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Second Language Acquisition of Voicing Patterns in Spanish Sibilants

William Hagerman
whagerman@harding.edu

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William Hagerman

Kristi Bond Ph.D.

Harding University

Abstract

In the current study, English-speaking students enrolled in an upper-level university Spanish class read a series of sentences that are designed to elicit alveolar sibilants [s, z] in coda position, both word-internal and word-final. Samples are analyzed using Praat (Boersma & Weenink 2005), and data analysis compares the duration of voicing of each sibilant to the total sibilant duration to determine the percentage of voicing assimilation. Given that voicing assimilation in native Spanish is variable rather than categorical (Romero 1999; Schmidt & Willis 2011; Garcia 2013), a control group of native speakers provides a comparison sample. Given the differences of the /s/ in English and Spanish, results are discussed comparing the production of the /s/ by native English speakers to the production of native Spanish speakers.

Introduction

Today, the ever advancing technology employed in the arena of phonology and phonetics has allowed linguists around the world to better analyze the second language acquisition of phonemes and allophones. Current research studies tend to mainly focus on the acquisition of phonemes that differ between the native (L1) language and second (L2) language. Unfortunately, this means that there is very little research aimed at studying allophonic variation which is equally important in the acquisition of pronunciation.

First, it is important to note that a phoneme is described as any basic distinctive unit of sound in a language. Although all languages are comprised of phonemes that may share similar qualities, each language has their own unique set of phonemes. For example, the /p/ and /b/ are phonemically different in the English language; therefore, there is a difference between the words *pit* and *bit.* Second, Stokes defines an allophone as a "manifestation or specific variant of a phoneme" (Stokes 2005, p.191). In other words, an allophone is one of at

least two speech sounds that are considered to be variants of one phoneme. Unlike a phoneme, allophones make no difference in the meaning of a word. For example, the English /l/ has two allophones [l] and [ɬ] that can be interchanged without changing the meaning of the word like in the words *follow* [fɒləʊ] and *full* [fʊɬ].

One of the ways an allophone is produced is through a process called assimilation—a phonological phenomenon that occurs when two speech sounds meet (Stokes 2005). There are many different types of assimilation, but this research specifically studies progressive—when a speech sound causes the consonant/vowel sound after it to change—,regressive—when a speech sound causes the consonant/vowel sound that precedes it to change—, and voicing assimilation—when a voiced consonant/vowel causes the nearby voiceless sound to become voiced. One area of phonology where this occurs is with sibilants, as will be discussed further below.

In the field of second language phonology, the acquisition of the Spanish alveolar sibilant /s/ as produced by L1 English speakers has been scarcely researched (Schmidt 2014; Escalante 2016). There are many reasons as to why the production of the /s/ presents itself to be an issue for L1(native) English speakers learning Spanish. The most prominent difference between the two languages is that the /s/ and /z/ are not considered phonemically different in Spanish, but they are in English (*precedent* [ˈprɛsɪdənt]; *president* [ˈprɛzɪdənt]). Secondly, in both English and Spanish, the /s/ phoneme has two allophones [s] and [z] that differ solely in voicing patterns, but the patterns are different in the two languages. In English, voicing assimilation—the process in which a voiced consonant/vowel causes a nearby sound to become voiced—is more prominent in word-final position and prefers a progressive trend (Torres 2001). This means that a voiced consonant/vowel will cause a voiceless sound that follows it to become voiced (dads [dæ**dz**]; grieves [gɹiː**vz**]). However, in Spanish, voicing

assimilation prefers a regressive trend which means that a voiceless sound will become voiced when followed by a voiced consonant (*esbelto* [e**z**.**b**é̬l̬.t̬o]; *cisnes* [sí**z**.**n**es]) (Quilis 1993). In addition, the voicing assimilation in Spanish occurs both word-internally (*esbelto* [e**z**.**b**él̬.to]) and across word-boundaries (*los rayos* [lo**z**.**r**á.jós]) (García 2013).

This research studies the production of the Spanish alveolar sibilant from advanced, collegiate L1 English (native)/L2 Spanish (learner) speakers with hopes of answering the following research questions:

1.1 Will native English speakers learning Spanish as a second language produce the voiced variation of the Spanish /s/ in the same context as native Spanish speakers?

1.2 Will there be a significant difference between voicing occurring word-internally and across word boundaries?

2. Review of Literature

2.1 Nature of /s/ in the English language

In English, the nature of the /s/ is slightly different than that of Spanish. First, as briefly mentioned above, the /s/ and /z/ exist as different phonemes in the English language. This means that there is a difference in meaning between words with /s/ and those with /z/. For example, the [s] in the word *sip* [sɪp] cannot be replaced with [z] without changing the entire meaning of the word. Therefore, the /s/ and /z/ are phonemically different.

In addition, the [s] and [z] also exist as allophones of the /s/ phoneme in English. Through the process of progressive voicing assimilation, the /s/ phoneme becomes voiced. To briefly summarize the process of progressive assimilation, the /s/ phoneme will voice when the consonant preceding it is voiced. Unlike the /s/ and /z/ that are phonemically different in the words *sit* and *zit*, the allophones of /s/ are interchangeable. Examples of the progressive voicing

assimilation of the English /s/ in the word-final position—meaning at the end of a word—are given below in Figure 1. Although not included in Figure 1 for reasons explained later, it is important to note that the /s/ is also voiced when intervocalic (e.g. *raisin* [ˈɹeɪzən]).

Figure 1. Progressive voicing assimilation of English /s/

Plurals:	
cats [kæ**ts**] brakes [bɹeɪ**ks**] graphs [gɹɑː**fs**] mops [mɒ**ps**]	dads [dæ**dz**] dogs [dɒ**gz**] graves [gɹeɪ**vz**] mobs [mɒ**bz**]
Possessives:	
Nick's [nɪ**ks**] Kate's [keɪ**ts**] Chip's [t͡ʃɪ**ps**] Adolph's ['æ.dɒl**fs**]	Greg's [gɹɛ**gz**] Brad's [bɹæ**dz**] Abe's [eɪ**bz**] Eve's [iː**vz**]
Third-Person Singular Present Tense	
laughs [lɒ**fs**] walks [wɔː**ks**] complicates [ˈkɒmplɪˌkeɪ**ts**]	grieves [gɹiː**vz**] brags [bɹæ**gz**] feeds [fiː**dz**]

Despite appearing as though the voiced variant of /s/ occurs as a result of regressive assimilation in words like *osmosis* [ɒz.ˈmoʊ.sɪs] and *wisdom* [ˈwɪz.dəm], Jansen (2007) argues that the voiced alveolar sibilant when voiced word-internally—meaning within the word—should be considered phonemic rather than the result of an assimilatory process.

2.2 Nature of /s/ in the Spanish language

Unlike English, the /z/ phoneme does not exist in Spanish. Despite this, there are two variants of the /s/ phoneme similar to that in English: [s] and [z]. In his work *Tratado de Fonología y Fonética Españolas* [Treaty of Spanish Phonology and Phonetics], Quilis (1993) describes the assimilation of the /s/ to be categorical—meaning that the /s/ will voice at any point it comes in contact with another voiced consonant. On the contrary, García (2013) uncovers that voicing assimilation may not be categorical like Quilis (1993) describes, but rather variable. She explores the idea that speech rate and speech formality affect the voicing patterns of /s/.

However, García (2013) does state that the /s/ in coda position—meaning at the end of a syllable—when followed by a voiced consonant will normally become voiced. In other words, the voicing of the /s/ occurs regressively and is found both word-internally, *mismo* [míz.mo] 'same,' and across word-boundaries, *los bollos* [loz.bó.jos] 'bread roll.' Below is a list providing examples of when the /s/ undergoes voicing before different types of voiced consonants (Figure 2), and when the /s/ remains voiceless before voiceless consonants (Figure 3):

Figure 2. Regressive voicing assimilation of Spanish /s/

Voiced Stops:	esbelto [e**z**.**b**é̞l̪.t̪o] 'skinny' esdrújula [e**z**.**d**ɾú.xu.la] 'pro-paroxytone' rasgos [rá**z**.**g**os] 'characteristics'
Nasals:	mismo [mí**z**.**m**o] 'same' cisnes [sí**z**.**n**es] or [θí**z**.**n**es] 'swans'
Liquids/Flaps:	trasladar [tɾa**z**.**l**a.ðáɾ] 'to move' los rayos [lo**z**.**ɾ**á.jós] 'the rays'

Figure 3. Voiceless Spanish /s/

Voiceless stops:	español [e**s**.**p**a.ɲól] 'Spanish' estacar [e**s**.**t**a.káɾ] 'to prick' asco [á**s**.**k**o] 'disgust'
Fricatives:	asfalto [a**s**.**f**á̞l̪.t̪o] 'asphalt' los gemelos [lo**s**.**ç**e.mé.los] 'the twins'
Affricate:	ellos chocan [e.jo**s**.**t͡ʃ**ó.kan] 'they collide'
Vowel:	esa [e.**s**a] 'that'

2.3 Previous Research

Two previous studies aiming at uncovering whether native English speakers learning Spanish would produce the voiced variant of the Spanish /s/ came up with slightly different results (Schmidt 2014; Escalante 2016). Schmidt (2014) compared fourteen English speakers enrolled in an upper-level Spanish class to fifteen native Spanish speakers. Her stimuli was

measured across three different contexts: /s/ and voiced consonant combination occurring word-internally (*beisbol* [beɪz.'bol]), /s/ and voiceless consonant combination occurring word-internally (*discos* ['dis.kos]), and /s/ and voiced consonant combination occurring across word-boundaries (*dos barcos* [doz.'baɾ.kos]). In order to have each participant elicit the /s/ more naturally, Schmidt presented them with a "picture-description task" so that they would not be simply reading from a list of words (Schmidt 2014, p. 8). This task consisted of seeing images from 54 different PowerPoint slides and describing the action that was happening in the slide. In this case, every picture had a vendor who was selling one or more items. Before recording, each participant had the opportunity to view the slides and get an idea of the scenes they would be describing. Each picture that contained a vocabulary word was also accompanied by the first 2 or 3 letters of the word, as to guide the reader to choose the specific vocabulary word. During the recording, each participant had 5 seconds to report the action on the current slide before moving onto the other slide. Again, that way they would elicit the /s/ more naturally. Although she found that as a whole the native English speakers did not produce the voiced variant of the /s/ like native Spanish speakers, four of the fourteen native English speakers did in fact show evidence of voicing in the appropriate context. One of the participants in Schmidt's study produced the voiced variant in one-third of the tokens with appropriate context, while the other three who also produced the voiced variant only voiced in 17% or less in the appropriate context.

Escalante (2016) also compared the production of the Spanish /s/ by native English speakers learning Spanish to that of native Spanish speakers. Her participants were comprised of two novice speakers, two intermediate speakers, and two advanced speakers. Her stimuli consisted of four different contexts: /s/ and voiced consonant (*beisbol* [beɪz.'bol]), /s/ and voiceless consonant (*discos* ['dis.kos]), /s/ intervocalically (*visitar* [bi.si.'taɾ]), and "z" intervocalically (*plaza* ['pla.sa]). Escalante had her participants read a set of phrases in a sound-

proof room. Much like Schmidt (2014), she found that none of her participants, regardless of their speaking level, demonstrated voicing patterns of the /s/ like native speakers in the appropriate contexts.

Methodology

3.1 Participants

Participants in the current study were comprised of fifteen upper-level collegiate Spanish students who were, at the time, enrolled in an advanced Spanish phonetics course. The participants represented 9 different states and 1 U.S. territory, and consisted of 12 females and 3 males whose ages ranged from 19-22 with an average age of 21. As previous research (Schmidt 2014; Escalante 2016) studied the production of the Spanish /s/ by native English speakers who spoke Spanish at various levels (e.g. novice, intermediate, advanced), participants were asked to list the number of years they had been studying Spanish at a collegiate level. The answers to this question ranged from 1.5 years to 4 years with an average of 2.6 years. Although a majority of the participants wrote that they spoke no other languages besides English and Spanish, 5 students listed that they spoke at least one additional language.

In addition to the Spanish learners, a control group was comprised of five native Spanish speakers. Four different Spanish-speaking Latin American countries were represented by participants whose ages ranged from 19-24 with an average age of 21. Of the five native speakers, 4 were male and 1 was female. Besides speaking Spanish and English, each participant listed that they had at least a basic understanding of one additional language.

3.2 Procedures

The class was presented with a consent form (Appendix A) which briefly explained what their participation entailed. All participants gave consent and none were compensated for their

participation, nor did it effect their grade in class. Those who wished to partake in the study signed the form and were given a code in order to maintain confidentiality. Participants were then asked to fill out a brief questionnaire (Appendix B) to get an idea of their demographics and language background. Upon finishing the questionnaire, each participant was given a brief run-down of instructions before recording. They were told to not stop or pause the recording, but rather take a break between sentences if they felt they needed a break. Each participant was then sent to a silent classroom or office where they recorded their pronunciation of twelve sentences.

The twelve sentences that each participant read (Appendix C) contained 26 tokens that were later analyzed. The 26 tokens were comprised of 18 stimuli that were expected to elicit voicing by native Spanish speakers (Quilis 1993; García 2013; Schmidt 2014; Escalante 2016), along with 8 stimuli where /s/ was expected to remain voiceless. As previous research states that native speakers normally voice the /s/ both word-internally and across word-boundaries (García 2013), 13 of the stimuli occurred word-internally and 13 of the stimuli occurred across word-boundaries.

Figure 4. Stimuli by context

Phonetic Context	**Consonant**	**Examples**	**N**
Word-Internal	/t, k/	destruyó, mariscos, gusta, escuela	4
Word-Internal	/g, b, n, m, l/	desgana, desbordó, cisnes, mismo, trasladara	9
Word-Boundary	/t, k/	es tener, nos contaron	4
Word-Boundary	/g, b, n, m, l/	les gusta, sus viajes, cisnes nadaban, las mujeres, es la	9
Total:			26

If the participant mispronounced the word in such a way that affected the /s/, the data for that word was not included in the statistical analysis. For example, 2 learners omitted the /s/

before the “n” in the word *cisnes*, and 1 learner took an accidental pause in the middle of the word. In total, 23 of the 520 tokens were not included in the statistical analysis.

3.3 Data Analysis

Each recording was analyzed using a spectrogram produced by the Praat software (Boersma & Weenink 2005). The spectrogram displayed formants—spectral energy at different frequencies—which were used to measure the total duration of the /s/ and the total duration of voicing which occurred at the end of the /s/ production. An example of three different words analyzed with the spectrogram can be found in Figures 5, 6, and 7 below.

Figure 5. Spectrogram of the word *destruyó* as produced by a native speaker

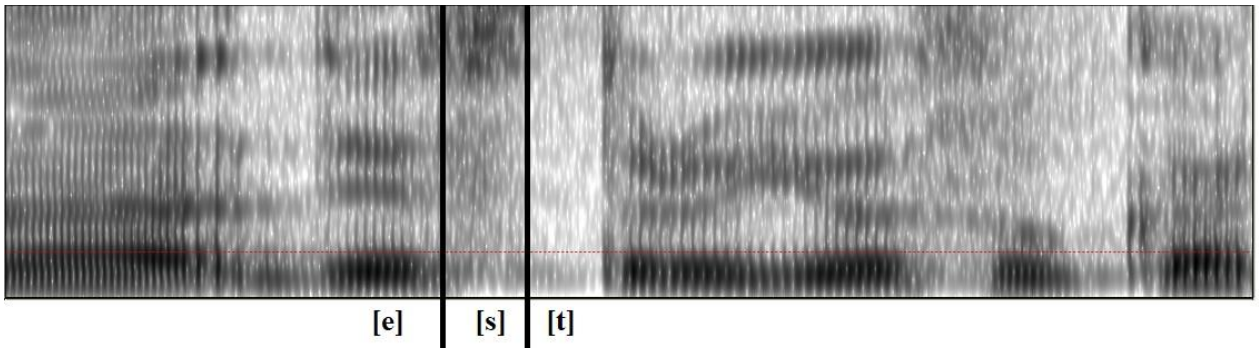


Figure 5 above is the spectrogram of the word *destruyó* [de.stɾu.ˈjo] as produced by a native speaker. In this case, the /s/ is not expected to voice because the consonant that follows it, [t], is not voiced. As seen above, the total duration of /s/ is measured between the two black vertical lines. The intensity in the upper range of the spectrum indicates the sibilant /s/. In the vowel [e] before, there is a greater intensity in the lower range of the spectrogram which means the phoneme is voiced. Since it is almost completely missing from the /s/, this would be considered voiceless without a measurement for end-voicing. It should be noted that left-edge voicing was not included in the measurements of voicing.

Figure 6. Spectrogram of the word *desgana* as produced by a native speaker

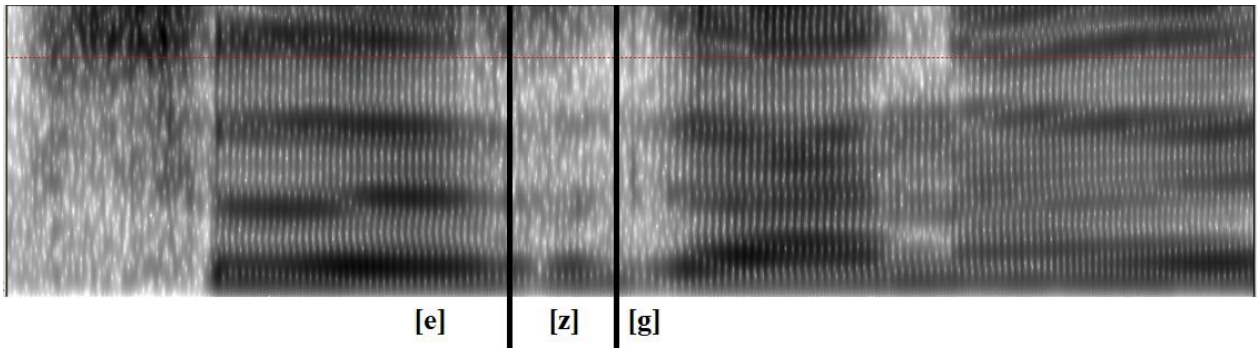


Figure 6 above is the spectrogram of the word *desgana* [dez.ˈga.na] as produced by a native speaker. Because the /s/ is followed by a voiced consonant, it is expected to become voiced. As mentioned above, the greater intensity in the lower range of the spectrogram indicates voicing. As seen, the intensity extends through the entire production of the /s/; therefore, the it is considered 100% voiced.

3. Results

3.1 Mean percentages of voicing

The data collected from the spectrogram was the total duration of the /s/ and the total time that the /s/ was voiced at the end of production. Because each participant spoke at a different rate of speech, comparing total duration of the [z] would not be useful. Therefore, the data collected was used to find the average percentage of time for which the /s/ was voiced.

After all the data was collected, it was transposed into SPSS (Statistical Package of the Social Sciences) in order to run an in depth statistical analysis. In Figure 8 the means of the percentage of time voiced in the 4 different contexts are displayed for the native speaker group.

Figure 7. Mean percentage of voicing in each context for native speakers

Group		Mean	SD	N
Natives	(1)Word-Internal Voiceless	.0000 (0%)	.00000	5
	(2)Word-Internal Voiced	.5216 (52.16%)	.19629	5
	(3)Word-Boundary Voiceless	.0000 (0%)	.00000	5
	(4)Word-Boundary Voiced	.6146 (61.46%)	.24524	5

There are a total of 4 means per group. Means 1 and 3 were calculated from the averages of the two contexts where /s/ was expected to remain voiceless, and means 2 and 4 were calculate from the averages of the two contexts that were expected to elicit voicing. More specifically, means 1 and 2 were measured word-internally, and means 3 and 4 were measured across word-boundaries.

For the word-internal voiceless condition, the mean percentage of time voiced for native speakers (n=5) was 0% (SD = 0.001). In the same word position but in the voiced condition, the mean percentage of time voiced was 52.16% (SD = 0.196). For the voiceless condition across word-boundaries, the mean percentage of time voiced was 0% (SD = 0.001). In the same word position that would elicit voicing, the mean percentage of time voiced was 61.46% (SD = 0.245).

Figure 8. Mean percentage of voicing in each context for learners

Figure 8 below presents the means of the percentage of time voiced by learners in each context. In the word-internal context where /s/ was expected to remain voiceless, the mean percentage of time voiced for learners (n=15) was 0% (SD = 0.001). In the same word position but where voicing was expected, the mean percentage of time voiced for learners (n=15) was 8.03% (SD = 0.067). For the word-boundary voiceless condition, the mean percentage of time voiced for learners (n=15) was 0% (SD = 0.001). For the voiced condition across word-boundaries, the mean percentage of time voiced for learners (n=15) was 9.63% (SD = 0.113).

Figure 8. Mean percentage of voicing in each context for both groups

Group		Mean	SD	N
Learners	(1)Word-Internal Voiceless	.0000 (0%)	.00000	15
	(2)Word-Internal Voiced	.0803 (8.03%)	.06651	15
	(3)Word-Boundary Voiceless	.0000 (0%)	.00000	15
	(4)Word-Boundary Voiced	.0963 (9.63%)	.11296	15

Figure 9. Graph of the mean percentages of time voiced in each context by both groups

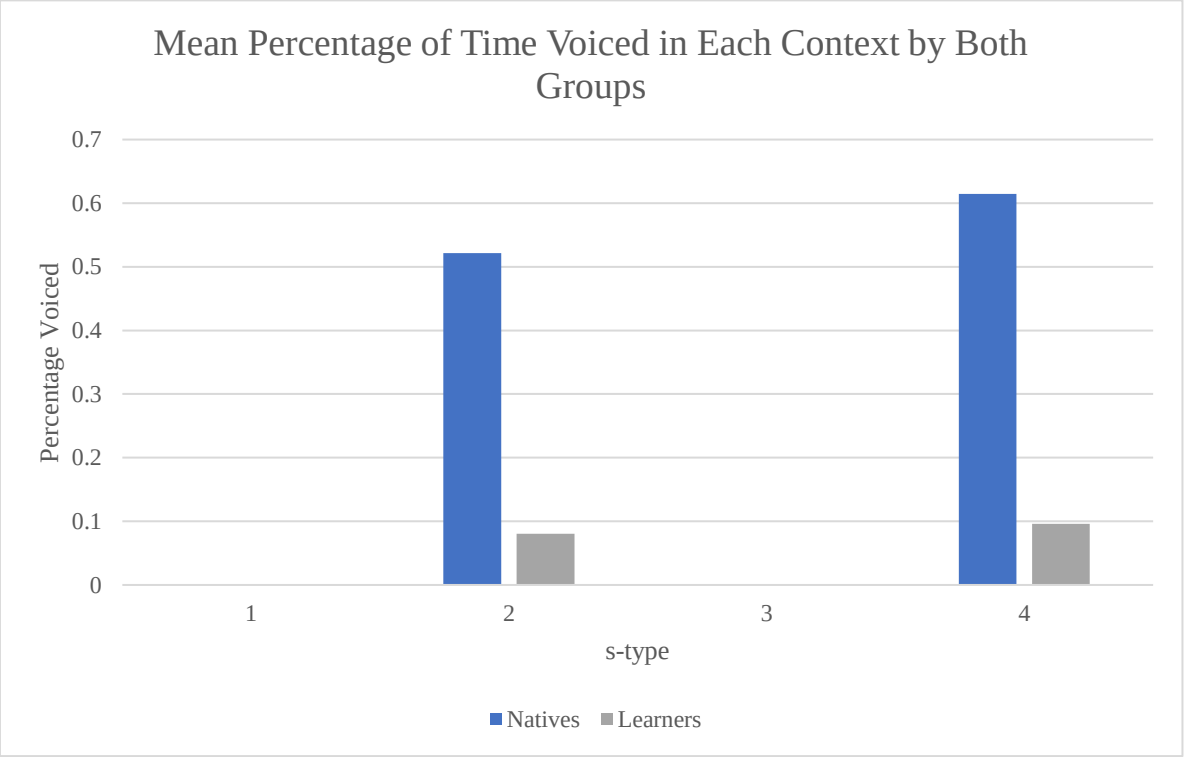


Figure 9 presents the mean percentages of time voiced produced by both natives and learners in all 4 contexts. The x-axis is labeled according to the number that corresponds with each context that is given in Figures 7 and 8.

3.2 Tests of significance

Since the average percentage of voicing from the 4 different contexts "s-type" was being compared between two different groups, a repeated-measures ANOVA was run on the data. Since Mauchly's Test of Sphericity produced an error and with Epsilon values less than .75, it was

advisable to correct for Sphericity using the Greenhouse-Geisser correction results (bolded below in Figure 11). The repeated-measures ANOVA found a significant interaction of s-type and group $F(1.376, 24.771) = 43.868$, $p = 0.001$. In addition, there was a significant difference between s-type $F(1.376, 24.771) = 82.172$, $p = 0.001$.

Figure 10. Tests of within-subjects effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
s-type "effect"	Sphericity Assumed	1.638	3	.546	82.172	.000
	Greenhouse-Geisser	**1.638**	**1.376**	**1.190**	**82.172**	**.000**
	Huynh-Feldt	1.638	1.535	1.067	82.172	.000
	Lower-bound	1.638	1.000	1.638	82.172	.000
s-type * group "interaction"	Sphericity Assumed	.874	3	.291	43.868	.000
	Greenhouse-Geisser	**.874**	**1.376**	**.635**	**43.868**	**.000**
	Huynh-Feldt	.874	1.535	.569	43.868	.000
	Lower-bound	.874	1.000	.874	43.868	.000
Error(s-type)	Sphericity Assumed	.359	54	.007		
	Greenhouse-Geisser	**.359**	**24.771**	**.014**		
	Huynh-Feldt	.359	27.636	.013		
	Lower-bound	.359	18.000	.020		

Because a significant difference was found between s-type, a second repeated-measures ANOVA was run to test the effects of s-type for each group. Again, the Greenhouse-Geisser correction was used. A significant effect of s-type was found for the native speakers $F(1.218, 4.873) = 31.045$. Tests of Pairwise Comparisons (Figure 14) found that for native speakers there was a significant difference between the contexts that would elicit voicing and the contexts where /s/ was expected to remain voiceless both word-internally ($p = 0.024$) and across word-boundaries ($p = 0.030$). Figure 11 below compares the mean percentages of time voiced in the voiceless and voiced conditions in the word-internal context, and Figure 12 compares the mean percentages of time voiced in the voiceless and voiced condition across word-boundaries.

Figure 11. Comparison of voicing and voiceless conditions in the word-internal context

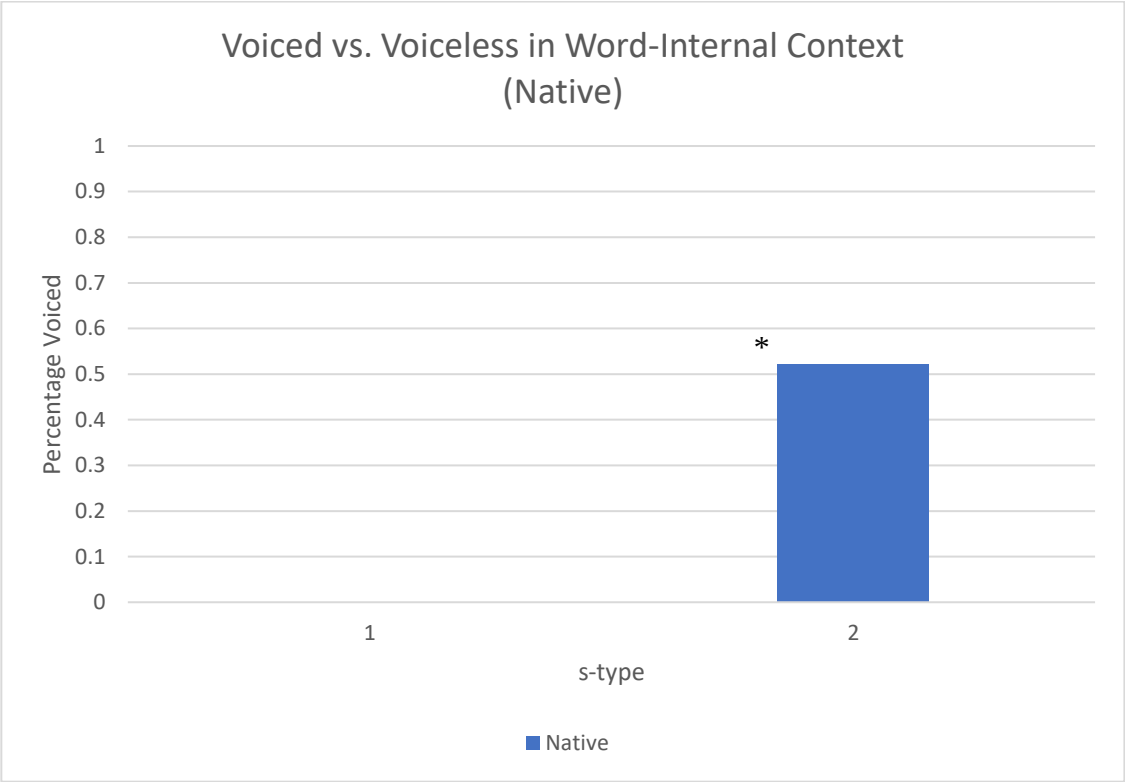
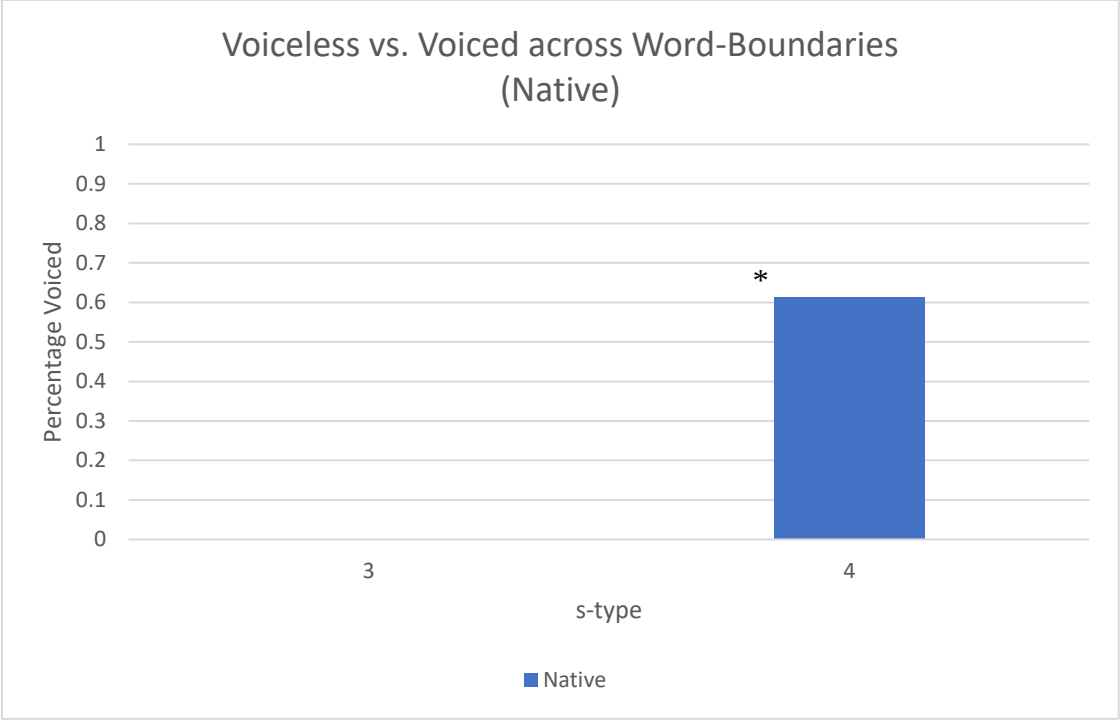


Figure 12. Comparison of voicing and voiceless conditions across word-boundaries



There was found to be no significant difference between the voicing produced by native speakers that occurred word-internally and across word-boundaries ($p = 0.876$), as shown in Figure 13.

Figure 13. Comparing the voiced condition produced word-internally and across word-boundaries

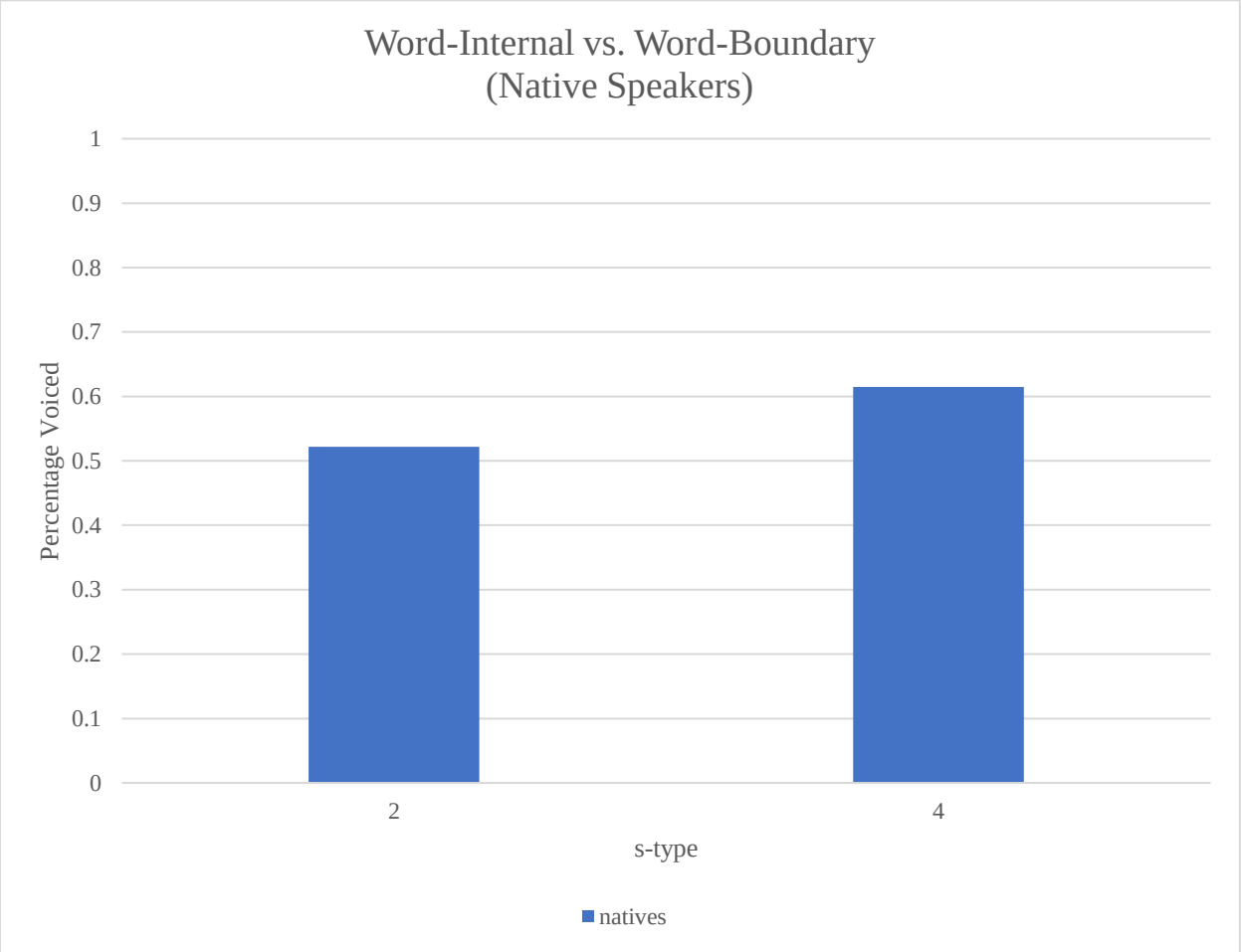


Figure 14 below is a summary of the data collected from the Pairwise Comparisons tests.

Figure 14. Pairwise comparisons of natives

Group	(I) s-type	(J) s-type	Mean Dif. (I-J)	Std. Error	Sig.
Natives	1	2	-.522*	.088	.024
		3	.000	.000	.
		4	-.615*	.110	.030
	2	1	.522*	.088	.024
		3	.522*	.088	.024
		4	-.093	.052	.876
	3	1	.000	.000	.
		2	-.522*	.088	.024
		4	-.615*	.110	.030
	4	1	.615*	.110	.030
		2	.093	.052	.876
		3	.615*	.110	.030

Likewise, a repeated-measures ANOVA was run to test for the effects of voicing in the learner group. A significant effect of s-type was found for the learners $F(1.457, 20.401) = 11.235$. Data from the Pairwise Comparison of learners is found below in Figure 17. Similarly, a significant difference was found between the voiced and voiceless conditions of both the word-internal ($p = 0.002$) and word-boundary ($p = 0.032$) contexts. Figure 15 compares the mean percentages of time voiced in the voiceless and voiced condition occurring word-internally and across word-boundaries, and Figure 16 compares the mean percentages of time voiced in the voiceless and voiced condition that occurred across word-boundaries.

Figure 15. Comparison of voicing and voiceless conditions in the word-internal context

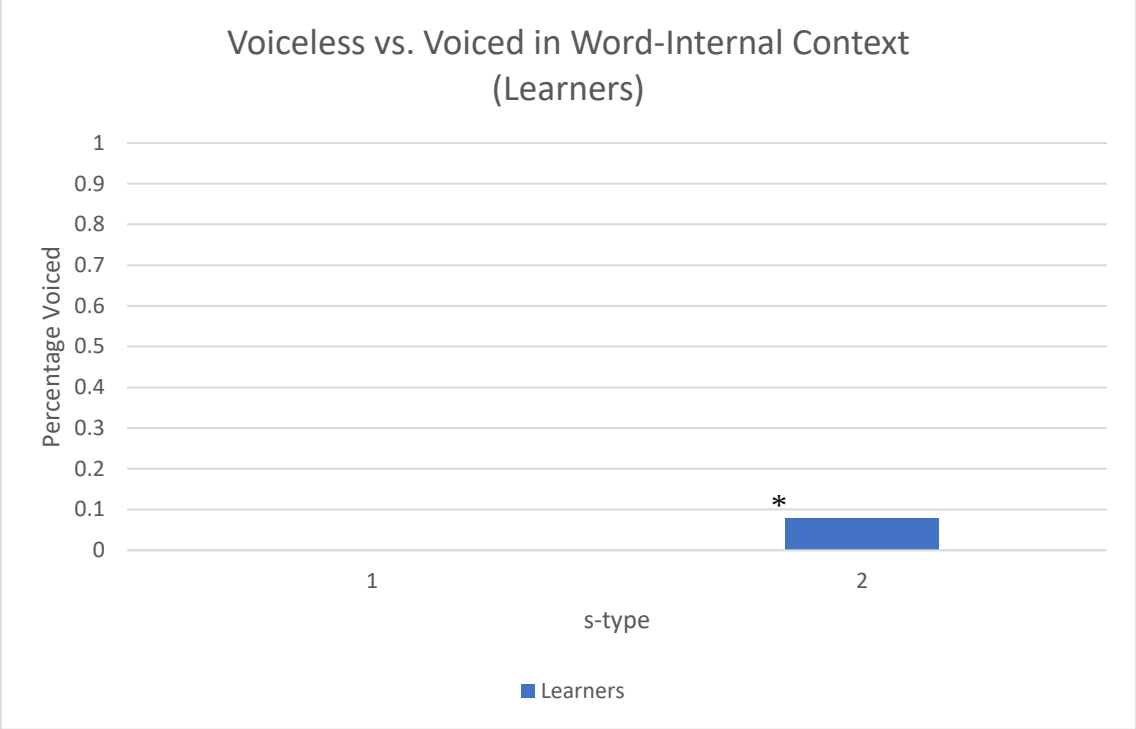
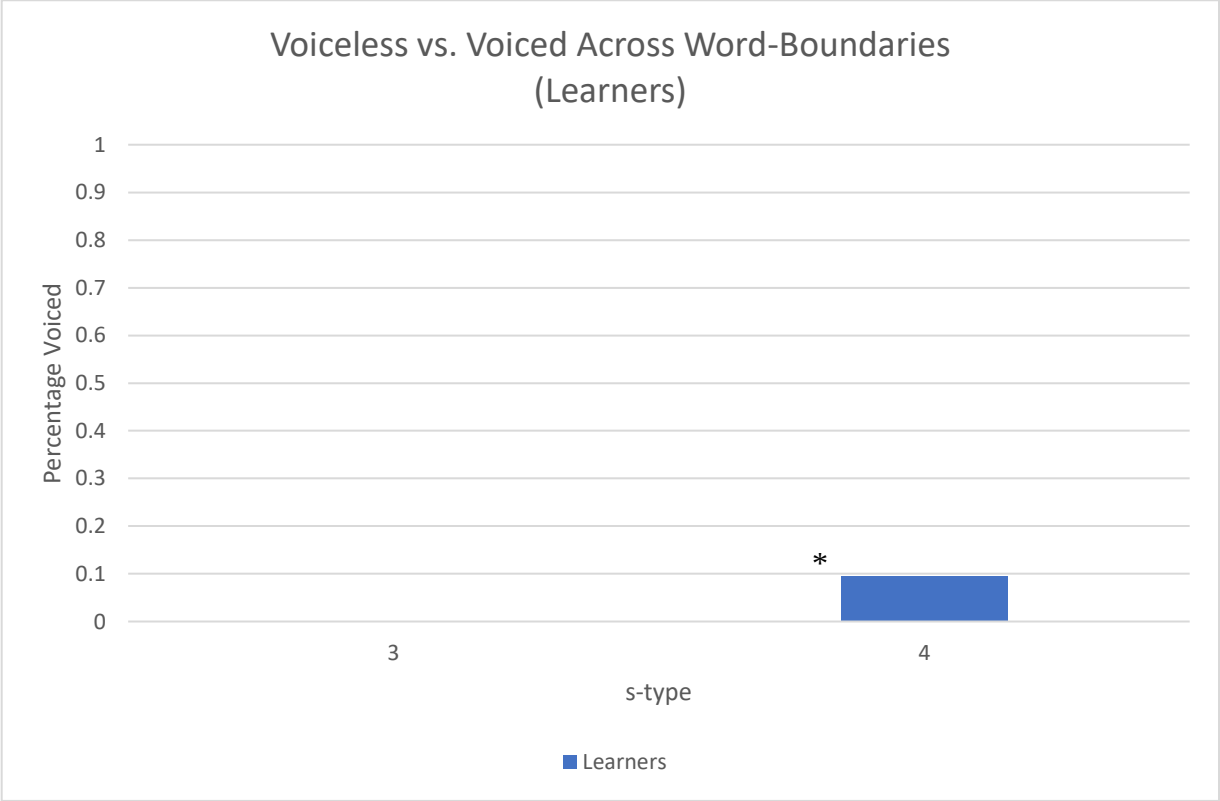


Figure 16. Comparison of voicing and voiceless conditions across word-boundaries



Like the native speakers, no significant difference was found between the voiced conditions of both word-positions ($p = 1.000$), as shown in Figure 17.

Figure 17. Comparison of voiced condition occurring word-internally and across word-boundaries

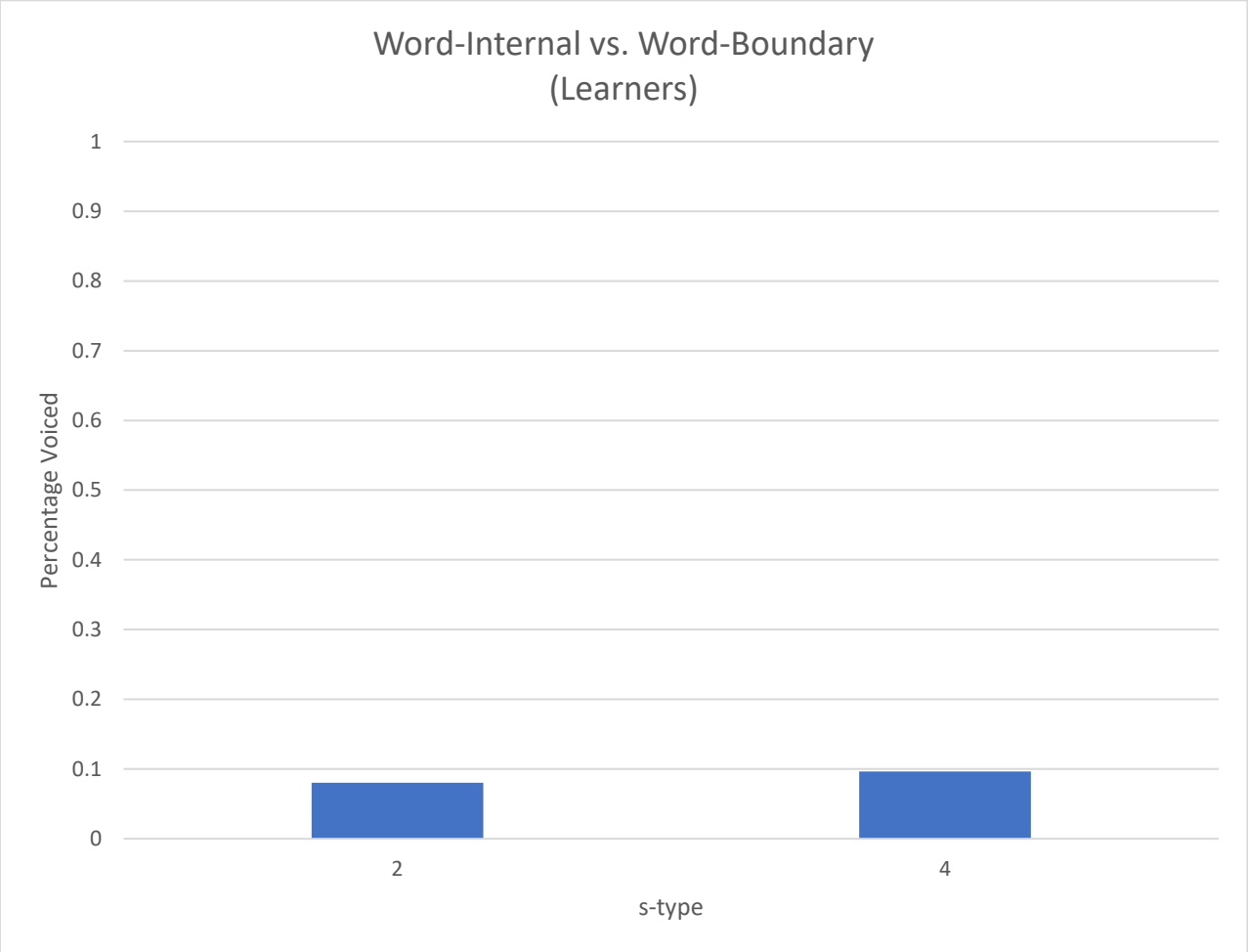


Figure 18 is a summary of the data produced by learners that was collected using the Pairwise Comparisons tests.

Figure 18. Pairwise comparisons of learners

Group	(I) s-type	(J) s-type	Mean Dif. (I-J)	Std. Error	Sig.
Learners	1	2	-.080*	.017	.002
		3	.000	.000	.
		4	-.096*	.029	.032
	2	1	.080*	.017	.002
		3	.080*	.017	.002
		4	-.016	.023	1.000
	3	1	.000	.000	.
		2	-.080*	.017	.002
		4	-.096*	.029	.032
	4	1	.096*	.029	.032
		2	.016	.023	1.000
		3	.096*	.029	.032

4. Discussion

Due to differences in the production of /s/ between English and Spanish, it was questioned if native English speakers learning Spanish would have produce the voiced variant of the Spanish /s/ in the same contexts as native speakers. Both the means and the repeated-measures ANOVA results show that there is much less voicing by learners than native speakers. However, it was found that, for learners, there was a significant difference between the contexts where native speakers produced the voiced variant of /s/ and the contexts in which the natives maintained the voiceless /s/.

Previous research (García 2013) stated that native speakers produced the voiced variant of /s/ both word-internally and across word-boundaries. However, it was questioned if the learners would produce the voiced variant in both contexts like native speakers. It was found that there was no significant difference, regardless of whether the sibilant occurs word-internally or across word-boundaries.

Unfortunately, there were a few issues with the study overall. The small sample size of native speakers and their greater variability in the data (as evidenced by SD = 0.196; SD = 0.245), created statistical issues. In the future, a more even sample size of learners and native speakers will solve this issue. Second, both Schmidt (2014) and Escalante (2016) addressed that the level at which participants speak can affect how they produce the /s/. In a future study, a questionnaire should ask the participants to self-rate their ability to speak and pronounce the language. In addition, students should list any Spanish speaking countries they have visited and for how long they stayed. Lastly, a few changes to stimuli should be made. Since /v/ exists as a phoneme in English but not in Spanish, the "sv" combination should be avoided. A filler sentence should be included at the end because many participants did not fully pronounce the last few words of the last sentence where there, unfortunately, was a token. Before creating the stimuli, it is important to test for words that might be commonly mispronounced as to avoid having to delete data.

There is little to no research studying the effect of instruction on the production of the Spanish sibilant by learners. Therefore, a future study should analyze the differences of the /s/ produced by learners before and after receiving a formal instruction of the allophones and assimilatory processes of the Spanish sibilant. This type of study would be beneficial to the second language acquisition process because it would allow instructors to form the best curriculum for instructing allophones and assimilatory processes.

5. Conclusion

This study investigated the production of the Spanish sibilant by native English speakers learning Spanish as a second language. Although learners voiced the /s/ much less than native speakers, the statistical analyses show that there is a great enough difference between the voiced and voiceless contexts of the learners to be considered significant.

Therefore, contrary to what was found in previous studies (Schmidt 2014; Escalante 2016), learners do produce the voiced variation of /s/ in the same contexts as native speakers.

Appendix A

Copy of Consent Form:

INFORMED CONSENT STATEMENT

The purpose of this study is to investigate second language acquisition of Spanish phonology. Although not guaranteed, your participation may result in improved pronunciation, either by direct instruction or by increased attention to pronunciation. You will also have contributed to a greater understanding of second language acquisition that may benefit even more students in the future.

In order to participate in the study, you will be recorded twice over the next few weeks. Each time, you will read a text in Spanish. You may also receive instruction in target-language pronunciation. All procedures for this study will be conducted during class in order to minimize any impact on your time. All individual data and recordings will be collected and stored anonymously so that confidentiality can be maintained. Furthermore, there is no personal risk to you as a participant.

Your participation is not required, and you are free to withdraw from the study at any time. Participation in the study, or lack thereof, will not impact your grade for the class in which the study is conducted. If you have questions about the study, please contact Will Hagerman at whagerman@harding.edu or Kristi Bond at knbond@harding.edu.

Your signature below indicates your consent to participate in the study.

_____ _____

Name Date

Appendix B

Copy of Questionnaire:

Questionnaire

PLEASE DO NOT WRITE YOUR NAME

(Q1) Country of origin: _____

(Q2) City, State: _____

(Q3) Age: _____

(Q4) Gender: _____

(Q5) Number of years you have studied Spanish at a collegiate level: _____

(Q6) Do you have knowledge of any other language(s)? If so, please list them: _____
_____

Please write your code: _____

Appendix C

Copy of First Set of Sentences:

INSTRUCTIONS:

Before recording become familiar with the code given to you by either Dr. Bond or Will Hagerman. Once you have that code you may begin recording - it is important that you do **NOT** say your name on the recording. When the recording begins, say the **code** given to you, and then read the twelve sentences below. Once you begin the recording, please do **not** stop recording until you have finished all the sentences. If you need a break between reading sentences, feel free to do so without pausing the recording. Once you have read all the sentences, you may press the stop button and return the iPad to either Dr. Bond or Will Hagerman. Upon receiving the iPad, Dr. Bond or Will Hagerman will save the file under the code that you were given. Remember that there are no penalties nor grades that will be assigned because of this recording, so relax and begin when you feel comfortable. **If at any time you need technical assistance, Dr. Bond or Will Hagerman will be free to help you.**

1. Su desgana destruyó su carrera.
2. Ellos nos contaron de sus viajes.
3. El hombre tiene rasgos tan peculiares.
4. Lo difícil es tener que desvenar los mariscos.
5. A ellas les gusta comer los bollos.
6. Ella vivía en una isla.
7. Yo leí el mismo libro que se llama “Los Martes con mi Abuelo.”
8. Mi tía mandó que yo trasladara la mesa de la cocina al garaje.
9. El agua desbordó el lavamanos.
10. Ella es la chica más graciosa de su escuela.
11. Los cisnes nadaban en el lago.
12. Él tomó una clase de literatura de las mujeres o del feminismo.

References

Boersma, P. & D. Weenink. (2005). Praat: doing phonetics by computer (Version 4.3.19) [Computer program].

Cuartero Torres, Nestor. (2001). Voicing assimilation in Catalan and English. Doctoral dissertation, Universitat Autonoma de Barcelona.

Escalante, Chelsea. (2016). Intervocalic Voicing and Regressive Voicing Assimilation in L2 Spanish /s/. Divergencias: Revista de estudios lingüísticos y literarios

Garcia, Alison. (2013). Allophonic Variation in the Spanish Sibilant Fricative. Dissertation, University of Wisconsin-Milwaukee.

Jansen, Wouter. (2007). Phonological 'voicing', phonetic voicing, and assimilation in English. Language Sciences, 29, 270-293.

Quilis, A. (1993). Tratado de fonología y fonética españolas. Madrid: Ed. Gredos.

Schmidt, Lauren B. (2014). Contextual Variation in L2 Spanish: Voicing Assimilation in Advanced Learner Speech. Studies in Hispanic and Lusophone Linguistics.

Stokes, J. D. (2005). Que bien suena!: Mastering spanish phonetics and phonology. Belmont, CA: Heinle Cengage Learning.