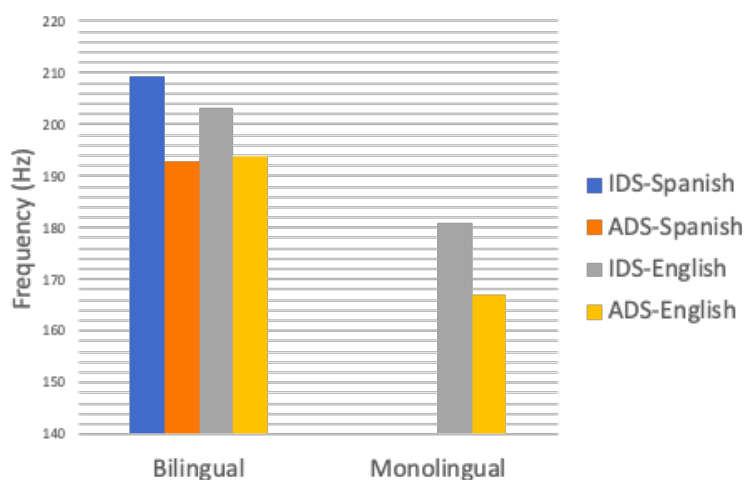
For the object labeling task, the experimenter places the bin with toys on the table, the same ones that were used in IDS object labeling task and free play task. The experimenter then explains to the parent that the objects have labels on the bottom portion in Spanish and English and specifically for this task they will choose each toy individually and provide a brief explanation of the object to the experimenter. The task is 6 minutes long. For the monolingual condition, the labels are only in English.

### **Coding**

The coding of the speech samples is conducted using Praat Software (Boersma & Weenink, 2019). A Spanish-English speaker codes the speech samples in IDS and ADS. Each language is annotated by indicating when the parents spoke Spanish or English and marking the target words. For the present analyses, we focused on the set of target words described above. Words and vowels were excluded from analysis if they included background noise or talker overlap. Using a Praat script, we extracted word duration and fundamental frequency ( $f_0$ ; a measure of pitch) information about the target words. In this group, Spanish-English bilinguals sometimes used the forms of diminutives forms of the target words by adding ending syllables (i.e. -ito, -ita). It is a frequent occurrence in Spanish IDS to use the regular diminutive form to indicate smallness (Ferguson, 1964). We decided to exclude them in our results because they could artificially inflate word duration values. Since this experiment is still ongoing, we have coded object labeling task and free play in IDS and object labeling task in ADS. We will complete coding the book task as well in IDS and ADS.

### **Results and Discussion**

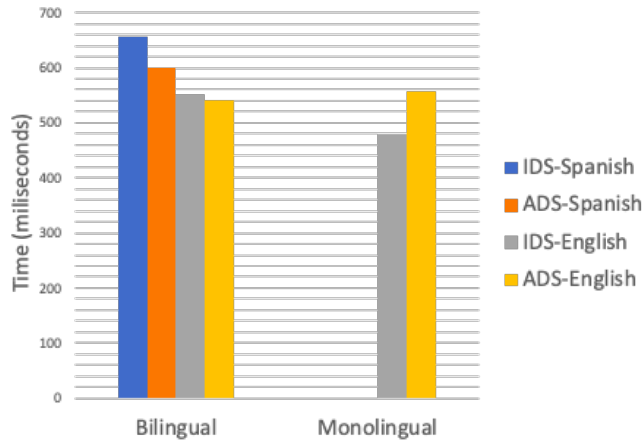
We were interested in conducting research specifically looking at pitch because is a widely studied aspect of IDS (Fernald & Simon, 1984). We had predicted that fundamental frequency ( $f_0$ ) would be higher in IDS than ADS. Based on the small sample of 17 participants, the results suggest a difference across speaking styles and possibly across languages. Because data collection is ongoing, we have not yet performed statistical significance tests. Figure 3 shows the results for average pitch in IDS and ADS. In the bilingual language condition, Spanish IDS has a higher pitch compared to Spanish ADS. Bilingual English IDS was also higher in pitch than ADS. The magnitude of IDS raising may be more in Spanish, but we will need a bigger sample to know if the effects that are present based on our current sample are reliable. For our monolingual English group, pitch in IDS was higher than ADS. However, overall pitch was lower because the sample included a male participant's voice, but the bilingual sample did not. The preliminary data also suggests that our monolinguals seem to be adjusting their pitch in IDS relative to ADS. These results are based on our small sample of preliminary data and we will need to have a larger sample to see if these effects continue to be present.



**Figure 3. Average pitch in IDS and ADS in Bilinguals and Monolinguals**

For duration, we had predicted that IDS would have a greater word duration than in ADS. Figure 4 shows the results for duration of IDS and ADS with our bilingual condition and monolingual condition. In the bilingual condition, Spanish IDS has a greater word length in comparison to ADS, which supports our previous hypothesis. In English, the bilinguals' word lengths are similar in IDS and ADS. One possible explanation for the difference in the results for English versus Spanish may be related to the parent's dominant language. The parents may feel more comfortable in speaking in their native language than speaking in a second language, so parents whose first language is Spanish will speak more naturally in IDS and ADS than in English IDS and ADS and may show more typical IDS characteristics in Spanish IDS. It is important to take into consideration that the data that are presented are based from a small sample of parents and child dyads thus the effect that is present right now may not hold with a bigger sample.

In the English monolingual condition, the duration results did not support the hypothesis. The English-speaking participants had a shorter duration in IDS than ADS, which contradicts what the literature in IDS has previously shown. Possible explanations for these results may be related to the way in which parents interpret the task. The parents might speak more clearly if they believe they are providing instructions to the experimenter. Clear speech is usually slower than other type of speech, hence this may be the reason why the ADS results are different.



**Figure 4. Duration of IDS and ADS in bilinguals and monolinguals.**

Data collection are ongoing. When we have a larger sample, we will look for statistically significant differences in the speech in the object labeling task and free play tasks across IDS and ADS and languages. In addition, we will expand our research to investigate code switching with bilingual parents in IDS. The current study provides data from parents' code switching across Spanish and English in both ADS and IDS. There are several interesting questions we can investigate. For example, if the parents code switch when interacting with their infant, how will being dominant in one language affect the amount of code switching used with their infants? We hypothesize that parent will code switch more when they start an utterance in their non-dominant language and will use repetition to mix both languages. We are also interested in measuring differences in fundamental frequency across language boundaries. How does the pitch changes when the parents switch from a dominant language to a non-dominant language? We predict that pitch will be higher when code switching from one language to the other because parents may exaggerate in their pitch to facilitate their infant's understanding of the two languages.

## **Conclusion**

The present investigation explores the acoustic characteristics of IDS in Spanish-English bilingual and English-speaking monolingual parents. Overall, bilingual Spanish IDS was higher in pitch than Spanish ADS. Bilingual English IDS was higher than bilingual English ADS. English speaking monolingual IDS also had a higher pitch than monolingual ADS. For duration, the results did not support our hypothesis of IDS having a greater word length than ADS. Bilingual Spanish had a word greater length in IDS than Spanish ADS and bilingual English was similar in IDS and ADS. For the monolingual English condition, the results indicate that duration was greater in English ADS than IDS. A possible explanation may be that parents spoke clearly in the ADS task pronouncing each word very distinctly. These results for average pitch and duration start to provide an understanding of bilingual IDS with Spanish-English speaking bilinguals. The findings are preliminary, and the data collection and coding are ongoing. We will test these variables again with a larger sample. In future work, we will investigate code switching with bilingual parents.

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