

**A Linguistic Study on the Phoneme /b/ in Spanish:  
The Realization of /b/ by Two Bilingual Speakers of Spanish and English**

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## **A Linguistic Study on the Phoneme /b/ in Spanish:**

### **The Realization of /b/ by Two Bilingual Speakers of Spanish and English**

In standard modern Spanish, both <b> and <v> are produced as /b/, with no phonological distinction between the letters. The phoneme /b/ has two allophones in Spanish; either a bilabial plosive [b], where one's lips are closed and air is built up behind the lips then released, or a softer version, the bilabial approximant [β], where there is a narrow opening between one's lips (Núñez Méndez, 2016). The voiced labiodental fricative /v/, where one's bottom lip is pressed against their upper teeth and air is pushed through the teeth, does not exist as a phoneme in standard modern Spanish. Although /v/ does not have phonological value, many Spanish words are spelled with <v> due to the influence of Latin on the language and because Old Spanish realized it as [v] (Núñez Méndez, 2016, p. 128). Due to the fact that <b> and <v> are both produced as /b/ nowadays, the spelling of words containing <b> and <v> is often confused by Spanish speakers (Kim, 2023). Nevertheless, /b/ is realized as [v] by some Spanish-speaking individuals and it is heard in multiple Spanish dialects for various reasons. Typically, it is a consequence of contact with other languages, such as contact with Portuguese in Paraguay, contact with Catalan in Catalonia, Spain, and contact with English in the US and Northern Mexico (Trovato, 2017).

I will be examining the realization of /b/ from speech data obtained through interview and reading tasks performed by two participants with Mexican heritage, both bilingual speakers of English and Spanish. My research questions were based on the different levels of cross-linguistic influence of each language on the participants throughout their lives, which I present in the methods section, and the effect that this influence has on their /b/ realization. In accordance with my conclusion that Abraham's Spanish has experienced more cross-linguistic influence than Ivanna's, I propose four hypotheses for my study. First, I hypothesize that Abraham will realize

the /b/ phoneme as a [v] to a higher degree than Ivanna, especially when it is orthographically represented by a <v>. Next, I believe that Ivanna will primarily realize <b> and <v> as a plosive [b] or an approximant [β] depending on the linguistic factors within the word. Additionally, I think that a higher rate of plosive realizations will occur in the reading task compared to the interview task, as the latter will be more conversational, engendering a more relaxed delivery. Lastly, I suspect that cognates in English and Spanish that are spelled with a <v> will be realized as a [v] at a higher rate for both Ivanna and Abraham, especially in the reading task, due to the influence of the English pronunciation.

### ***Literature Review***

Previous studies have shown that Spanish speakers from Northern Mexico and Texas produce the labiodental fricative /v/ “as a variant of the phoneme /b/,” with orthography being the most influential factor in the production of /b/ (Ortega, 2018, p. 37; Takawaki, 2013; Trovato, 2017). Thus, if a participant read a word orthographically represented by a <v>, they were more likely to pronounce it as [v] rather than [b]. Ortega (2018) found that participants that had more contact with the English language produced the allophone [v] more frequently than those with less English contact. Unlike Ortega, Trovato (2017) observed that the level of education was not relevant to the realization of [v], but the “language of formal education”; if participants were educated in English, they were more likely to produce /b/ as [v] (p. 267).

Ortega (2018) and Takawaki (2013) found that the position of the <b> or <v> in a word has an effect on the allophones produced. For instance, Ortega found higher rates of [v] and [b] in stressed syllables compared to unstressed syllables, while the approximant [β] occurred more frequently in unstressed syllables. In the initial position of a word, [b] was realized the most and [β] the least, unless the word was preceded by a vowel, in which [β] was realized the most,

followed by [v] then [b] (Ortega, 2018). Likewise, in the middle of the word, or the “medial position,” [β] occurred the most, followed by [v] then [b] (Ortega, 2018). Thus, “Realizations of [β] are higher when vowels are following with 80.8% compared to following consonants with 70.2%” and “following vowels creates the lowest rate of” [b] realizations, whereas [b] occurred the most when consonants were following the segment (Ortega, 2018, p. 42). Takawaki (2013) noted that “The preceding phonological segment was also deemed to predict the realization of the phoneme /b/ as the allophone [v],” with [v] produced more often when it was after the vowels <e>, <o>, and <a>, and after the phoneme /s/ (p. 27). When <b> or <v> occurred after a nasal consonant /m/ or /n/, [b] is the most likely to occur and [v] is the least likely to occur (Ortega, 2018; Takawaki, 2013).

Overall, the studies observed that the bilabial plosive [b] was realized the most in a stressed syllable, in the initial position, and after a nasal consonant. The approximant [β] was realized the most in an unstressed syllable, in a medial position of a word, in an intervocalic position, or in the initial position if the last letter of a word is a vowel. Lastly, the labiodental [v] was realized when /b/ appeared in stressed syllables, after the vowels <e>, <o>, or <a>, after the phoneme /s/, and occasionally in the medial position of the word. (Ortega, 2018; Takawaki, 2013; Trovato, 2017)

### ***Methods***

I will examine the production of <b> and <v> by two bilingual speakers of English and Spanish: Abraham and Ivanna. Both participants learned Spanish as their first language from their parents. Abraham is a 2nd generation Chicano man who was born and raised in Riverside, California. His parents are both from Mexicali, a city in Northern Mexico on the US border. Although he attended English-speaking schools, he grew up speaking Spanish with his family

and community. Ivanna is a 1.5 generation woman who was born in Mexico City, where she attended a Spanish-speaking elementary school. She moved to Arizona when she was 10 and thenceforth mainly spoke Spanish with her nuclear family, as the majority of her community in Arizona were monolingual English speakers. Both Ivanna and Abraham are currently seniors attending UCLA, and neither study Spanish or have taken Spanish courses in college. Abraham lives in a house with other Latino and Chicano men with whom he primarily communicates in Spanish and less so in English, while Ivanna lives with English speakers, so continues to primarily speak Spanish with her parents. Both participants self-identify as balanced bilinguals, speaking Spanish and English at very similar levels. Although Ivanna has lived in the US for the majority of her life, her Spanish has remained very distinct from her English, whereas Abraham's Spanish has had more contact with English; he has lived in California for his entire life and Mexicali borders the US, so has heightened contact with English. Due to these factors, I maintain that Abraham's Spanish will show more cross-linguistic influence.

My study used two data collection methods. The first method was a conversational-style interview. I asked open ended questions based on their life, experiences, and opinions, and occasionally asked follow-up questions. Examples of the questions I asked are as follows:

*¿Cómo describirías tu personalidad? ¿Qué haces en tu tiempo libre? ¿Cuáles son tus valores más importantes? ¿Cuáles son las mejores y las peores estaciones del año?*

Although words containing <b> and <v> occurred naturally within their answers, I designed the questions specifically in order to elicit responses with these target letters. In the question about seasons, for instance, 3 out of 4 seasons are spelled with <v>. Before I began this task, I asked my participants to restate the questions in their answers to ensure that they answer with full sentences, while ensuring that they also naturally used words in the questions—like

“valores”—in their answers.

The second task was a reading task. I presented words to my participants on a Google Slides presentation that they could go through at their own pace, and they read each word using the carrier phrase “puedo decir la palabra X”. The words were randomized using the Slide Randomizer extension. I created a list of 10 words that include <b>, 10 words with <v>, 5 words that contain both these letters, and 20 distractor words containing neither <b> nor <v>. Taking inspiration from Ortega’s (2018) study *A Voiced Labiodental Fricative [V] In El Paso Spanish*, I selected my words carefully in order to get a range of letter placements, such as words that have <b> or <v> in the initial position of the word, between vowels, in stressed syllables, after /s/, and after nasal sounds /m/ or /n/. I also selected perfect and near-perfect cognates, such as “verbal”, “invisible”, “obviamente”, and “brevedad” for this task, in case this aspect made a difference. In both tasks, my participants produced a range of words containing <b> and <v>, which allowed me to gain a more in depth understanding of allophones that they realized.

Each task was audio and video recorded. I used the Voice Memos application on my phone to record audio, and the Photo Booth application on my laptop to record video. The audio recording allowed me to clearly hear the sounds they produced, while the video recording helped me to distinguish between a bilabial or labiodental production by observing their mouths. Afterwards, I reviewed both recordings. To ensure I collected data for all of the words containing <b> and <v> in the interview task, I used the transcription service Happy Scribe to write out the full conversation. Then, I re-listened to it, edited the transcript for accuracy, and noted the timestamps where the target sounds were said.

I analyzed the speech data by writing all the words containing the target letters in separate Google Sheets for each participant, separated by ‘Interview Task’ and ‘Reading Task’. If a target

letter appeared twice in one word, I duplicated the word and highlighted the letter that I would be analyzing in that specific row. Then, I went to each timestamp and watched the videos of my participants to analyze their realization of the /b/ phoneme; I found that watching the videos was a necessary step because the sounds were difficult to distinguish through audio only. I coded each sound production based on the three Spanish allophones for <b> and <v>: [b], [β], and [v]. Afterwards, I coded the words according to the factors: orthography (whether the sound was represented by <v> or <b>), stressed syllables, initial letter placement, intervocalic placement (including if the preceding word in the interview task ended in a vowel), if the word was a cognate in English, and the preceding and following consonants that I selected for this study (l, r, t, s, d, and nasal consonants m and n). Next, I made tables based on the production of the /b/ phoneme in each task for both participants. I created stacked column charts from these tables with the tasks as the Y axis, and the X axis the percentage of the realized allophones. This allowed me to easily visualize my participants' production of /b/, which I also separated by orthography. Subsequently, I created four tables that presented the percentage of each allophone produced according to the specific factors that I analyzed. These tables were also broken down into participants and tasks. I then simplified this data to make two graphs of the overall realization of /b/ by my participants.

### ***Results***

The results reveal a variation between the realization of /b/ between the tasks, and a marked difference between Abraham and Ivanna's overall realizations. What stands out the most is the fact that Abraham produces significantly more [v] allophones than Ivanna for all of the analyzed tokens, at 39.4% and 1.9% respectively. These results concur with my hypothesis that Abraham would realize /b/ as [v] more frequently than Ivanna. However, there is no difference

between the raw numbers of the realizations of /b/ as [v] between the two tasks for either of the participants, which was unexpected. Moreover, while Ivanna's realizations of the approximant [β] were similar (39.7% for the interview task and 43.3% for the reading task), Abraham produced the approximant [β] considerably more in the interview task (50%) than the reading task (23.3%). Conversely, Abraham produced more bilabial plosive [b] allophones in the reading task, whereas Ivanna produced more in the interview task.

However, when we consider the orthography of the word, i.e. whether the token was spelled with <v> or <b>, the effect of spelling becomes evident. As seen in Figures A3 and A4 in Appendix A, the /b/ phoneme was realized by both Ivanna and Abraham as a [v] only when it was orthographically represented by <v>. In addition, Abraham realizes /b/ as [b] only when represented by <b>, and never for <v>, while Ivanna produces <b> as [b] in 46.2% of the tokens in the interview task and 60% in the reading task. Thus, we can see that the orthography of the word affects the pronunciation of the phoneme /b/, especially in the reading task when the participant can see that the word is written with a <v>, which conforms with my hypothesis. Furthermore, Ivanna only produces <v> as [v] in “favorita” and “adverso,” both words being near cognates in English. However, Abraham produced <v> as [v] in cognates in only 30.7% of his recorded [v] realizations.

We can gain a deeper understanding of the realization of /b/ by analyzing it with regards to other linguistic factors, as shown in Appendix B. For stressed syllables, Ivanna realizes /b/ as [b] at a rate of 68.8%, [β] at a rate of 29.2%, and [v] only once, at a rate of 2.1%. These rates are similar between both tasks, but in the interview task she does not realize /b/ as [v]. Ivanna's speech data align with the results of previous studies that show that [b] is realized the most in stressed syllables. On the other hand, Abraham realizes /b/ in stressed syllables as [b] at a rate of



only 25%, while [β] and [v] were realized at a rate 29.2% and 45.8%, respectively. This conforms with previous findings of [v] realizations in stressed syllables. Interestingly, Abraham's rates of [b] and [β] realizations in his speech data diverge between tasks: he realizes /b/ as [b] at a much higher rate in the reading task (35.7%) compared to the interview task (10%), and as the approximate [β] at a rate of 40% in the interview versus 21.4% in the reading task.

When the /b/ is in the initial position of the word, Ivanna realized the phoneme as a plosive [b] for 63.3% of tokens, and as the approximate [β] for 36.7% of tokens, which also mirrors existing research findings. When split up between tasks, she produced a plosive in the initial position more frequently in the interview task (66.7%) versus the reading task (42.9%). Abraham was more likely to produce a labiodental fricative [v] when /b/ was in the initial position, at an average rate of 52.4% for both tasks. In the reading task, he realized the initial /b/ as a plosive at a rate of 50%, and the other 50% as a [v], whereas in the interview task he did not realize the /b/ as a plosive at all, but realized it as [β] and [v] at a rate of 40% and 60%, respectively.

If the /b/ phoneme was in an intervocalic position, Ivanna and Abraham were more likely to realize it as the approximate [β] in both tasks, at an average rate of 55.6% and 55.9% respectively. This result aligns with previous research that observed /b/ being realized as [β] the most before, after, and between vowels. Abraham once again shows a lot of variance between tasks; he realized /b/ as [β] at a much higher rate (64%) in the interview task than the reading task (33.3%), and as a plosive [b] for only 4% of tokens in the interview task compared to 22.2% in the reading task. Abraham realized /b/ as [v] in the intervocalic position at an average rate of 35.3% for both tasks, whereas Ivanna only realized it as [v] once in the interview task in the word "favorita".

With regards to the following segments, if a consonant followed /b/, neither Ivanna nor Abraham realized it as a [v]; their realizations were dispersed fairly evenly between [b] and [β]. On the other hand, if a consonant preceded the /b/ phoneme, Ivanna realized it as [b] at a rate of 90.6%, as a [β] at a rate of 6.3%, and only realized it as [v] once in the word “adverso”. When examining nasal consonants, Ivanna’s results show agreement with past findings. She realized /b/ preceded by a nasal consonant as a [b] at a rate of 71.4%, the most out of all following consonants for both tasks. However, Abraham only realized /b/ preceded by a nasal consonant as [b] 33.3% of the time, compared to [v] at 66.7%. Abraham’s results do conform with existing findings when we analyze his realization of /b/ when it appeared after /s/, which occurred at a rate of 100%. However, I only collected speech data for 1 word that had a preceding /s/, “desviar”, and one word where /b/ was in the initial position after a word ending in <s>: “muchas veces”. Thus, this result is not significant enough to draw concrete conclusions.

### ***Discussion***

The results from my speech data collection conform with half of my hypotheses. Abraham realized /b/ as [v] at a much higher rate than Ivanna, which was expected due to the heightened influence of English on his Spanish. Based on this finding, it appears that the extent of the exposure to English during childhood has a stronger role in the production of [v] than the amount of Spanish used during adulthood. Additionally, orthography was shown to play a large role in the realization of /b/, as both participants only realized /b/ as [v] when the word was orthographically represented by a <v>. This means that my participants do, in fact, make a distinction between the /b/ phoneme depending on the spelling of the word, which I argue is because both participants read and hear English more frequently at UCLA. Likewise, the only words in which Ivanna realized /b/ as [v] were cognates in English and Spanish, although this

only occurred in 33.3% of cognates that were represented by <v>. Thus, this finding is not extremely significant, and does not fully conform with my hypothesis. Moreover, the realization of /b/ as [v] in cognates where it was represented by <v> for Abraham was not significant, due to his overall propensity to realize <v> as [v].

The results do not support my hypothesis that the reading task would engender a higher rate of plosive [b] realizations for both participants; while Abraham did produce a handful more plosives in the reading task, Ivanna produced less plosives in the reading task compared to the interview task. I attribute this result to the design of my reading task. Words beginning with /b/ should have been realized more frequently as [b] according to past research, but the carrier phrase “puedo decir la palabra” ends with a vowel, which I believe affected the realization of the initial letter of the words in the task. If I were to re-do this study, I could re-categorize the tokens in which there was no pause between the carrier phrase and the word as intervocalic, and if there was a pause, as word-initial. Alternatively, if I were to conduct a follow-up study, I would not use a carrier phrase. Rather, I would add a timer to the playback of my Google Slides to ensure sufficient time between the words presented in the reading task, so that they could be isolated in the speech data and not affected by a previous word.

## References

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## Appendix A

### Ivanna /b/ Realization

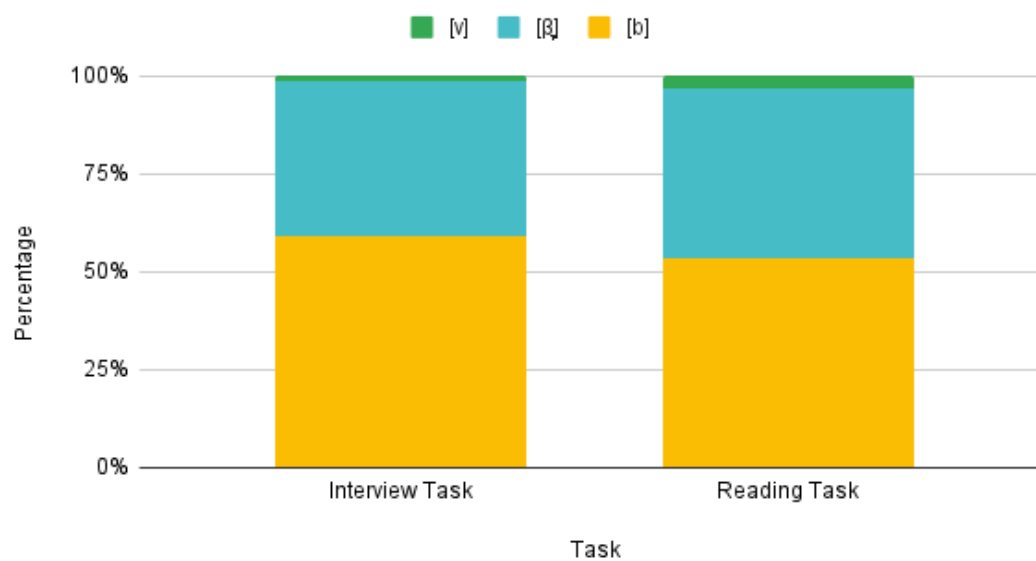


Figure A1: Ivanna's realizations of /b/ phoneme by the percentage of total tokens, per task.

### Abraham /b/ Realization

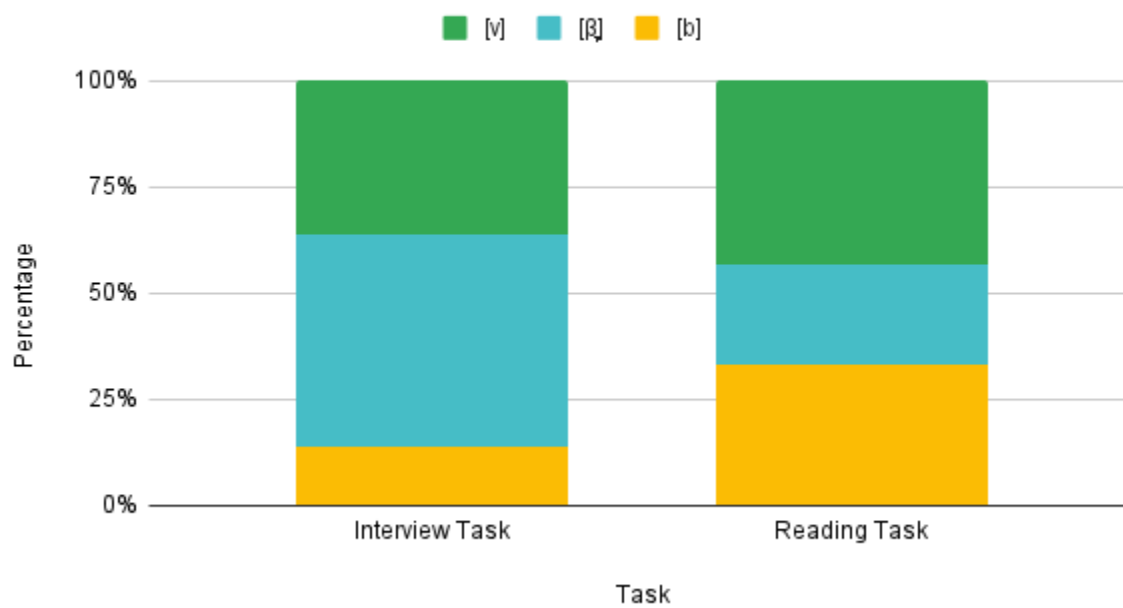


Figure A2: Abraham's realizations of /b/ phoneme by the percentage of total tokens, per task

### Ivanna Realization of /b/ per Task and Orthography



Figure A3: Ivanna's realizations of /b/ phonemes per task by the percentage of total tokens, separated by orthographic representations of <b> and <v>.

### Abraham Realization of /b/ per Task and Orthography



Figure A4: Abraham's realizations of /b/ phonemes per task by the percentage of total tokens, separated by orthographic representations of <b> and <v>.

## Appendix B

### Ivanna /b/ Realization

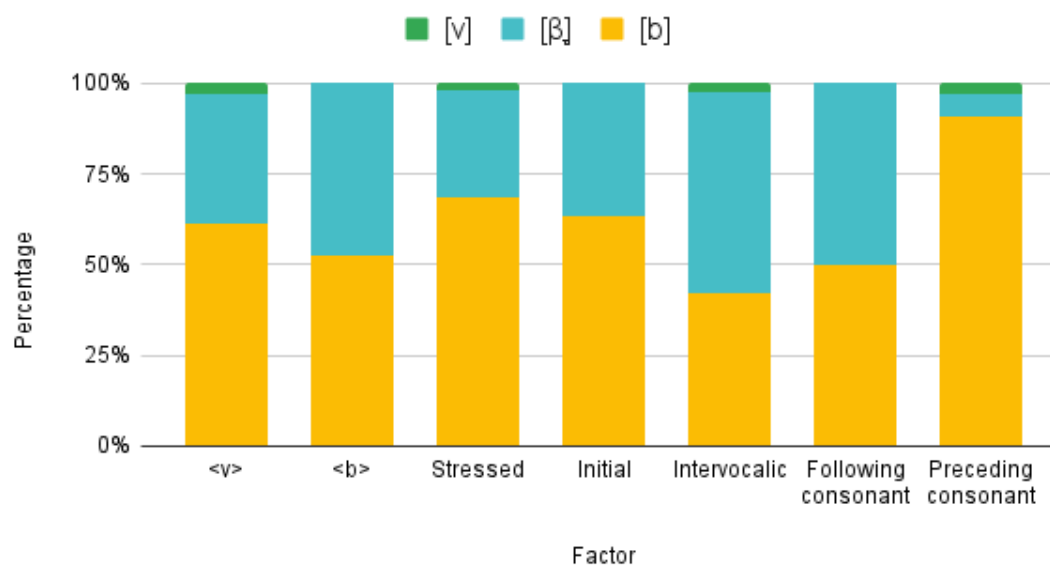


Figure B1: Ivanna's total realizations of /b/ phonemes by percentage of total tokens, separated by linguistic factors.

### Abraham /b/ Realization

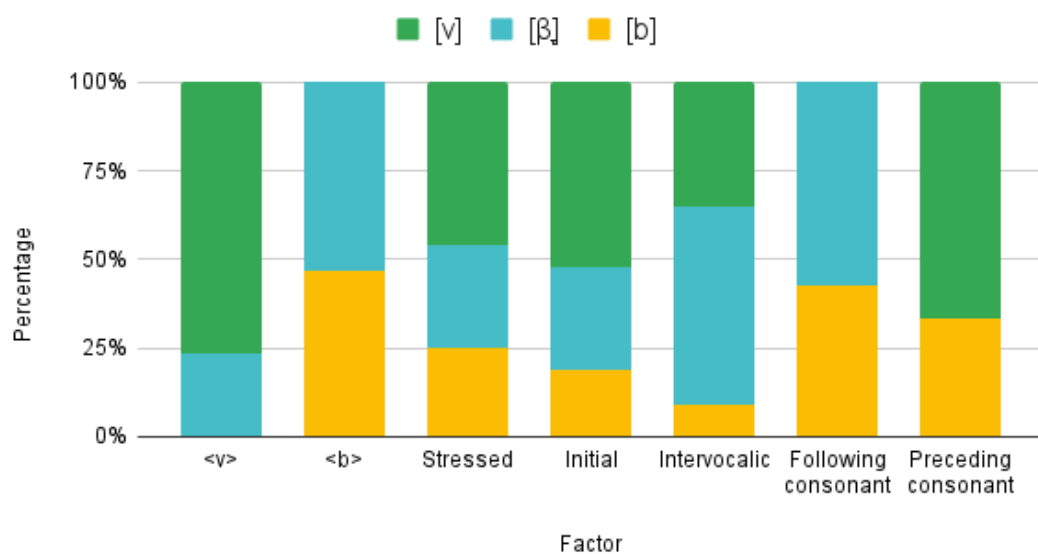


Figure B2: Abraham's total realizations of /b/ phonemes by percentage of total tokens, separated by linguistic factors.

## Appendix C

		Ivanna Reading Task			
		Produced Allophone (%)			
		[b]	[β]	[v]	Total Number
Orthographically Represented with	'v'	46.7	46.7	6.7	15
	'b'	60.0	40.0	0.0	15
<b>Stressed</b>		64.3	28.6	7.1	14
<b>Initial</b>		42.9	57.1	0.0	7
<b>Intervocalic</b>		33.3	66.7	0.0	9
<b>Cognate</b>		71.43	14.3	14.3	7
<b>Following consonant:</b>		60.0	40.0	0.0	5
	L	0.0	100.0	0.0	2
	R	100.0	0.0	0.0	3
<b>Preceding consonant:</b>		77.8	11.1	11.1	9
	Nasal (M,N)	50.0	25.0	25.0	6
	R	100.0	0.0	0.0	1
	T	0.0	0.0	0.0	0
	S	100.0	0.0	0.0	1
	D	100.0	0.0	0.0	1
	L	0.0	0.0	0.0	0

Table C1: Ivanna's production of /b/ within the reading task, separated by linguistic factors and shown as a percentage of the total produced allophones within each factor.

		Ivanna Interview Task			
		Produced Allophone (%)			
		[b]	[β]	[v]	Total Number
Orthographically Represented with	'v'	65.4	32.7	2.0	52
	'b'	48.1	51.9	0.0	27
<b>Stressed</b>		70.6	29.4	0.0	34
<b>Initial</b>		66.7	33.3	0.0	42
<b>Intervocalic</b>		44.4	52.8	2.8	36
<b>Cognate</b>		14.3	71.4	14.3	7
<b>Following consonant:</b>		42.9	57.1	0.0	7
	L	33.3	66.7	0.0	3
	R	50.0	50.0	0.0	4
<b>Preceding consonant:</b>		87.5	12.5	0.0	22
	Nasal (M,N)	100.0	0.0	0.0	12
	R	50.0	50.0	0.0	4
	T	0.0	0.0	0.0	0
	S	80.0	20.0	0.0	5
	D	60.0	40.0	0.0	3
	L	100.0	0.0	0.0	3

Table C2: Ivanna's production of /b/ within the interview task, separated by linguistic factors and shown as a percentage of the total produced allophones within each factor.



		Abraham Reading Task			
		Produced Allophone (%)			
		[b]	[β]	[v]	Total Number
Orthographically Represented with	'v'	0.0	13.3	86.7	15
	'b'	66.7	33.3	0.0	15
<b>Stressed</b>		35.7	21.4	42.9	14
<b>Initial</b>		50.0	0.0	50.0	6
<b>Intervocalic</b>		22.2	33.3	44.4	9
<b>Cognate</b>		25.0	25.0	50.0	8
<b>Following consonant:</b>		33.3	66.7	0.0	3
	L	0.0	100.0	0.0	2
	R	100.0	0.0	0.0	1
<b>Preceding consonant:</b>		33.3	0.0	66.7	9
	Nasal (M,N)	33.3	0.0	66.7	6
	R	100	0.0	0.0	1
	T	0.0	0.0	0.0	0
	S	0.0	0.0	100.0	1
	D	0.0	0.0	100.0	1
	L	0.0	0.0	0.0	0

Table C3: Abraham's production of /b/ within the reading task, separated by linguistic factors and shown as a percentage of the total produced allophones within each factor.

		Abraham Interview Task			
		Produced Allophone (%)			
		[b]	[β]	[v]	Total Number
Orthographically Represented with	'v'	0.0	31.6	68.4	19
	'b'	29.4	70.6	0.0	17
<b>Stressed</b>		10.0	40.0	50.0	10
<b>Initial</b>		0.0	40.0	60.0	15
<b>Intervocalic</b>		4.0	64.0	32.0	25
<b>Cognate</b>		33.3	66.7	0.0	3
<b>Following consonant:</b>		50.0	50.0	0.0	4
	L	100.0	0.0	0.0	2
	R	0.0	100.0	0.0	2
<b>Preceding consonant:</b>		33.3	0.0	66.7	6
	Nasal (M,N)	33.3	0.0	66.7	3
	R	0.0	0.0	100.0	1
	T	100.0	0.0	0.0	1
	S	0.0	0.0	100.0	1
	D	0.0	0.0	0.0	0
	L	0.0	0.0	0.0	0

Table C4: Abraham's production of /b/ within the interview task, separated by linguistic factors and shown as a percentage of the total produced allophones within each factor.