L2 Perception of the S-Aspirated Phone in Spanish

Raúl A. Gamboa

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L2 PERCEPTION OF THE S-ASPIRATED PHONE IN SPANISH

A Dissertation
presented in partial fulfillment of requirements
for the Ph.D. in Second Language Studies
in the Department of Modern Languages
The University of Mississippi

by Raúl A. Gamboa

May 2023
ABSTRACT

This dissertation deals with the perception of the aspirated coda /s/ by Spanish L2 learners. Second language research, with some exceptions, focuses on whether L1 English– L2 Spanish learners can perceive the aspirated variant, showing that only advanced learners with time spent in s-weakening regions succeed at the task. L2 studies about s-aspiration have yet to investigate the perception of the aspirated coda /s/ in different environments across actual phrases and sentences. This study focuses on the intelligibility of pairs of ambiguous phrases and sentences perceptually differentiated only by the aspirated coda /s/. Additionally, it investigates the prosodic stress’ influence on the perception of the s-aspirated phone within and between words. The population consisted of three groups of 20 L1 English-L2 Spanish students each. Data were collected employing a survey with four sections: a biographical information section, a perception task (intelligibility), a comprehensibility section, and an appreciation section. The analysis included descriptive and inferential statistics. The descriptive statistics consisted of percentages of correct and incorrect responses, biographical information, and appreciation ratings, while the statistical analysis comprised various tests in R, such as one-way ANOVA followed by pairwise t-tests (Bonferroni), logistic regressions, and a one-proportion z-test.

The results showed that language proficiency, level (beginner, advanced, and linguistics), environment, word set, and place for interaction contributed to the statistically significant perception of the aspirated coda /s/. Higher language proficiency and social interaction (social group) are sufficient for perceiving the aspirated coda /s/ in the within word set but not in the between word set. Furthermore, the time spent in Spanish-speaking regions variable did not
contribute to perception, and it could not be compared with previous studies due to participants not having sufficient time in this regard. Additionally, the within word set environments were conducive to high perception accuracy, whereas the between word set environments were challenging for the task. The prosodic stress aided perception in the within word set since the two stressed environments received statistically significant scores. However, an unstressed environment, the unstressed word medial, also got statistically significant scores.

*Keywords: Weakening, Aspiration, Resyllabification.*
DEDICATION

This dissertation is dedicated to everyone who has helped me learn life lessons. In particular, I thank my family and my wife, who have supported me in the most challenging times.
LIST OF ABBREVIATIONS AND SYMBOLS

[h] fricative glottal voiceless
L1 first language
L2 second language
[θ] fricative interdental voiceless
COG Center of Gravity
e.g. example
ACKNOWLEDGEMENTS

I express my most sincere gratitude to the head of the Department of Modern Languages of the University of Mississippi, Dr. Daniel E. O’Sullivan, my advisor, Dr. Felice Coles and my committee members, Drs. Vance Schaefer, Robin Wright, and Michael Raines. I would have never achieved my goal without their help.
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CHAPTER I
INTRODUCTION

This dissertation focuses on Spanish L2 learners’ perception of the aspirated coda /s/ in different environments. Issues in perceiving the s-aspirated phone [h] in a word may cause misunderstandings in real-life communication because listeners can hear a different phrase or sentence. Limited insights are known about whether the perception of the aspirated coda /s/ is equally challenging in the different environments where it occurs. This research extends Escalante’s (2018) study who provided evidence of the varying degrees of difficulty in perceiving the aspirated coda /s/ in pseudowords by L2 Spanish learners. Thus, the present study addresses various environments where the aspirated coda /s/ occurs using phrases and sentences: stressed word-medial (e.g., Tengo muchos gastos [ˈtɛn.go.ˈmu.ʃos.ˈɣah.toʃ] ‘I have many expenses’), unstressed word-medial (e.g., La amistad del camino [la.ʔə.mi.ˈtað.del.ˈka.ˈmi.no] ‘the friendship of the road’), stressed word-final (e.g., El bus que está en el puerto [el.ˈbuʃ.ˈke.es.ˈta.e.ˈnel.ˈpwɛɾ.to] ‘The bus that is in the port’), unstressed resyllabified (e.g., a los amigos en el hotel [a.ˈlo.ˈha.mi.o.ˈse.ne.ˈlo.tel] ‘to the friends at the hotel’), and stressed resyllabified environments (e.g., las aulas de estudiantes [la.ˈhaw.ˈle.zə.ˈde.es.tu.ˈðjan.ˈteʃ] ‘the students’ classrooms’). That is, this study focuses on how the prosodic stress facilitates the perception of the aspirated coda /s/. Spanish prosody suggests that some environments are more prominent across phrases and sentences (Morgan, 2010), which may facilitate the perception of the aspirated coda /s/ in L2.
The first chapter starts with demographic information about Spanish in the United States, highlighting its importance in American universities. After that, it defines the phoneme /s/ with its aspirated allophone phonologically and acoustically. Additionally, it provides information about its origin and other affected languages. Following are models that account for the speakers’ aspirated choice. After that, the chapter illustrates various environments where the aspirated allophone occurs and what social class aspirates more often. Finally, the chapter presents information about the place of dialects in second-language classrooms in the United States.

1.1 Spanish in the United States

Spanish is the official language of eighteen Hispano-America countries and Puerto Rico’s commonwealth (Lipski, 2008). The linguistic contexts do not coincide with the political borders. However, the interaction reflects the complex history of the American nations and the mosaic of indigenous tribes and immigrants who have had contact with the Spanish language in the last 500 years. In the United States, Spanish is the second most spoken language (Lipski, 2008). Social issues and lack of labor have brought thousands and thousands of Hispanics to the United States. Most Hispanics come from Mexico, Cuba, Puerto Rico, Central and South America (United States Census Bureau, n.d.). Other populations were already in the States as part of territory gained after the nineteenth century’s border wars (Lipski, 2008). Later, due to labor shortages, recruiting programs would bring thousands of workers to the U.S. The first Puerto Rican group arrived in New York and the Northeast looking for new economic horizons before World War II (Lipski, 2008). After that, the island’s financial situation would determine more Puerto Ricans’

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1 Puerto Rico is not an independent country nor a U.S. state. People born in Puerto Rico have American citizenship, but it can be revoked. Puerto Ricans cannot elect the president, their own senator, or representatives to the U.S. Congress (Duany, 2003).
immigration into the States. For Cubans, the revolution in 1959 marked the beginning of massive migration that continued in the early eighties with the Mariel Boatlift (Lipski, 2008). This group of immigrants is associated with a particular region in the United States: Dade County, Florida. In the Salvadorean’s case, the early 1920s civil war brought thousands of refugees to the States, many of whom entered the country illegally. They settled in Houston, Chicago, Los Angeles, Washington D.C., Miami, and New York City (Lipski, 2008).

According to the 2019 US. Census, there are 60,095,000 Hispanics in the United States: Mexicans 37,447,000 (62.3%), Puerto Ricans 5,156,000 (8.6 %), Cubans 2,484,000 (4.1%), Central Americans 5,585,000 (9.3%), South Americans 3,972,000 (6.6%), and other Hispanics 5,450,000 (9.1%). The category “Central America” differs from the category “Mexican.” (United States Census Bureau, n.d.).

Despite race, these figures show people’s origins. The foreign-born are classified as first-generation, but natives with at least one foreign-born parent belong to the second generation. Natives with two native parents but with one or more foreign-born grandparents are considered third-and-higher generations. The states with the highest Hispanic population are California (15,574,880), Texas (11,524,840), Florida (5,663,840), New York (3,749,260), Arizona (2,310,590), Illinois (2,216,300), New Jersey (1,856,850), Colorado (1,256,900), Georgia (1,042,640), New Mexico (1,032,950), and North Carolina (1,023,000) (STATISTA, n.d.).

In terms of L2 education, Spanish leads the language enrollment figures in American universities, where students must take several credits in a language of their preference. Of a total of 1,417,921, these were the enrollments per foreign language in the Summer and Fall of 2016: Spanish (712,240), French (175,667), German (80,594), Japanese (68,810), Italian (56,743), Chinese (53,069), Arabic (31,554), Latin (24,866), Russian (20,353), Korean (13,936), Ancient
Greek (13,264), Portuguese (9,827), Biblical Hebrew (9,587), Modern Hebrew (5,521), other six (34,830) (Looney & Lusin, 2018). Thus, being aware of the number of native Spanish speakers and its leading role as a language requirement in American universities deserves more study of its varieties. The s-aspirated dialects are one variety, common in the speech of Spanish Caribbean speakers in various Latin American countries’ coastal areas.

1.2 The Target Phoneme

The aspirated phone [h] is an allophone of the phoneme /s/, which belongs to the group of sibilants. In producing sibilants, the air passes through a long channel-like narrow aperture formed by the tongue roughly around the alveolar area. This opening looks like a rut, and it differs from the wide dent seen in the productions of the non-sibilant fricatives such as [f], [θ], [β] or [x] (Morgan, 2010). As friction results from the contact between the tip of the tongue and the alveolar ridges, acoustically, the noise produced by the sibilants has a high frequency (Morgan, 2010). The phoneme /s/ has two sibilant allophones in Latin American Spanish: the fricative sibilant predorso-alveolar voiceless [s] and the fricative sibilant predorso-alveolar voiced [z]. The fricative sibilant predorso-alveolar voiced [z] occurs before voiced consonants (e.g., desde [‘dez.de] ‘since’), and the fricative sibilant predorso-alveolar voiceless [s] occurs in the rest of the contexts (e.g., este [‘es.te] ‘this,’ los otros [los.’o.tros] the ‘others’). There are other dialectal variants of the /s/ in peninsular Spanish². In the center and north of Spain, speakers produce the apico-alveolar voiced [z] and the apico-alveolar voiceless [s]. The former occurs before voiced consonants and the latter before voiceless consonants (Morgan, 2010). In the

---

² There are three social and regional pronunciation norms of /s/ in Spain: ceceo, seseo, and distinction. Ceceo consists of pronouncing the graphemes c (ce and ci), s, x, and z as [θ] and is characteristic of the Andalusian variety. The /s/ in this variety is not apico-alveolar as in the center and north of Spain. In contrast, seseo consists of pronouncing the same graphemes c (ce and ci), s, x, and z as [s] and occurs in some parts of Andalusia, the Canary Islands, and also Latin America. In distinction, speakers distinguish between /s/ and /θ/, pronouncing s and x with [s] (e.g., sal [sal] ‘salt’), and c (ce, ci) and z with [θ] (e.g., Cecilia [θe.’θi.lja]) (Morgan, 2010).
Andalusian variety, speakers pronounce the /s/ as the fricative interdental voiceless [θ] systematically or randomly.

### 1.3 /S/ Aspiration

Aspiration consists of producing the sibilant fricative alveolar phoneme /s/ as the fricative glottal voiceless [h]. The glottis needs to be opened when producing the voiceless fricative [h] to allow enough airflow to generate turbulence at the vocal tract constriction (Iverson & Ahn, 2007). Additionally, the tongue touches nothing, and the vocal cavity is set up as it was to produce the vowel. The usual current of air gets out, resulting in glottal friction as aspiration. Aspiration leaves a void by the absence of the /s/, and if more weakening occurs, it is deleted (e.g., escuela [e.'kwe.la] ‘school’) (Morgan, 2010).

The production of the aspirated allophone [h] differs from that of the sibilant [s]. The aspirated allophone [h] is less intense and shorter than the sibilant [s]. Low impedance\(^3\) causes a high airflow, which dissolves quickly, and the wider open constriction does not allow for much acoustic energy in the spectrum of [h] (Shadle, 1990). Producing the sibilant [s] displays high frequency while the aspirated coda /s/ displays low frequency (Widdison, 1991). Figure 1 shows an example of the sibilant [s] (A) and the aspirated coda /s/ (B) in the spectrogram of the word *pista* [ˈpis.ta] [ˈpih.ta] ‘clue.’ The darker area shown by the arrows suggests that the sibilant [s] has more acoustic energy than the aspirated [h] (Ladefoged, 2006).

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\(^3\) Acoustic impedance: “A measure of the total tendency of a medium to oppose the passage of sound waves through it.” (Trask, 2015).
The s-aspiration phenomenon is part of a change and started in Spain. Accounts of aspiration and deletion date from the early 17th century (Widdison, 1997). Martínez Celdrán and Fernández Planas (2007) proposed two sources of origins of s-aspiration. The first one is the weakening of the coda /s/, and the second one is a lessening of the Castilian [x], which extended to the south of Spain, the Canary Islands, and areas of Latin America. In describing the weakening processes, Hyman (1975) identifies segments X, Y and zero. He claims that “a segment X is said to be weaker than a segment Y if Y goes through an X stage on its way to zero” (p. 165). That is, aspiration is an intermediate stage of a process that ends in deletion. Penny (2000) suggests that the aspirated coda /s/ is the last change in modern Spanish. In fact,
the s-weakening phenomenon has occurred in different natural languages. In Sanskrit, the /s/ weakened in the final pre-pausal, while in Armenian, it gets deleted before a vowel or a pause. In ancient Slavic, it gets deleted in polysyllabic words, whereas in vulgar Latin, it weakens in absolute final position (e.g., tribunos militare instead of tribunus militaris ‘military tribune.’ In French, the /s/ is deleted before consonants (e.g., mes frères [me.fʁɛʁ] ‘my brothers’ and retained before vowels (e.g., mes amis [me.za.mi] ‘my friends’) (Alvar, 1955).

Various phonological explanations account for the Spanish s-weakening choice. The strength hierarchies comprise the positional hierarchy and the major class feature hierarchy (Escure, 1977). It postulates that the position of the s within an utterance predicts their weakening, with the environments that require less articulatory force being more likely to weaken than those that require more force. Pronouncing consonants in utterance and word initial demands more articulatory force than those in word or phrase final. Environments are classified from the strongest to weakest ones as follows: phrase final, word final, coda word medial, onset, and phrase initial. Hence, occurring in the first three positions of the ranking, s-aspiration is an instance of the tendency toward the reduced articulatory force (Bjarkman, 1989). Similarly, the major class feature hierarchy predicts the order of weakening from the strongest to the weakest environments: voiceless stops, voiced stops, voiceless fricatives, voiced fricatives, nasals, liquids, and glides. Finally, s-weakening is more common in word medial environments because of the tendency to maintain the CV syllabic pattern (Momcilovic, 2005), which occurs between 50% and 58% (Guerra, 1983), so speakers weaken the coda /s/ to comply with it.

S-aspiration occurs primarily in the coda (e.g., áspero ['ah.pe.ro] ‘rough,’ pasto ['pah.to] ‘grass,’ las cosas costosas [lah.'ko.sah.koh.'to.sas] ‘the costly things’), although far less common in the onset (Brogan & Bolyanatz, 2018). The /s/ can also be aspirated before a pause (e.g., son
otras casas [ˈso.n.tras.ˈka.sah#] ‘there are other houses’). However, there are dialects where the
coda /s/ is not aspirated in this phonetic environment. In some regions, it is common to aspirate
the /s/ in the word final environment even if the following word starts with a vowel (e.g., *tres
libros interesantes* [ˈtre.ʃ.li.bro.in.te.re.ˈsan.teh] ‘three interesting books’) (Morgan, 2010).

Aspiration is a common feature of the vernacular and educated speech in various dialects
of Spanish (Morgan, 2010). Nevertheless, it is mostly associated with speakers of low-
socioeconomic status (e.g., Dohotaru, 2004; Ruíz-Sanchez, 2004). Social variables influence
the /s/ aspiration phenomenon since it usually occurs in fast or informal registers (Núñez-
Méndez, 2022; Morgan, 2010; Prieto, 2008; Widdison, 1995; among others). Nevertheless, most
people aspirate the /s/ to varying degrees in those dialect regions where it is a common feature,
such as the South of Spain, the Caribbean, and the South American coast. Thus, the /s/ in those
locations is not categorical but variable, and it is produced as sibilant, aspirated, and deleted
(Morgan, 2010). Hypercorrection is the response to deletion and aspiration. Speakers who adopt
hypercorrection insert the /s/ in various environments where it may not sound more educated
(e.g., *dipusta vs disputa* ‘dispute,’ *asbogado vs abogado* ‘lawyer’) and avoid using the often-
stigmatized s-weakened utterances (Bradley, 2006).

1.4 Geographical Areas of S-Weakening

This section provides the specific geographical locations where the s-aspiration occurs in
Latin America. Lipski and Recuero’s (1994) overview of the geographical areas where s-
weakening occurs. S-weakening occurs mostly in the coda (e.g., *esto* [ˈeh.to] ‘this’). Retention of
/s/ is often associated with educated speakers in all nations and with careful speech, but deletion
is associated with lower-class, rural inhabitants, and speakers with low limited schooling.
Aspiration is also stigmatized except in Caracas, Chile, and Buenos Aires, where even educated
urban speakers aspirate -s. The review only focuses on Latin American regions divided into three areas: The Caribbean, South America, and Central America.

In the Caribbean, speakers show high rates of aspiration and deletion. In Colombia, the phenomenon is common on the Caribbean mostly and the Pacific coast at a minor rate (Montes Giraldo, 1982). The phenomenon is highly stigmatized in this area of the continent except in Venezuela, where aspiration is the preferred option among upper-class speakers. Nevertheless, deletion is the preferred option for lower-class speakers. Venezuela’s Andean region has shown some resistance to the s-weakening phenomenon (Calles & Bendigolio, 1986). However, in the speech of Caracas, which is considered prestigious, /s/ is usually weakened. This is one of the few cases in Latin America where an s-weakening dialect competes for prestige with the standard norm. In the Dominican Republic, deletion rates are so high that they are practically systematic (Alba, 1982).

In South America, deletion and aspiration occur in Argentina (except in Santiago del Estero), Bolivia (highlands), Chile, Paraguay, Perú, Uruguay, and Ecuador. Buenos Aires and Chile are the regions with the highest rates of aspiration. Deletion is less frequent in Ecuador and more frequent among rural inhabitants in Paraguay who speak a different language (Granda, 1981). In Central America, the Spanish speakers weaken the s in Costa Rica (in Punta Arenas), Honduras (except on the border with Guatemala), Guatemala (on the border with El Salvador and Belize), Nicaragua, and Mexico (Yucatan, the coast of Veracruz, Tabasco, and Acapulco). S-weakening dialects are stigmatized in the Caribbean, but not as much as in the highlands.

1.5 Dialects in the Classroom

Because of their social capital, the present study advocates teaching dialects in the L2 classroom. Conversational second language pedagogy seeks to develop communicative
competence. Hymes (1972) proposed communicative competence as a response to Chomsky’s linguistic theory, which consists of an innate capacity to produce grammatically correct utterances in concrete situations. Hymes pointed out that Chomsky’s linguistic theory lacked contextual appropriateness. Later, in outlining teaching frameworks for communicative competence, Canale and Swain (1980) and Bachman (1990) included sociolinguistic competence, giving a place to language varieties. Although dialects can be situated within this competence, they have been somewhat excluded from basic Spanish L2 courses at university programs. Why? Spanish departments in American universities teach Castilian Spanish (Castellano) and the Latin American norma culta (educated norm) influenced by ideologies of language standardization and nativeness (Train, 2007) dictated by The Real Academia Española (RAE; ‘Royal Spanish Academy’) (Burns, 2018). Furthermore, many Spanish L2 instructors reinforce this trend with their preference for academic Spanish (Valdés et al., 2003). Eventually, learners encounter disparities between what they are taught in the classroom and actual language use, causing learning frustration.

Nevertheless, language variation is more congruous with the goal of nativeness than standard language because it reflects the varied conversational context in which learners interact in real-life (Train, 2003). Several arguments advocate including dialect content in Spanish L2 instruction. Learners need classroom exposure to natural conversation (Gilmore, 2004). Besides, they can acquire a more expansive repertoire of language variation to improve their listening skills (Valdman, 2003). Additionally, learners should raise awareness about linguistic variation before producing dialects (Gutiérrez & Fairclough, 2006). Hence, the present study attempts to inform pedagogical practices in Spanish L2 with insights into the perception of aspirated utterances. This content suits lessons in textbooks such as those about the Caribbean or Southern
Spain, which portray distinct cultural aspects, including music, clothing, festivals, and famous charact
CHAPTER II

LITERATURE REVIEW

This chapter starts with a review of aspiration in Spanish L1, then explains Spanish L2 learners’ challenges in assimilating it and the L2 perception models about perception. After that is a review of L2 Perception works on the aspirated coda /s/ followed by an account of frameworks and factors involved in acquiring L2 dialectal Forms. Finally, a definition of the prosodic stress, and how it relates to perception follows.

2.1 Research into Aspirated /s/ in L1

This section summarizes some representative studies on coda /s/ variation in both L1 production, perception, and resyllabification. At the same time, the section provides a basis for formulating aspirated items for a perception test in this research.

2.1.1 Production

Research into the production of aspirated /s/ in Spanish L1 is extensive, so many studies are not included here (see Núñez-Méndez, 2022 for a review). This line of research employs language samples containing the phoneme /s/ in the coda, albeit some studies focus on syllable-initial /s/ (Brown, 2005; Brown & Cacoullos, 2003) and s-post-aspiration (Del Saz & Cabedo Nebot, 2015; Gerfen, 2002; Torreira, 2006, 2007, 2012). Most studies are conducted within four methodologies. The first one addresses sociolinguistic variables such as gender, age, education, socioeconomic status, and the social significance associated with aspiration choices (Cepeda, 1995; File-Muriel, 2009; Fontanella de Weinberg, 1973; Lynch, 2009; Rodríguez, 2008; Rogers,
2020; Valdivieso & Magana, 1991; among others). The second one is concerned with morphosyntactic and frequency variables, including the lexico-morphological context, grammar, and word frequency. The third methodology focuses on the phonological environment of sibilance, aspiration, and deletion. Finally, the fourth one is the gradient-based approach or acoustic framework that consists of examining the acoustic properties of the phone [s]: the center of gravity (COG), intensity, and duration (Erker, 2010; File-Muriel & Brown, 2011).

This summary only comprises studies within the morphosyntactic and frequency and phonological methodologies to obtain criteria for the formulation of testing utterances used in the present study. Morphosyntactic and frequency studies consist of the lexico-morphological context, grammar, and word frequency variables. In the lexico-morphological context, speakers from Valdivia, Chile, aspirated the /s/ in lexical and non-lexical premodifiers. In the non-lexical group in monosyllabic premodifiers (81%) (e.g., las [lah] the-feminine, plural), but in the lexical group in monosyllabic premodifiers (63%) (e.g., dos [doh] two) (Cepeda, 1995).

With regards to grammar, aspiration was the choice with the highest number of instances in verbs (e.g., mostraron [moh.'tar] ‘show’) (4.7%), and the second in nouns (e.g., mujeres [mu.'xe.reh] ‘women’) (37.5%) (Rodríguez, 2008) in the speech of Barranquilla, Colombia. The educated Cubans living in Miami aspirated or kept /s/ in the first item (as a sibilant or aspirated variant) except for direct object pronouns (los, las ‘them’), which they deleted without affecting the conveyance of plurality (Terrell, 1979). As for word frequency, it affects s-weakening in the speech of speakers from Barranquilla, Colombia. The study used the criteria of lenition (deletion and aspiration) or retention, and frequent words accounted for 65% of lenition (File-Muriel, 2009).

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4 The COG or centroid is defined as “a weighted average of the frequency peaks over a specified duration. Lowering of the centroid is interpreted as an s-weakening tendency” (File-Muriel & Brown, 2011).
The phonological methodology consists of the phonological environment, phonetic environment, and stress variables. As for the phonological environment, aspiration alternates with retention and deletion in free variation and complementary distribution in Buenos Aires. The aspirated /s/ occurs before consonants in the word medial environment (e.g., *felizmente* [fe.lih.men.te] ‘happily’) (80%), and between words before consonants (e.g., *animales finos* [a.ni.ma.leh.fi.nos] ‘fine animals’) (69%), vowels (e.g., *actividades escolares* [ak.ti.bi.ˈða.ðe.h.e.ko.la.re] ‘school activities’) (7%), and pauses (e.g., *esas cosas* [e.sah.'ko.sah#] ‘those things’) (11%) (Fontanella de Weinberg, 1967; Terrell, 1978b).

Most aspirated instances occurred in within word environments in word medial (e.g., *costo* [koh.to] ‘cost’) (92%), word final before consonants (e.g., *muchas cosas* [mu.tʃah.'ko.sas] ‘many things’) (73%), word final vowels (e.g., *mis amigos* [mi.ha.'mi.ɣos] ‘my friends’) (50%) and a pause (e.g., *personas interesantes* [per.'so.na.hin.te.re.'san.teh#] ‘interesting people’) (Terrell, 1978a). Finally, in Barranquilla, Colombia, most cases occurred in resyllabified environments (e.g., *los amigos* [lo.ha.'mi.ɣos] ‘the friends’) (Rodriguez, 2008).

With regards to the phonetic environment, there were more probabilities for weakening in Concepción, Chile — including aspiration—when a voiced stop segment followed the /s/ (e.g., *rasgo* [rah.ɣo] ‘feature’) than when a voiceless consonant followed it, especially voiceless stops (e.g., *mosca* [moh.ka] ‘fly’) (Valdivieso & Magana, 1991). Valdivian speakers in Chile produced the aspirated /s/ before non-continuant and nasal consonants (e.g., *unas polleras negras* [u.nah.po.'ʃe.rah.'ne.gras] ‘some black skirts’) (Cepeda, 1995). In a sample of speakers from Barranquilla, lenition—defined as deletion or aspiration—was the preferred choice before fricatives (e.g., *fósforos* [foh.'fo.ro] ‘matches’) (67.6%) and nasals (e.g., *mismo* ['mih.mo]
‘same’) (48%). The /s/ segments are more prone to lenition before dorsal and labial consonants (e.g., *caspa* [‘kah.pa] ‘dandruff,’ *fiscal* [fi’h.kal] ‘fiscal’) (File-Muriel, 2009).

With regards to stress, the aspiration rate in the speech of the Dominican speakers was 35.89% in unstressed words (e.g., *los* [loh] ‘the’) and in stressed words 25.76% (e.g., *muchos* [‘mu.ʧo] ‘many’). When the /s/ is followed by words that start with a stressed vowel in resyllabified environments, the aspiration cases were scarce. The cases of stressed syllables (41%) are almost double those of unstressed ones (23%) (Alba, 1982). The participants preferred the aspirated allophone before stressed resyllabified environments in the speech of Barranquilla (e.g., *[la.’ho. tras]* ‘the others’ -feminine) (56.7%) and the second most important before unstressed syllables (e.g., *nuestros asuntos* [‘nwes.tro.ha.’sun.tos] ‘our matters’) (32.2%) (Rodríguez, 2008). Aspiration rates were higher in unstressed syllables in the word medial environment among speakers of Concepción, Chile (e.g., *costó* [koh.’to] ‘it cost’) (Rogers, 2020).

Speakers from Cartagena, Colombia, aspirated mostly in monosyllabic words (e.g., *más* [mah] ‘more’) and unaccented words (e.g., *nos* [noh] ‘us’) (Lafford, 1989). Finally, the working-class Puerto Ricans living in Philadelphia in the U.S. retained the /s/ (aspiration or sibilance choice) in determiners before stressed resyllabified environments (e.g., *mis hijos* [mi.’si. xos] ‘my children’) (Poplack, 1980).

### 2.1.2 Perception

In Schmidt (2015), exposure of native speakers from Bogotá (Colombia) and La Rioja (Argentina) to social contacts from /s/-weakening regional varieties, including conversations with family members, friends, and/or colleagues, played an influential role in perceiving the aspirated variant. Hayes (1989) offered evidence of /s/-weakening being easier to perceive in preconsonantal contexts owing to compensatory vowel lengthening: losing a consonant in the
coda lengthens the vowel in the same syllable. Hammond (1978) found that Cuban Spanish-speaking participants used vowel lengthening as a cue to perceive the member with the weakened /s/ in pairs like pastilla [pah.'ti.jas] ‘pill’ ~ patilla [pa.'ti.ja] ‘sideburn’ and pescado [peh.'ka.ðo] ‘fish’ ~ pecado [pe.'ka.ðo]. Similarly, in Figueroa (2000), vowel lengthening in word medial (e.g., pastilla ~ patilla, pescado ~ pecado) aided the perception of two-thirds of the vowels, mostly [a] and [e], preceding the weakened /s/ by six bilingual speakers of Puerto Rican Spanish.

2.1.3 Resyllabification

Resyllabification occurs when the status of a coda (a consonant) changes to onset in the word boundary. That is, the coda of es joins the next nuclear vowel o in es otro [e.'so.tro] ‘it is another.’ Consonant resyllabification yields more Spanish prototype syllables since the consonant of the rhyme of one syllable becomes the onset of the next one (Barrutia & Terrell, 1994). Resyllabification does not occur when the next word starts with an allophone that is not nuclear, like a glide or liquid (e.g., dos huecos [do.'we.kos] ‘two holes’ but not dos suecos [do.'swe.kos] ‘two Swedes’) (Barrutia & Terrell, 1994). In the case of the coda s-aspirated dialects, resyllabification produces a new syllable too but aspirated: es otro [e.'ho.tro] instead of [e.'so.tro] ‘it is another’ (Morgan, 2010). Broš (2013) found samples of aspirated resyllabified speech among Chilean speakers from Coquínbo: unas enfermedades [u.na.hen].fer.me.'ða.ðes] ‘some diseases’). Kaisse (1999) identifies the aspirated resyllabified phrases in the upper

5 The CV syllable is the prototype pattern in Spanish, and it is in almost 60% of isolated words (Morgan, 2010).

6 Vowels in a syllable can be nuclear or glides. The vowels a, e, o are nucleuses and u and i are glides and appear next to a nucleus. If they are stressed, they become nucleuses. The nucleus has to be a single vowel. When a syllable has more than one vowel, it is called vocoid: one is the nucleus, and the other a glide, which can be part of the onset or the coda, depending on whether it is before or after the nucleus. For instance, the graphemes i and u in viaje, baila, suave and causa represent glides since in each case the nucleus is /a/ in the first syllables (Morgan, 2010).
Caribbean Spanish dialect in word-final before any context (e.g., *los animales* [lo.ha.ni.'ma.leh]) ‘the animals’). In Chappell (2016) the late L1 Miskitu-L2 Spanish speakers weakened the /s/ in the coda in the prevocalic environment between words because they have been exposed to that input that has the aspirated /s/ in this environment. In Nicaraguan Spanish, the aspirated fricative-vowel joint is common across the word boundary (e.g., *paz eterna* [pa.he.'ter.na] ‘eternal peace’). The acoustic cues in the fricative-vowel joint make the fricative salient, but the cues in the fricative-consonant joint do not (e.g., *for los tapo* [lo.h.'ta.po] ‘I cover them’).

Research into the perception of Spanish L2 aspirated resyllabification is absent. The only study relevant to this line of research addresses resyllabification without aspiration (Scarpace, 2017). It tests two methodological frameworks to describe how L1 English-L2 Spanish listeners segment spoken speech in resyllabification. The first one is the Possible Word Constraint (Norris et al., 1997) which proposes that word activation during fluent speech is primed by a cluster with a structure stored in the lexicon. For instance, it is easier to recognize the word apple in the nonsense word *vuffapple* than in *fapple* because the former meets the phonological requirements of English words. This model underscores the importance of onsets for word recognition. The second one is the Syllable Onset Segmentation Heuristic model (Dumay et al., 2001), which also promotes that listeners make use of the onset to segment words in spoken language and are a reference for lexical mapping.

Scarpace (2017) conducted an audio-visual matching (perception) and an eye tracking-experiment (production) to investigate how L1 English-L2 Spanish learners parsed resyllabified phrases. The materials consisted of minimal pairs sets of which one member was a resyllabified

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7 Miskitu is the language of an indigenous tribe in Nicaragua.
version in the carrier sentence. In the audio-visual matching, the materials were constituted by /n/-/s/words (e.g., hace ['a.se] ‘he does’ vs nace ['na.se] ‘he is born’). The participants had to press a button if the word they saw on the screen, embedded in a phrase, matched the word they heard (audio-visual match). If after seeing the word nace and hearing the phrase escriben#/phace, the participant pressed the button, this means they heard the stimulus as a word that starts with the last letter (n) of the word escriben [es.'kri.βen] ‘they write’ (a consonant). The Spanish L2 participants successfully extracted the word in the resyllabified phrase in the audiovisual matching experiment, ruling out evidence of the Syllable Onset Segmentation Heuristic and the Syllable Onset Segmentation Heuristic models.

2.2 Challenges to Perceive the Aspirated Coda /s/

Allophonic differences between Spanish and English make the aspirated allophone challenging for Spanish L2 learners to assimilate it. The first difference is concerned with the phoneme-allophone correspondence in the two languages. In Spanish, the aspirated fricative glottal voiceless phone [h] is an allophone of the fricative sibilant predorso-alveolar voiceless phoneme /s/. Also, because standard Spanish has a phone that sounds similar to the aspirated coda /s/, the fricative velar voiceless phoneme /x/ with its allophone [x], learners should distinguish between the two phones. They should be aware that the fricative velar voiceless phoneme /x/ corresponds to the grapheme j, while the aspirated coda /s/ corresponds to the grapheme s. However, some aspirating dialects use [h] instead of [x] as an allophone of /x/. Hence, L2 learners should be aware that speakers of these dialects produce the fricative glottal voiceless phoneme [h] as an allophone of the phonemes /x/ and /s/.

In contrast, English has a phone that sounds similar to the Spanish aspirated coda /s/, the fricative glottal voiceless phoneme /s/ with its allophone [h].
The second difference deals with allophonic position in the two languages. The English counterpart [h] is contrastive with the /s/ in the onset (e.g., high ~ sigh), referring to two different words and meanings (a minimal pair). In contrast, the Spanish s-aspirated phone occurs in the coda in free variation with the /s/ (e.g., gasto ['gas.to] ‘expense’ ~ gasto ['gah.to] ‘expense’). That is, the same word has two pronunciations but the same meaning. Native English speakers are not used to hearing input with the phone [h] in the coda (McMahon, 2002). Hence, for L2 Spanish learners to perceive the s-aspirated phone, they must cluster the English fricative glottal voiceless phoneme /h/ and the English sibilant fricative alveolar voiceless phoneme /s/ and relate them to the Spanish sibilant fricative predorso-alveolar voiceless phoneme /s/ in the coda (Schmidt, 2018). They need to learn that ['gas.to] and ['gah.to] are the same word (‘expense’) and not a minimal pair.

2.3 L2 Perception Models

As for the L2 assimilation of /h/, the perception models anticipate various scenarios. The first one consists of beginner learners having difficulties perceiving the aspirated coda /s/ for not having language experience since beginner learners’ perception is still heavily influenced by their L1 (PAM-L2, and SLM, L2LP). The second scenario consists of experienced learners...
improving their perception of the aspirated coda /s/ as their language experience increases. Learners change the existing phonetic categories and eventually create new ones, but do not reach nativelike status (PAM-L2). In the third scenario, perception is affected by the specific environment of the aspirated Spanish allophone [s] and the English allophone [h] in the syllable (SLM and L2LP). English does not have s-aspiration but has a fricative glottal voiceless /h/ contrastive with the /s/ in the onset (e.g., high ~ sigh). Hence, it is challenging for English-speaking listeners to perceive the Spanish aspirated allophone since [h] is an allophone of /s/ in the coda (e.g., ['es.to] ~ ['eh.to] ‘this’). Finally, the fourth scenario is expected to occur within the subset scenario (Multiple Category Assimilation pattern) (PAM-L2) and refers to the change and reduction of phonemic boundaries in L1 to avoid bogus perception (L2LP). Spanish L2 learners should know that gasto ['gas.to] and ['gah.to] ‘expense’ are the same word and not minimal pairs (Schmidt, 2018). They must assimilate the Spanish full sibilant [s] and aspirated [h] allophones into the Spanish phoneme /s/.

2.4 Research into L2 Perception of the Aspirated /s/

This section provides research findings about the perception of aspirated /s/ by L2 participants whose first language is English. It shows the research design and instruments used in earlier research, and the gaps that the present study attempts to close. Most research into the perception of s- weakening dialects focuses on aspirated /s/ in the coda. The limited number of studies is concerned with whether Spanish-English participants perceive the phone [h]. These studies compare the performance of novice, intermediate, and advanced participants on tasks such as minimal pairs, intelligibility and comprehensibility, and word identification. Some have observed the effect of variables such as training and individual learning experiences.
Geeslin and Gudmestad (2008) investigated the pronunciation of the interdental fricative [θ] and the aspirated /s/ within the framework of second language acquisition of L2 Spanish learners whose first language is English with various proficiency levels and learning experiences. Data came from the participants’ performance in role plays. The results show that 5 out of 130 students use the s-aspirated variant (las [lah] the-feminine plural), mainly by the most proficient participants. The variables of living abroad or length of stay abroad are not necessarily indicators for adopting this variant. Maintaining contact with speakers of that dialect after living abroad is a better indicator. Exposure to this variant may occur because of contact with instructors who speak it, supplemental materials, or peers who use it.

In a study about the perception of various Spanish dialects, Trimble (2014) implemented the intelligibility and comprehensibility scales proposed by Munro and Derwing (1995). Intelligibility is concerned with the understanding of an utterance, and comprehensibility refers to the difficulty of an utterance as assessed by the listener. The listeners were intermediate and advanced native English participants studying L2 Spanish with some time in Spanish-speaking regions. On average, the intermediate group had two weeks, and the advanced group 19.7 weeks studying abroad. However, some intermediate participants did not spend any time abroad in s-weakening regions, and some had spent less than six weeks. In addition, the advanced group had taken four more Spanish courses than the intermediate group. In the intelligibility task, the participants had to transcribe the sentences they heard. In this study, all substitutions and words omissions were considered errors. In the comprehensibility task, participants had to rate the difficulty of the segments they heard. The dialects studied were the Caribbean (Venezuelan and the Dominican Republic), Castilian (Northern and Central Spain), highland Colombian (Bogotá), Mexican (Central interior), and Rioplatense (the Rio de la Plata region in Buenos Aires and
The results, which were reported in mean scores, showed that the intelligibility score of the aspirated /s/ was lower than those of the other dialects, demonstrating this sound was difficult to perceive for the participants. The intermediate group obtained a mean of 30, while the advanced group obtained a mean of 56.1. The four advanced participants who had spent one semester in Venezuela and five months in Chile obtained an intelligibility mean of 59.5. This score was higher than the average score of 56.1 obtained by the advanced group and statistically significant better than that of the participants who had not been to any Spanish-speaking country or had been there less than six weeks. The word *bastante* [ba\h.'tan.te] ‘a lot’ caused perception issues to the participants who transcribed it as the nonexistent words *tante* or *tanto*.

In another study, George (2014a) investigated the s-aspirated phone, testing the perception of the s-aspirated dialect with a minimal pair task. The participants were beginners, intermediate, advanced university students and two native speakers from s-weakening regions. None of the native English participants had lived in an s-aspirating region. In the first task, the participants had to circle the word they thought they heard (e.g., *costa* ['koh.ta] or ['ko.ta] *cota* ‘coast’). The words could or would not have the s-aspirated allophone and were mostly composed of content words. All the target words were stressed in word medial. After that, in the second task, the participants were instructed to write the word or words they heard (another list). The answer counted as correct if the participants perceived the s-aspirated phone as -s. The results showed that Spanish L2 learners could perceive the s-aspirated phone to varying degrees although the difference was statistically insignificant. In the first task, the advanced and intermediate participants obtained a mean of 38% and beginner participants of 31%. In the second task, the perception means increased. Finally, native speakers outperformed all the L2 groups by 50% and 44% in the first and the second task respectively, showing the perception of
s-aspirated phone is challenging for native speakers as well. The study does not report data on the influence of variables such as time spent abroad, or number of additional Spanish courses taken.

Rasmussen and Zampini (2010) studied the perception of the Andalusian dialect by advanced Spanish L2 learners whose first language was English and had not participated in any study abroad programs. The participants were native English speakers in intermediate and advanced Spanish courses. They were randomly assigned to an experimental and a control group. Only the experimental group received phonetics training on the perception of the Andalusian dialect. The material of the study to be measured by intelligibility and comprehensibility consisted of dialect features such as s-aspiration (e.g., \textit{estás [eh.'ta]}h ‘you are’), synalepha\footnote{The standard pronunciation of the phrase \textit{la amiga} is [la.\textipa{a}.\textipa{mi.\textipa{ya}] ‘the friend’ has two phones [a] in the word boundary. In synalepha, one of the two phones [a] is dropped, and the word boundary is pronounced with only one phone [h] as [la.'mi.\textipa{ya}].} (e.g., \textit{la amiga [la.'mi.\textipa{ya}] ‘the friend’}), the interdental sound /θ/ (e.g., \textit{cena / dinner, cita / date, zapato / shoe}), and the deletion of /d/ (e.g., \textit{tomado [to.'mao] ‘taken’}). Based on Smith and Rafiqzad (1979), the intelligibility task required students to fill in the blanks with the content dictated by Spanish speakers, while the comprehensibility task, based on Munro and Derwing (1995), required participants to rate the difficulty of the segments. The participants’ responses were graded as correct if the words had the target phonetic feature. The training included explaining articulatory phonetics, listening to single words and sentences containing specific features, and a review session. The results showed improvement of the perception the s-aspirated phone in the post-test in both the control and experimental groups. The control group got 25\% of correct responses in the post-test, while the experimental group obtained 41\%, both scores were statistically significant compared to the pre-test scores. The control group did better at
transcribing function words (definite articles) (e.g., las entradas [la. hen.'tra. ðas] ‘the tickets,’ los niños [lo.h.'ni.ño.ś] ‘the children,’ las vacaciones [la.h. βa.ka.'əjo.nes] ‘the vacations,’ las monedas [la.h.mo.'ne.ðas] ‘the coins,’ los dulces [lo.h.'ðul.še.ś] ‘the candies’)\(^{10}\) than content words. Nevertheless, the results do support the efficacy of perception training.

Agostinelli-Fucile (2017) investigated the effectiveness of training on the perception of aspirated /s/. The population comprised beginner L2 students of Spanish whose first language was English and with no time spent in s-weakening regions. The study comprised a pretest, training, immediate post-test and delayed post-test. The participants had the same near- minimal pair task with a different order in each test (gasto ['ga. h.to] ‘expense’ - gato ['ga.to] ‘cat’) for learners to mark same or different on a sheet. Several items followed the -st cluster. The study sought to control context and word-final -s. Thus, only near minimal pairs with word-medial /s/ were used. The study had two experimental groups: the classroom group and the laboratory group. The classroom group had self-guided listening activities, but the training given to the laboratory group consisted of a listen-and-repeat activity without contrastive sounds practice. The results showed no improvement in the perception of aspirated /s/ in either experimental group. The classroom experimental group got a score of 25.56 in the pre-test and 18.89 in the post-test, while the laboratory group obtained a score of 32.00 in the pre-test and 23.33 in the post-test. The author suggests that more input during the training is necessary.

Schmidt (2011) explains the s-aspirated phone within the framework of the second language perception models. The participants in her study were classified as beginner (levels one and two), intermediate (level three), and advanced groups (levels four and five). Levels one had taken Beginner Spanish II, level two had taken Intermediate Spanish II, level three had taken

\(^{10}\) It is unknown if these sentences had more than one aspirated segment in them.
third-year introductory topics courses in Spanish culture and literature, level four had taken fourth-year advanced topics courses in Spanish literature and linguistics, and level five were enrolled in master’s degree and Ph.D programs in Spanish literature, and these students were also university instructors. The two advanced groups had taken 7.2 and 14.4 Spanish courses. As for time spent in Spanish-speaking regions, the two advanced groups reported between 4.5 and 15.5 months on average respectively. With respect to social contact with s-weakening speakers, the participants reported limited interaction across the board. Of 25 students in Level 4, six reported having monthly contact with s-weakening speakers, and of 20 students in Level 5, 13 reported the same kind of contacts. As for metalinguistic knowledge, 22 and 20 participants in the two advanced groups (levels four and five) had at least taken one metalinguistic course. Data were collected through an identification task that consisted of associating a target stimulus (pseudowords) with [s], [f], [l], [ɾ], [n] or no coda. After hearing the stimulus pseudoword ['bah.pe], participants had to categorize the stimulus as base ['bas.pe], bafpe ['baf.pe], banpe ['ban.pe], barpe ['bar.pe], balpe ['bal.pe], bape ['ba.pe] or nothing. The results revealed that the beginner participants ignored the final consonant sound in the word medial environment of the stimulus. The intermediate participants heard the [s] in the coda, and the advanced perceived a variant of the /s/ as [h]. The accuracy rate of the aspirated /s/ varies across the groups. The beginner group obtained 6.4%, the intermediate group obtained 5.5%, third-year introductory topics courses in Spanish culture and literature 25%, fourth-year advanced topics courses in Spanish literature and linguistics 48%, and master’s and doctoral students of Spanish literature 57.9%. There were statistically significant differences between each group. Contact with speakers who spoke the aspirated /s/ dialect, dialect contact variables of past study abroad location, and metalinguistic training (7.2 to 14.4 Spanish courses) favored the perception of
aspirated /s/. This study shows that the perception of s-aspiration is not only a matter of identifying a single phoneme but also advancing through second language acquisition stages, including contact with speakers of the target dialect.

Escalante (2018) studied the perception of aspirated /s/ within the context of immersion in the coast of Ecuador. The participants for this research were 14 English-speaking participants. The stimuli were pseudowords that followed the same pattern as actual s-words. As for the procedure, the participants pronounced the stimulus baspe as ['ba\text{uh}.pe] for the participants to choose baspe ['bas.pe], bape ['ba.pe], paspe ['pas.pe], pape ['pa.pe], or unsure. The pseudowords, which were stressed on the penultimate syllable, had two and three syllables that followed the CV or CVC pattern of Spanish. The participants took the perceptual task once before the program and then other five times periodically throughout their year abroad. It addressed various environments within and between words: stressed word medial before consonants, unstressed word final before vowels, unstressed word final before consonants, and unstressed word final before pauses. Voiceless stops followed the /s/ in word internal and word final environments before consonants (File-Muriel, 2007). The aspirated coda /s/ appeared in the first word in all environments except for the unstressed word final before pauses in which it appears in the second word. The results show that the learners’ ability to associate different variants to /s/ varies according to the phonological context, learner exposure to the variable, individual learner differences, and language proficiency. Regarding the phonological context, the participants perceived the aspirated /s/ before consonants in stressed word medial (70.7%) and unstressed word final before consonant (49.1%), but not in unstressed word final before pauses (27.7%) or unstressed word final before vowels (15.5%). Regarding exposure, participants obtained the highest scores in perception during the first eight to ten weeks but did not show progress after
that period. Higher language proficiency and prior interaction with the dialect speakers during living abroad or study abroad yielded higher perception rates. The intermediate-high learners obtained 56.1%, the intermediate-low 35.1%, and the novice 25.8%.

Escalante argues that salience (stress), the effect of the realization of voiceless stop, and compensatory lengthening shaped perception in the stressed word medial. Regarding stress, the prominence of stressed environments makes them salient for listeners to perceive the target allophone (Ortega-Llebaria & Prieto, 2007). Furthermore, the closure stage of the realization of voiceless stops after the aspirated /s/ produces a blockage effect on the glottal turbulence of the aspirated /s/ that signals that the space after the nucleus of one syllable and the onset of the following one is filled, making the aspiration more salient for perception. Finally, compensatory lengthening also accounts for high perception accuracy. Weakened consonants in the coda lengthen the preceding vowel, making the environment more salient (Figueroa, 2000; Hammond, 1978; Hayes, 1989).

To summarize this section, Spanish L2 research into the perception of the aspirated coda /s/ has focused on: (1) How the s-aspirated phone is perceived, as a deleted or a sibilant phone in tasks such as minimal pairs or sentence transcription; (2) With what phone learners associate the aspirated phone ( [s], [f], [l], [ɾ], [n] or nothing); (3) Whether or not training is effective for the perception of the s-aspirated phone; (4) Whether or not immersion and study abroad programs facilitate the perception of this dialect. The results show that advanced language proficiency and a minimum time of two months spent in s-weakening regions together are mainly responsible variables to successfully perceive the aspirated allophone (Escalante, 2018; Schmidt, 2018). George’s (2014a) participants were advanced in the fifth semester of a Spanish course but with no time spent abroad and these students failed at the task, demonstrating that advanced language
proficiency alone is not enough. Nevertheless, it is uncertain why four advanced participants in Trimble (2014) who were in Central America for eight months did not achieve statistically significant results. On the other hand, metalinguistic knowledge alone was a statistically significant predictor of perception accuracy scores in Schmidt (2011) whose successful participants had at least taken one metalinguistic course. Finally, Escalante (2018) is the only study that investigated several environments for perception of the target allophone. Participants succeeded in the stressed word medial environment, but failed in environments before vowels and pauses. Escalante attributes the success to language proficiency, phonological factors.

2.5 Acquisition of Dialectal Forms

This section consists of the role of input in acquiring the aspirated coda /s/ and the specific frameworks and studies for acquiring dialectal allophones.

2.5.1 Input

The perception of the aspirated /s/ can be within second language acquisition, which intrinsically relates to exposure and L2 input processing. Emphatically, research findings suggest that exposure to input is necessary for second language acquisition (Doughty & Long, 2003; Ellis, 1994; Ellis, 1997; Gass & Selinker, 1994; Gass, 1997; VanPatten et al., 2020). L2 input has a role in acquiring the aspirated coda /s/, activating the internal mechanism for second language acquisition (Ellis, 2008) and fostering the development of competences and mental representations (Patten & Benati, 2010). Input is “what is available” to be used by the learner, but intake is the part of the input that the learner comprehends (Corder, 1967). Perceptually salient input becomes intake for forms to incorporate into the interlanguage system. Thus, the acquisition of the aspirated coda /s/ requires exposure that consists of stimuli, interaction, and feedback (Ellis, 2008;). The input in the stimuli should be frequent (Nassaji & Fotos, 2010),
comprehensible (Krashen, 1981), and strengthened (Gass, 1997) for acquisition to occur. This said, Spanish L2 learners with limited or no exposure to the aspirated coda /s/ are in a disadvantageous circumstance compared to those with extensive exposure to and interaction with s-weakening conversation.

2.5.2 Acquisition Frameworks

Much research into acquiring dialectal forms has been conducted within the vertical and horizontal continuum (Young, 1988) and the Type I variation frameworks (Adamson & Regan, 1991). They underscore the importance of developing L2 proficiency and then, distinguish between two nativelike forms. L2 learners need to develop Spanish L2 proficiency to deal with the aspirated allophone. Hence, beginners are expected to do poorly at tasks on dialectal forms. Another derived model is the one-to-one form principle. It puts forth that learners first reinforce the one-to-one form meaning, and later move on to a one-to-two or more form meaning associations (Andersen, 1984, 1990; Bardovi-Harlig, 2017). L2 Spanish learners master the sibilant fricative phonemes in Spanish and later the aspirated /s/.

Another crucial factor is attention. Schmidt (1990, 2001) proffers that noticing the forms in the language input is the first step for acquisition. Because beginner learners still lack the resources to perform basic linguistic competences, they cannot notice sociolinguistic variants like the aspirated /s/. Additionally, frequent items are more likely to be noticed and occur in production than infrequent items, so university language learners without enough exposure are likely to face challenges in perception tasks on dialectal allophones. Finally, Howard et al., (2013) reviews variationist studies and put forth a hierarchy of experiences about second language acquisition of informal variants. The order goes from the most to the less conducive environment: 1) naturalistic context, 2) study abroad, 3) immersion, and 4) classroom instruction.
Due to limited exposure to input, the effect of classroom instruction is low for acquiring dialectal forms.

2.5.3 Factors

Next are studies on the acquisition of dialectal allophones in a second language whose significance lies in the fact that factors other than language proficiency affect immersion’s success. L2 participants can improve their performance in a second language form in a short period. Schmidt (2009) showed that three weeks of immersion improved the dialect listening comprehension of Dominican speech by Spanish L2 participants. This dialect includes phenomena like /s/ aspiration: hasta [’ah.tə] ‘until,’ lambdacement: mujer [mu.'hel] ‘woman,’ intervocalic /d/ deletion: helado [e.'la.o] ‘ice cream.’ Henriksen et al. (2010) showed that L2 learners could acquire Spanish intonation patterns in a seven-week study abroad program in León, Spain. Some participants improved their Spanish intonation of absolute questions, declarative sentences (e.g., Mimaba a la nena ‘She was spoiling the girl’), and pronominal questions (e.g., ¿Quién mimaba a la nena? ‘Who was spoiling the girl?’). In contrast, others changed their final tone intonational pattern.

Nevertheless, learners’ attitude affects the acquisition of dialectal forms even in immersion programs. In Drummond (2012), the Polish migrants with a basic language proficiency living in Manchester, England, opted for the standard pedagogical vowel (Standard Southern British English) instead of the local STRUT vowel /ʌ/ because of their negative feelings towards the city and its inhabitants. Likewise, Fox and McGory (2007) showed that learners’ negative attitudes toward the Southern dialects, limited interaction with local individuals, and the use of a standard variety of English spoken in the classroom caused the Japanese learners of English to fail at perceiving Southern English vowels. They had lived in
Alabama for at least two years and had spent between 21.5 and 30 years on average acquiring English. Contrarily, in George (2014b), only those English-speaking learners of Spanish with better skills and positive attitudes toward the local dialect reported a substantial production of the Castilian Spanish voiceless interdental fricative /θ/ and voiceless uvular fricative [χ] during a 13-week semester of study abroad.

In addition, interaction with native speakers and classroom reinforcement favorably contribute to acquiring dialectal forms. Knouse (2012) showed that the study abroad group produced more instances of the target phoneme /θ/ than the at-home group owing to extra-linguistic factors such as more contact with Spanish native speakers and frequent use of corrective feedback in class. The length of Spanish study was 5.6 years for the study abroad and 6.5 years for the at-home group. Ringer-Hilfinger (2012) employed intermediate Spanish L2 learners without time in a Spanish-speaking country in a semester study in Madrid that tested the distinction between [θ] and [s]. Those with frequent contact with native speakers and instructors of a non-distinction variety reported lower use of the allophone [θ]. In Wolfram et al. (2004), the Hispanic speakers living in the urban and rural areas of North Carolina did not converge with the local norm of the Southern dialect, particularly with the diphthong [ai], because of factors such as limited interaction with speakers of the local dialect, preference for interaction with other Hispanic speakers, and the regular use of the standard language in the English classroom.

Finally, previous knowledge relevant to a dialectal form influences performance on a perception task. Baker and Smith (2010) employed two groups of American students studying French in an immersion setting. The Quebec French group did better than the European French group at the perception task because they used the additional assibilation\textsuperscript{11} cue to help

\textsuperscript{11} Assibilation consists of the affrication of /t/ and /d/ to [ts] and [dz] only before the high front vowels /i/ and /y/ (Baker & Smith, 2010).
distinguish the vowel contrasts /i/, /y/, and /u/). This additional assimilation cue is a salient feature of the Quebec French variety, which the Quebec French group learned during their previous stay in France. In Raish (2015), L1 English-L2 Egyptian learners in a one-year study abroad program with previous exposure to Arabic input did better in the perception and production of Cairene/Egyptian ([g]).

2.6 Prosodic Stress

This section is concerned with elements of the prosodic stress in Spanish and research findings into the acquisition of Spanish L2 prominence. In Spanish, all words in isolation get stressed, but when embedded in a phrase or sentence, only certain categories do. Regardless of the number of syllables, words like definite articles and prepositions are unstressed and join the stressed ones like verbs and adjectives to create a prosodic phrase. For instance, the phrases la pata [la.'pa.ta] ‘the leg’ and los Andes [lo.'san.des] ‘the Andes’ have only one stressed syllable in pata and Andes (see Morgan, 2010 for more details).

The present study attempts to prove that the prosodic stress can facilitate perception of the aspirated coda /s/. The contribution of stress to perception of Spanish L2 allophones is an unexplored research area. Ortega-Llebaria and Prieto (2007), Escalante (2018), and Schmidt (2011) provide the only relevant empirical evidence supporting the role of the prosodic stress on perception of utterances in Spanish. Ortega-Llebaria and Prieto (2007) showed that stressed syllables are longer than unstressed ones even if they do not have a written accent. Hence, participants can perceive the aspirated stimuli in stressed syllables more than in unstressed ones owing to longer cues on glottal frication such as duration (Escalante, 2018; Ortega-Llebaria and Prieto, 2007). Additionally, in Escalante (2018), the participants got the highest scores in the unstressed word medial environment before consonants and the lowest in the unstressed
environment before vowels in pseudowords, proving that perception accuracy varies across environments. The present study advances this research by testing the perception of actual aspi rated utterances in stressed and unstressed environments.

The following are examples of stressed and unstressed words in aspirated sentences used as testing items in the present study with the aspirated phone in bold. Nouns (e.g., *bus*), auxiliary verbs (e.g., *hemos*), main verbs (e.g., *hablamos, cenar*), adjectives (e.g., *más*), adverbs (e.g., *hasta*), and the verb ‘to be’ (e.g., *es, está*) get stressed, whereas relative pronouns (e.g., *que*), prepositions (e.g., *a*), the clitic (e.g., *nos*), and definite articles do not get stressed. Hence, better perception accuracy is expected in items c, d, e, and h than in the rest of the items for being in a more salient syllable.

a. Hemos orado  ['e.mo.ho.'ra.ðo]  ‘We have prayed.’

b. Nos hablamos  [no.ha.'bla.mos]  ‘We can talk.’

c. El bus que está en el puerto  [el. βuh.ke.es.'ta.e.'nel.'pweɾ.to]  ‘The bus that is by in the port.’

d. Margarita es la más bonita  [maɾ.'ya.'ri.ta.'eh.la.'mas.βo.'ni.ta]  ‘Margarita is the prettiest.’

e. Es que eso es delicioso  [e.ch.ke.'e.so.ez.ðe.li.'sjo.so]  ‘It is that it is delicious.’

f. ¿Vas a cenar con nosotros!  [ 'ba.ha.se.'nar.kon.no.'so.tros]  ‘You are going to have dinner with us!’

g. a los amigos en el hotel  [a.'lo.ha.'mi.γo.se.ne.lo.'tel]  ‘to the friends at the hotel’

h. Hasta los zapatos rojos  [a.ta.lo.sa.'pa.to.s.ɾo.xos]  ‘even the red shoes’

Research into the perception of Spanish L2 prominence is limited, with only few studies addressing how learners distinguish the stressed syllable in an utterance. Both Spanish and English listeners use cues such as syllable duration and pitch to perceive the stressed syllable in declarative sentences. However, the stressed syllables in the two languages differed in pitch accents. While in both languages, the L*H and H* pitch accents are common in declarative sentences, the L*H pitch accent is realized with a low pitch in Spanish more often than in English because of the post-tonic F0 peaks, making it a less common type. Hence, English speakers are expected to have
perception issues when perceiving the Spanish stressed syllable in declarative sentences (Arvaniti & Garding, 2007; Dainora, 2002; Ortega-Llebaria & Fan, 2013). Also, unlike Spanish speakers, English speakers draw on reduced vowels to distinguish stressed syllables. Delattre (1966) found that the duration ratio between stressed and unstressed syllables is considerably greater in English than in Spanish: 1:6 in English and 1:3 in Spanish. Hence, having a reduced ratio between syllables in Spanish may cause perception issues in English listeners (Cutler, 1986; Cutler et al., 1997). Although these studies did not use aspirated stimuli, the short ratios between short and long syllables in Spanish compared to those in English may pose a higher degree of difficulty of the aspirated coda /s/ even in salient environments. The more experienced learners who may be more sensitive to the most prominent syllable in an utterance do better in perceiving the aspirated coda /s/ in stressed environments.

2.7 The Present Study

The present study addresses several gaps in the research into the aspirated coda /s/ regarding language proficiency, metalinguistic knowledge, environments and stress, the hierarchy of difficulty, task type, and social variables. Advanced language proficiency is operationalized in several ways and alone is insufficient to account for statistically significant perception. It is uncertain why the four participants in Trimble (2014), with eight months spent in s-weakening regions, could not succeed at the task. The present study examines the role of language proficiency on perception by participants with a limited number of Spanish courses taken and limited time spent in Spanish-speaking regions.

Regarding metalinguistic knowledge, only Schmidt (2011) reported a statistically significant contribution to perception. Nevertheless, the participants had between 4.5 and 15.5 months on average spent in s-weakening regions, took between 7.2 and 14.4 Spanish courses, and
had s-weakening contact outside of the classroom. It is necessary to observe the behavior of this variable among participants with less time abroad and fewer Spanish courses taken.

In terms of environments, stress, and hierarchies, Escalante (2018) is the only one investigating the perception of the aspirated coda /s/ in several environments. Nevertheless, it is necessary to investigate other environments, such as the unstressed word medial and resyllabified ones. Research evidence suggests that perception accuracy varies across environments (Escalante, 2018; Ortega-Llebaria & Prieto, 2007), possibly with the prosodic stress and other phonological phenomena affecting the ease or difficulty of perception (Del Saz & Cabello Nebot, 2015; Escalante, 2018; Figueroa, 2000; Gerfen, 2002; Hammond, 1978; Hayes, 1989; Ortega-Llebaria & Prieto, 2007; Torreira, 2006, 2007). At the same time, the study seeks to rank the environments from the least challenging or most conducive to the most challenging or least conducive to perception.

With respect to task type, the present study employs an innovative one. Rasmussen and Zampini (2010) implemented an intelligibility task that had the participants transcribe aspirated sentences. The method reflects comprehension of aspirated content but may be cognitively demanding for some participants since they must pay attention to aural utterances and write them down. Apart from this task, research has yet to implement others to test actual aspirated utterances that avoid the facilitative effect of lexical knowledge that compensate for perception issues. For instance, a listener can transcribe the aspirated sentence *Me gusta la pizza* [me.'ɣuh.ta.la.'pi.sa] ‘I like pizza’ accurately, even if the s-aspirated phone is not perceived. Identifying the rest of the words in the statement (Me ____ la pizza) and the rest of the phones in gusta ['ɣu.ta] is enough to complete the task. Then, it is necessary to use utterances that allow semantic ambiguity when the s-aspirated phone is not perceived. For instance, failure to perceive the s in the word pasto in the aspirated sentence *El pasto está bonito* [el.'pah.to.es.'ta.βo.'ni.to] ‘The grass is beautiful’ leads to
El pato está bonito [el.'pa.to.ɛs.'ta.βo.'ni.to] ‘The duck is beautiful.’ Here, contextual clues are not helpful because both versions make sense. Thus, this task reflects the listeners’ perception of the s-aspirated phone in a real-life situation, which has not been deeply investigated. Also, this study wants to call attention to the type of aspirated stimuli in the perception tasks. Previous research stimuli vary in format and length of utterances, which may affect the perception accuracy rates. The present study uses short phrases and sentences with only one aspirated phone to ensure listeners comprehend and spend their linguistic resources on perceiving the aspirated allophone.

Finally, in social variables, Schmidt (2011) found that the time spent in s-weakening regions and s-weakening contact variables separately predict perception task scores. Nevertheless, this study examines other social variables since populations vary in social interaction.

The research questions of the present proposal are:

1. Research question number 1: Does the population (the beginner, advanced, and linguistics groups) perceive the aspirated coda /s/ that distinguishes between phrasal and sentence pairs that sound alike?

2. Research question number 2: Does each Spanish L2 group perceive the aspirated coda /s/ that distinguishes between phrasal and sentence pairs that sound alike?

3. Research question number 3: Does metalinguistic knowledge facilitate the perception of the aspirated coda /s/ and, consequently, the intelligibility of s-aspirated phrases and sentences?

4. Research question number 4: Is the perception of the aspirated coda /s/ equally challenging in the various environments where it occurs?

5. Research question number 5: Do the Spanish L2 participants understand that the aspirated coda /s/ is a dialect trait, not a deficit?

6. Research question number 6: Do the beginner, advanced, and linguistics groups differ from one another in their comprehensibility ratings?
7. Research question number 7: Is perception of the aspirated coda /s/ equally challenging in the within word set and the between word set?

8. Research question number 8: What is the hierarchy of environments’ difficulty for the perception of the aspirated coda /s/?

9. Research question number 9: How do biographical variables contribute to the perception of the aspirated coda /s/?

2.7.1 Hypotheses

Here, the hypothesis deriving from the research questions are defined. Previous findings serve to predict a possible outcome. The section starts with the hypothesis for research question number 1, followed by research questions numbers 2 and 3. Next, the hypothesis for research questions number 4, 7, and 8 is provided. These questions were grouped because their hypotheses are interrelated. Following are research questions number 5, 6, and 9, which are addressed individually.

Research question number 1: Does the population (the beginner, advanced, and linguistics groups) perceive the aspirated coda /s/ that distinguishes between phrasal and sentence pairs that sound alike?

Previous studies did not report an overall perception rate. Instead, they provided perception rates for each group of participants, which were classified according to language proficiency. The results indicate that participants with advanced language proficiency, time spent in s-weakening regions, and contact with dialect speakers can perceive the aspirated phone (Escalante, 2018; Schmidt, 2018; Trimble, 2011). Thus, the advanced and linguistics groups are expected to obtain statistically significant scores in the perception task, and the beginner group is expected to perform poorly (Agostinelli-Fucile, 2017; Escalante, 2018; George, 2014a; Schmidt, 2018; Trimble, 2011). Hence, I hypothesize that the beginner group’s score will lower the
population’s overall perception rate. However, research has yet to show whether participants with limited or no time spent in s-weakening regions are sufficient to perceive the aspirated coda s using new perception tasks such the ambiguous pair of phrases and sentences type in this dissertation. Hence, if advanced participants with limited or no time spent in s-weakening regions fail at the task, the perception rates will be even lower and may not reach a statistically significant perception.

Research question number 2: Does each Spanish L2 group perceive the aspirated coda /s/ that distinguishes between phrasal and sentence pairs that sound alike?

I hypothesize that the beginner group cannot perceive the aspirated coda /s/. Because beginner learners still need to invest much effort to process linguistic forms, they ignore the less frequent dialectal allophones, making perception a tough task (Schmidt, 1990, 2001). Contrarily, the advanced and linguistics participants will likely perceive the coda s-aspiration phone more than beginner learners as observed in Schmidt (2011). The vertical and horizontal continuum (Young, 1988) and the Type I variation frameworks (Adamson & Regan, 1991) suggest that advanced proficiency is a prerequisite to mastering dialectal allophones because language users can have more linguistic resources available than inexperienced learners.

Research question number 3: Does metalinguistic knowledge facilitate the perception of the aspirated coda /s/ and, consequently, the intelligibility of s-aspirated phrases and sentences?

The linguistics group is expected to obtain better perception accuracy than the other Spanish L2 groups. Because they took the “Introduction to Hispanic Linguistics” (intermediate course), they should be familiarized with some articulatory features of the aspirated allophone. In Schmidt (2011), the successful participants had taken at least one metalinguistic course, and the metalinguistic variable alone was a perception accuracy predictor. Nevertheless, the participants had time spent in s-weakening regions (between 4.5 and 15.5. months) and had taken Spanish
courses (between 7.2 and 14.4) that could have helped the effect of metalinguistic knowledge on perception. Hence, it is necessary to examine the role of metalinguistics among participants with less time abroad and fewer Spanish courses taken. These next questions were grouped because they are interrelated. Each environment’s perception accuracy accounts for perception in the word set.

Research question number 4: Is the perception of the aspirated coda /s/ equally challenging in the various environments where it occurs?

Research question number 7: Is perception of the aspirated coda /s/ equally challenging in the within word set and the between word set?

Research question number 8: What is the hierarchy of environments’ difficulty for the perception of the aspirated coda /s/?

The within word set comprises the unstressed word medial, the stressed word medial, and the stressed word final, while the between word set comprises the stressed resyllabified and the unstressed resyllabified environments. Each environment’s perception accuracy accounts for the perception accuracy of the word set. This hypothesis predicts that participants will do well in the environments of the within word set but not in the between word set. Salience, the realization of the voiceless stop /t/, vowel lengthening, L1 input frequency, and the L1 parsing strategy buttress this claim. Stressed syllables are more salient (Ortega-Llebaria & Prieto, 2007) and will shape perception in the stressed word medial environment in the advanced and linguistics groups (e.g., un cisne [un."sih.ne] ‘a swan’). Evidence comes from Schmidt (2011), Escalante (2018) whose participants did well in the stressed word medial environment before consonants (e.g., baspe ['bas.pe]). Another factor expected to aid perception in this environment is the effect of the realization of voiceless stops in the -st cluster, which consists of producing a blockage that stops
the aspiration and makes the environment more salient (Escalante, 2018). Of the four target words in the stressed word medial environment, three contain the -st cluster (see Appendix c).

With respect to the unstressed word medial environment, research shows that it can become salient for perception despite being unstressed. Hammond (1978) showed that vowel lengthening helped the participants perceive the aspirated coda /s/ in *pastilla* [pah.'ti.jas] ‘pill’ and *pescado* [peh.'ka.ðo] ‘fish.’ The effect of the weakened /s/ lengthens the preceding vowel. Similarly, in Figueroa (2000), the exact two words (e.g., *pastilla* and *pescado*) got a high perception score aided by vowel lengthening in the same position after the vowels [a] and [e]. Hence, the same phenomenon could occur in the present study whose aspirated phrases and sentences contain four target words with the -st cluster in three of the target words and the cluster -sc in one of them, including *pastilla* and *pescado* (items 24 and 35). Furthermore, the effect of the realization of voiceless stops may also occur in this environment due to the presence of those clusters.

Regarding the stressed word final, there is no relevant previous evidence, but still participants could achieve satisfactory perception accuracy given that it is salient. In Escalante (2018), the unstressed word final environment before consonants (49.1%) got the second highest score despite being non-salient. In the present study, salience can make it even more favorable.

Another explanation deals with L1 input frequency, which could aid the perception accuracy of participants with time spent in Spanish-speaking regions. L2 listeners who spent time in s-weakening regions got input on aspirated coda /s/ in word medial (stressed and unstressed) environments, where it is more frequent. Hence, they can perceive it easily in this environment (Alba, 2000; Fontanella de Weinberg, 1967; Poplack, 1980; Terrell, 1978b). Evidence comes from Chappell (2016) with the L1 Miskitu-L2 Spanish who did well at
perceiving the aspirated coda /s/ between word where it is more frequent in Nicaraguan Spanish (e.g., paz eterna [pa.he.'ter.na] ‘eternal peace’).

Finally, in resyllabified environments, the odds of statistically significant perception seem low. Scarpace (2017) provided evidence of Spanish L2 learners extracting the correct word in these environments, but the stimuli were not aspirated, and more empirical evidence is necessary in this area. In resyllabified environments, listeners must deal with the difficulty in parsing spoken language in environments where the coda of one syllable becomes the onset of the next one (e.g., es otro [e.'so.tro] ‘it is another’) (Barrutia & Terrell, 1994; Morgan, 2010), and native English listeners rely on onsets to identify the right word in the spoken input (Dumay et al., 2001; Norris et al., 1997). For instance, listeners interpret the resyllabified segment [ˈha.la.s] in las alas ‘the wings’ as jalas [ˈxa.la.s] ‘you pull,’ causing a perceptual distraction that leaves the listener undecided about what item to choose on the task sheet: alas [ˈa.la.s] ‘wings’ or jalas [ˈxa.la.s] ‘you pull.’ The only relevant evidence comes from Escalante (2018) whose participants performed poorly in the unstressed word final before vowels (15.5%). The second challenge is concerned with the absence of salience in the unstressed resyllabified environment. Hence, the unstressed resyllabified environment is expected to be even more challenging than the stressed resyllabified.

All in all, I anticipate that the within word set will be more favorable than the between word set. Hence, the difficulty for the perception of the aspirated coda /s/ is hypothesized to be as follows (1 = the least difficult or facilitative and 5 = the most difficult):

1). Stressed word medial (e.g., un cisne... [un.'sih.ne...] ‘a swan…’)
2). Unstressed word-medial position (e.g., Sus pastillas... [sus.pah.'ti.jas] ‘His pills…’)
3). Stressed word final (e.g., El bus que... [el.ˈbuh.ke.es.ke] ‘The bus that…’)
4). Stressed resyllabified (e.g., Nos hablamos... [no.ˈha.ˈbla.mos] ‘We will talk…’)

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5). Untressed resyllabified (e.g., las aulas... [la.'haw.laz] ‘the students´ classrooms…’)

The first two places in the hierarchy correspond to the stressed word medial environments, which may have an advantage over the unstressed word medial environment in the third place given their stressed state, although the three environments are expected to favor perception accuracy. The fourth and fifth places correspond to the resyllabified environments, which are expected to be challenging for the L2 listeners.

Research question number 5: Do the Spanish L2 participants understand that the aspirated coda /s/ is a dialect trait, not a deficit?

This is an instance of a non-directional hypothesis since no previous study has investigated whether participants perceive coda s-aspiration as a deficit, and whether those poor views affect perception. The most relevant research evidence about the matter comes from Spanish native speakers´ evaluations. L1 listeners who ascribe negative characteristics to speakers of the aspirated coda /s/ considers it bad Spanish. However, out-group listeners evaluate the aspirated allophone as good Spanish when hearing speakers of aspirating dialects (e.g., Puerto Rican), showing that regional differences and ideology influence dialectal evaluations. For instance, Mexican listeners expect Puerto Rican speakers to produce the aspirated coda /s/, because they view it as a representative feature of their culture, so their ratings for it are positive (Chappell, 2019; Walker et al. 2019). Although this research question deals with the aspirated coda /s/ being a trait or a deficit, speakers´ past experiences can influence their attitude toward the aspirated coda /s/. If those experiences yielded a positive cultural impression toward speakers of aspirating dialects, the Spanish L2 participants will rate the aspirated coda /s/ as a trait and not a deficit. Yet some participants might not even be able to note the aspirated coda /s/, so they will not get relevant input for ratings. Hence, it is uncertain whether they will rate it as a trait or a deficit.
Research question number 6: Do the beginner, advanced, and linguistics groups differ from one another in their comprehensibility ratings?

Comprehensibility ratings vary according to the number of dialects to rate in the task and the task type. In Trimble (2014), the intermediate and advanced groups rated the Caribbean dialect\(^\text{12}\) as difficult despite doing relatively well in the intelligibility task, while in Rasmussen and Zampini (2010) both groups provided high comprehensibility ratings. In both studies, the task was cognitively demanding since learners had to listen and transcribe the aspired stimuli for several dialects. Nevertheless, unlike Rasmussen and Zampini (2010), in Trimble (2014) the participants had to rate several dialects that could have added an additional cognitive demand. In the present study, because of their advanced language proficiency, the advanced and linguistics groups are expected to provide higher comprehensibility ratings than the beginner group.

Research question number 9: How do biographical variables contribute to the perception of the aspirated coda /s/?

Research shows that biographical variables have a role in the perception accuracy of the aspirated coda /s/. In Schmidt (2011) prior study abroad experience in s-weakening regions and social contact with s-weakening speakers contributed to perception accuracy. In the present study, the biographical information section requires participants to provide information on the Spanish-speaking regions where they have been. However, s-weakening regions may or may not be part of their answers, so this study may differ from Schmidt (2011) in that regard.

Furthermore, in Escalante (2018), exposure and previous contact with Spanish native speakers contributed to statistically significant perception. Exposure refers to the time participants spent in the immersion and was analyzed individually, and previous contact with Spanish native speakers

\(^{12}\) Trimble (2014) uses the category Caribbean dialect whose main features include the aspirated coda /s/
is part of the individual factors variable. Because in Escalante (2019) the study was conducted in an immersion program, and exposure was recorded after the first two months, it may not be comparable to the present study. Still, I hypothesize that time spent in Spanish-speaking regions, if relevant, and place for interaction will contribute to statistically significant perception in this study.
CHAPTER III

METHODOLOGY

This chapter presents information about the participants, data collection instruments, and analysis, listing the dependent and independent variables involved in the study as well as the statistical methods.

3.1 Participants

This study involves a population of L1 English-L2 Spanish learners majoring in undergraduate programs; such as psychology, accounting, nursing, math, arts, and marketing at a Southern university in the United States. The population consists of three groups of 20 students each: the beginner group, the advanced group, and the linguistics group. Also, the study includes a group of eight native Spanish speakers from Venezuela, Mexico, and Honduras to compare the difficulty of the items in the perception task. The learners were grouped according to their language proficiency and metalinguistic knowledge. The beginner group participants were enrolled in an elementary course (“Intensive Elementary Spanish”), the advanced group was in conversational courses (“Conversation and Composition”), and the linguistics group was taking culture and linguistics courses (“Spanish in the United States” and “Introduction to Spanish Linguistics”). Both the advanced and the linguistics groups had advanced skills. Nevertheless, they differed from each other in the courses that they were taking and their metalinguistic knowledge, defined as having taken the “Introduction to Spanish Linguistics.” Hence, only the linguistics group had a verifiable amount of metalinguistic knowledge.
3.2 Instruments

This dissertation measures intelligibility and comprehensibility using the framework that Munro and Derwing (1995) proposed. Intelligibility tests the comprehension of an item and comprehensibility deals with participants’ perception of how difficult that item is (Derwing & Munro, 1997). The instrument used to collect the data for the present study consisted of a survey with four sections: a biographical information section, a perception task, a comprehensibility section, and an appreciation section. The biographical information section asked about the participants’ age, birth date, parents’ native and second languages, language background, number of years learning Spanish, number of Spanish courses taken, places for Spanish interaction outside of the class, context for L2 interaction, and time spent in Spanish-speaking regions (see Appendix A). The main task tested the participants’ perception of the aspirated /s/ with pairs of actual phrases and sentences that sound alike. It consisted of 42 items of which 20 are the target ones (the aspirated) and 22 are distractors. Each item consisted of two options written on the task sheet in which the participants had to choose the one they thought they heard. The 20 target items were phrases and sentences with an aspirated phone that occurs in stressed word medial (items 1, 12, 22, and 33), unstressed word medial (items 3, 14, 24, and 35), stressed word final (items 5, 16, 26, and 39), stressed resyllabified (items 10, 20, 31, and 41), and unstressed resyllabified environments (items 8, 18, 29, and 37), but the distractors were phrases and sentences about other phenomena such as tonic paronyms (items 2, 7, 11, 15, 19, and 23), singular and plural verb distinction (items 4, 6, 9, 27, 28, 30, 34, 38, 40, and 42), lateralization of /r/ (items 13, 21, and 36), and consonant deletion (items 17, 25 and 32) (see Appendix D).

After listening to each stimulus, the participants had to choose either option a or b on the task sheet (the perception task). Then, they had to rate the difficulty of that stimulus in the
comprehensibility section, which was constituted by six ratings: “extremely difficult,” “very difficult,” “difficult,” “average,” “easy,” “very easy,” and “extremely easy.” Finally, in the appreciation section, the participants had to choose between three options to rate the same stimulus as “same dialect,” “different dialect” or “deficit.” This sequence was repeated for every item.

3.3 Stimuli

The stimuli are classified into target and distractor items. The target items consist of 20 aspirated utterances recorded on online-voice-recorder.com (Online Voice Recorder, n.d.) by a native Spanish speaker from Colombia. The stimuli are classified into five categories according to the environments of the aspirated phone in a sentence: stressed word medial (e.g., El pasto esta bonito [el.'pah.to.es.'ta.βo.'ni.to] ‘The grass is beautiful’), unstressed word-medial (e.g., El pescado causa problemas [el.peh.'ka.ðo.'kaw.sa.pro.'βle.mas] ‘The fish causes problems’), stressed word-final (e.g., Margarita es la más bonita [mar.γa.'ri.ta.'eh.la.'mas. βo.'ni.ta] ‘Margarita is the prettiest’), unstressed resyllabified (e.g., ¡Vas a cenar con nosotros! [ 'ba.ha.se.'nar.kon.no.'so.tros] ‘You are going to have dinner with us!’), and stressed resyllabified (e.g., las alas [la.'ha.las] ‘the wings’). Each target stimulus is formulated in such a way so that if the aspirated phone is not perceived, the listener gets the wrong meaning (see Appendix B). For instance, if the listener does not perceive aspiration in the word hasta in the phrase ...Hasta los zapatos rojos ['ah.ta.lo.sa.'pa.tos.'ro.xos] ‘even the red shoes’, it may be heard as ['a.ta], changing the meaning of the sentence for Ata los zapatos rojos ['a.ta.lo.sa.'pa.tos.'ro.xos] ‘Tie the red shoes’. The full criteria for choosing the testing stimuli are:
• Semantic ambiguity. The aspirated stimulus should allow a different interpretation if the s-aspirated phone is not perceived. The two interpretations are the written options a and b between which the participants must choose one.

• Word length. Each stimulus has between four to seven words easy to process so that the participants attend to meaning. The average sentence length is 4.4 words.

• Context. The aspirated stimulus and the two written options are syntactically and semantically accepted.

• Number of s-aspirated phones. One utterance has only one aspirated phone to pose a reasonable challenge for the listeners.

• Type of s-aspirated words. Most s-aspirated phones occur in content words in the within word environment before consonants where most cases of aspiration are produced in Spanish L1 (Alba, 2000, Escalante, 2018; Fontanella de Weinberg, 1967; Terrell, 1978b), and some others in function words in the between word environment (see Appendix B). Some content words are members of a minimal pair (e.g., hasta ['as.ta] ‘even’ vs. ata ['a.ta] ‘tie’), and another type involves a noun or a verb followed by the relative pronoun que (e.g., el bus que... [el.'βus.ke.] ‘the bus that’... vs. el buque [el.'βu.ke] ‘the ship’; Es queso delicioso ['es.ke.so.'ðe.li.'sjo.so] ‘It is delicious cheese’ vs Es que eso es delicioso ['eh.ke.'e.so.ez.'ðe.li.'sjo.so] ‘It is that it is delicious.’). Some are nouns that when aspirated sound like a periphrasis (e.g., Estado de emergencia [eh.'ta.ðo.ðe.e.mer.'xen.sja] ‘State of emergency’ vs He estado de emergencia [e.es.'ta.ðo.ðe.e.mer.'xen.sja] ‘I have been in a critical condition.’). An aspirated periphrasis with hemos orado in second person plural sounds like the periphrasis he mejorado in third person singular (e.g., Hemos orado
We have prayed' vs *He mejorado* ‘I have improved’). A clitic followed by verbal forms *Nos hablamos* sounds like a negation (e.g., *Nos hablamos* [nos.ha.blamos] ‘we can talk’ vs. *No hablamos* [no.a.blamos] ‘We don’t talk’) (see Appendix C for a complete list of target words within sentences).

### 3.4 Procedure

Data were collected in four sessions because of conflicting class schedules not allowing all participants to be in the same classroom simultaneously. The participants were told that the purpose of the experiment was to study Spanish L2 listening skills. Each of the four sessions lasted around 40 minutes and took place in the language classrooms. After signing the consent form, the participants completed the biographical section of the survey which took them eight minutes. The students got familiarized with the instructions and the task perception sheet. Then they listened to each stimulus twice and chose only one option between a and b. For instance, the participants heard: *El pasto está bonito* [el.pa.to.es.ta.bo.to]. Then on the answer sheet, they had to choose between a. *El pasto está bonito* or b. *El pato está bonito*. If the participants choose option a. *El pasto está bonito* (‘The grass is beautiful’), it means they perceived the aspirated /s/. Instead, if they chose option b. *El pato está bonito* (‘The duck is beautiful’), it means they did not perceive the aspirated /s/ and interpreted the wrong meaning. After that, the participants took time between items to rate the difficulty in the comprehensibility section and assess the stimulus as a dialect or deficit in the appreciation section.

### 3.5 Analysis

The present study investigates the perception of the aspirated coda /s/ in various environments by L1 English-L2 Spanish learners. Data analysis requires both descriptive and
inferential statistics. The dependent variable of the study was the perception task results (ptr), which was the score given to each item the participants responded to in the perception task. If the participant responded correctly, their response was coded as 1, and if not, was coded as 0. The following are the independent variables classified into two groups: numeric and categorical. The numeric variables are: item, participant, number of Spanish courses taken (scu), number of years learning Spanish (yls), and time spent in Spanish-speaking regions (tss). The item variable consists of the levels one to sixty that represent each item in the perception task; the participant variable includes the levels one to sixty that are the overall number of participants. The number of Spanish courses, the number of years learning Spanish, and time spent in Spanish-speaking regions are variables with opened-ended levels whose answers depend on the quantities the participants provide.

On the other hand, the categorical variables are: group (proficiency level), environment (phonological environments), category, degree of difficulty (dod), perception appreciation (pa), use of other languages (uol), number of Spanish-speaking relatives (ssr), heritage speaker status (hs), TV watching time (tvw), music listening time (mlt), newspaper reading time (nrt), place for interaction (pi), and time of interaction (ti). The category variable comprises two items: the within and the between word set. The former refers to the stressed word medial environment, the unstressed word medial, and the stressed word final, whereas the latter refers to the stressed resyllabified and the unstressed resyllabified environments. Grouping the environments into two sets is based on findings by Escalante (2018) and the difficulty participants might encounter in segmenting the right word in these environments. Escalante (2018) found that the stressed word medial environment got the highest perception accuracy followed by the unstressed word medial environment, which is stressed in the present study. Additionally, the between word environment
before vowels got the lowest scores. On the other hand, in resyllabified environments the coda of a syllable becomes the onset of the next one (Barrutia & Terrell, 1994) for listeners to extract the right word. For instance, listeners get the word jalas [ˈha.las] ‘you pull’ instead of alas [ˈa.las] ‘wings’ in the aspirated resyllabified phrase las alas [ˈla.ha.las] ‘the wings.’

Next, the environment variable is classified into the stressed word medial environment, the unstressed word medial, and the stressed word final, the stressed resyllabified, and the unstressed resyllabified environments. The data of the category and environment variables are the same but grouped into two distinct ways. Studying five environments across phrases and sentences will reveal a complete insight into the participants’ perception of the aspirated coda /s/, which previous studies have not addressed. Some environments such as the unstressed word final before consonants and pauses were not included here because of the difficulty in finding ambiguous pairs of aspirated phrases and sentences with frequent words. The difficulty variable is classified into six levels: “extremely difficult,” “very difficult,” “difficult,” “average,” “easy,” “very easy,” and “extremely easy.” Next, the appreciation variable consists of the levels “same dialect,” “different dialect,” and “deficit.” Previous studies did not tackle this matter, so this variable is an innovative step in the research into the aspirated coda /s/. In the case of the number of Spanish-speaking relatives and heritage speaker status variables, the options are “yes” or “no.” Finally, the use of other languages, the number of Spanish courses, and the interaction place are opened-ended variables whose levels depend on the participants’ answers. Here, the levels were expected to be frequency descriptors such as “often,” “always,” or “never.”

The following are the descriptive and inferential statistics analysis to answer the research questions. First, to answer research question number 1, the perception task scores of the population were obtained (the beginner, advanced, and linguistics groups). The test included the
sample size (N = 1200), hypothesized probability (P₀), and the sample proportion (p̂).

Furthermore, percentages of every perception task item were obtained to conduct a comparative analysis for the population and the native speakers of Spanish. This analysis tries to identify which items were the most challenging for both the population and the native Spanish speakers. Complementarily, the percentages of correct and incorrect responses classify the task items into two groups: one above and another under a 50% score to reinforce the analysis.

Next, I ran a logistic regression in R studio and calculated the perception task scores (percentages) to answer research questions number 2, 3, part of 4, and 9. Because the scores alone do not reveal statistically significant differences, I ran a logistic regression, which predicts an outcome (dependent variable) by comparing the independent variables (Cohen et al., 2003). After running several trial models, I removed the variables that did not reach statistical significance in the perception task results.

To answer research question number 2, I used the perception task scores and the results of the logistic regression. I ran the logistic regression model twice as it was necessary to compare all the levels in the group variable (the beginner, advanced, and linguistics groups) it does not allow all the necessary between-level comparisons in one run. The first run had the advanced group as the intercept and the second one had the linguistics group. Research question number 3 was operationalized as having metalinguistic knowledge from the “Introduction to Spanish Linguistics” course, which offers insights into various Spanish dialects. Being familiarized with s-aspirated samples could contribute to the successful perception of the aspirated coda /s/, and the linguistics group was the only one that had taken that course. Hence, metalinguistic knowledge aids perception of the aspirated coda /s/, only if the scores by the linguistics group are statistically significant better than those of the advanced group.
While in research question number 1, the descriptive statistics notes the role of environment, the emphasis was placed on how participants perceived each item along with correctness scores, to answer research question number 4, I will focus, rather, on each environment perception accuracy. Hence, I used the perception task scores of each environment and a one-way ANOVA test followed by a pairwise t-test (Bonferroni). The one-way ANOVA goes hand-in-hand with the pairwise t-test (Bonferroni) (Winkler & Hays, 1975), and its use is justified for analyzing the environment variable in each group. The ANOVA test only shows if there is a statistically significant difference in the variable, and the pairwise t-test (Bonferroni) shows which specific pairs of levels are statistically significant for perception. This specific analysis requires data subsets of each group, for which I had to run two ANOVA tests and two pairwise t-tests (Bonferroni) per group. Hence, it was necessary to adjust the statistical significance value to 0.0083, which results from dividing six (number of more tests) by 0.05 (standard significance value). A statistically significant better score in an environment means perceiving the aspirated coda /s/ is successful, but the environment should reach 50% in the perception task score. Otherwise, the differences are not interpreted as satisfactory perception accuracy.

In order to answer research question number 5, I used the scores of the appreciation section of the survey, which had participants rate the aspirated phrases and sentences as “same dialect as mine,” “different dialect from mine,” and “deficit.” Additionally, I compared the proportion of responses for each option to one another. The answer to research question number 6 is based on the comprehensibility scores of each group, which deal with how the participants rate the difficulty of the s-aspirated phrases and sentences (e.g., “extremely difficult,” “very
difficult,” “difficult,” “average,” “easy,” “very easy,” and “extremely easy”). I obtained the proportion of responses for each rating and compared them to one another.

Next, in order to answer research question number 7, I compared two groups the within word set with the between word set to determine whether word sets affect perception accuracy. The regression model can display a statistically significant difference in the category variable. Nevertheless, it does not show the interaction between the environments of the within word set and the between word set. Hence, as in the environment variable, it was necessary to run a pairwise t-test (Bonferroni) in the three groups. I ran a one-way ANOVA followed by a pairwise t-test (Bonferroni) to pinpoint the specific word set in which the statistically significant differences were revealed. Both tests had the perception task results as the dependent variable and category as the independent variable for each of the three groups.

In order to answer research question number 8, I set up a difficulty ranking for perception within each group. The ranking arranges the environments from left to right from the conducive or least to the most challenging according to the results of the models and the perception task scores. The pairwise t-test (Bonferroni) set differences between the word sets for the category and environment variables, while the perception task scores rank the individual environments in the hierarchy. The environments with the highest scores hold the highest ranks in the hierarchy, and those with the lowest ranks hold the last positions. Finally, in order to answer research question number 9, I used the results of the logistic regression for the social variables whose answers were taken from the biographical section of the survey (Appendix A).
CHAPTER IV
RESULTS

This chapter shares the results of the descriptive and statistical analysis. It starts with the results of the biographical information section for each group followed by the perception task scores in percentages and by the results of the statistical tests.

4.1 Biographical Information

This section summarizes the biographical information of the Spanish L2 population (see Appendix A) and the native speakers of Spanish (see Appendix D), such as: sex, age, use of other languages, number of years learning Spanish, number of Spanish-speaking relatives, heritage speaker status, number of Spanish courses taken, “Introduction to Hispanic Linguistics” (intermediate course), TV watching time, newspaper reading time, and music listening time. Table 1 presents the first five variables.

Table 1

Sex, age, use of other languages, number of years learning Spanish

<table>
<thead>
<tr>
<th>Groups, proficiency, and courses</th>
<th>Factors</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sex</td>
<td>Age</td>
<td>Use of other languages</td>
<td>Number of years learning Spanish</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>Min.</td>
<td>19</td>
<td>Min.</td>
</tr>
<tr>
<td>Beginner:</td>
<td>Women</td>
<td>Mean</td>
<td>20.45</td>
<td>None</td>
</tr>
<tr>
<td>low proficiency Beginner Spanish</td>
<td></td>
<td>Max.</td>
<td>26</td>
<td>Mean</td>
</tr>
<tr>
<td>Advanced</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced proficiency</td>
<td>Men</td>
<td>1</td>
<td>18</td>
<td>Arabic</td>
</tr>
<tr>
<td>Conversation &amp;</td>
<td>Women</td>
<td>19</td>
<td>20</td>
<td>German</td>
</tr>
<tr>
<td>Composition in Spanish, intermediate course</td>
<td></td>
<td>Max.</td>
<td>22</td>
<td>Hindi</td>
</tr>
<tr>
<td>Linguistics:</td>
<td></td>
<td>None</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Advanced proficiency</td>
<td>Men</td>
<td>7</td>
<td>19</td>
<td>Korean</td>
</tr>
<tr>
<td>“Hispanic Linguistics,” (intermediate course)</td>
<td>Women</td>
<td>Mean</td>
<td>20.5</td>
<td>Twi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.</td>
<td>22</td>
<td>None</td>
</tr>
</tbody>
</table>

55
Regarding the sex variable, the beginner group has 8 men and 12 women, the advanced group has 1 man and 19 women, and the linguistics group has 7 men and 13 women. With age, as seen in Table 1, the mean age for all participant groups centers on 20 years old. The mean age of the beginner group is 20.45 years old, the youngest is 19 and the oldest is 26. The mean age of the advanced group is 20 years old, the youngest participant is 18 and the oldest being 22. The mean age of the linguistics group is 20.5 years old, with the youngest being 19 and the oldest 22.

As for the use of other languages factor; in the beginner group, 1 participant speaks Vietnamese, and the other 19 speak only English. In the advanced group, of 20 participants, 1 speaks Arabic, 1 German, and 1 Hindi, while the others speak only English. In the linguistics group, 1 participant speaks Korean and 1 Twi, while the other 18 speak only English. Next, regarding the number of years spent learning Spanish, we can see in Table 1 that all groups show a large range of time, spanning from 1 to 15 years for the beginner and advanced groups, with means of 4.05 and 4.95 respectively, and 1 to 18 years for the linguistics group, with a mean of 6.35 years.

Table 2 presents information about the number of Spanish-speaking relatives, heritage speaker status, the number of Spanish courses, and “Introduction to Hispanic Linguistics” (intermediate course).
Table 2

Number of Spanish-speaking relatives, heritage speaker status and number of Spanish courses taken

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of Spanish-speaking relatives</th>
<th>Heritage speaker status</th>
<th>Number of Spanish courses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beginner</td>
<td>2</td>
<td>2</td>
<td>Min. 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean 1.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max. 3</td>
</tr>
<tr>
<td>Advanced</td>
<td>5</td>
<td>3</td>
<td>Min. 013</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean 3.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max. 8</td>
</tr>
<tr>
<td>Linguistics</td>
<td>1</td>
<td>2</td>
<td>Min. 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean 5.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max. 10</td>
</tr>
</tbody>
</table>

With regards to the number of Spanish-speaking relatives, the advanced group has the highest number of Spanish-speaking relatives with 5, followed by the beginner group with 2 and the linguistics group with 1. The overall number of heritage speakers is low: there are 2 in the beginner group and 5 and 1 in the advanced and linguistics groups respectively. As for the mean of Spanish courses taken, the linguistics group has a mean of 5.4 courses higher than the other two groups with 1 the minimum and 10 the maximum. The advanced group follows with a mean of 3.7; at least 0 and a maximum of 8. In the section of number of Spanish courses taken by beginners, the mean appears with 3.5, with at least 1 and a maximum of 3. Table 3 presents information about frequency of TV watching time, newspaper reading time, and music listening time.

---

13 This represents a heritage student.
Table 3

*Frequency of TV watching time, newspaper reading time, and music listening time*

<table>
<thead>
<tr>
<th></th>
<th>TV watching time</th>
<th>Newspaper reading time</th>
<th>Music listening time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every day</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Often</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sometimes</td>
<td>4</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Rarely</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Never</td>
<td>12</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

In the beginner group, 4 participants rarely watch TV in Spanish, 4 sometimes, and the rest never do. For the advanced participants, 3 rarely watch TV in Spanish, 8 sometimes watch it, and 1 often does. The linguistics group watches the most TV in Spanish. Out of 20 students, 4 rarely watch TV, 6 sometimes, 2 often, and 1 every day. The newspaper reading variable does not seem common among the population; only 4 participants in the advanced group and 5 in the linguistics group read the newspaper in Spanish. Of the 4 advanced, 3 often do and 1 sometimes, but of the 5 linguistics participants, 3 rarely do, 2 sometimes, and 1 every day. The population listens to Spanish music more often: 11 in the beginner group, 16 in the advanced group and 16 in the linguistics group often listen. Of the 20 advanced, 6 do it every day, 4 often, 5 sometimes, and 1 rarely, but in the linguistics group, 6 do it every day, 4 often, 4 sometimes, and 2 rarely.

Next, Table 4 displays information about the time spent in Spanish-speaking regions. It lists the Spanish-speaking countries where participants have been with the number of weeks that they spent there. Each item (row) in the table represents a participant.
Table 4

*Time spent in Spanish-speaking regions*

<table>
<thead>
<tr>
<th>Immersion time (in weeks)</th>
<th>Beginners</th>
<th>Advanced</th>
<th>Linguistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolivia</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bolivia and Ecuador</td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Costa Rica and Mexico</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Costa Rica, México and, Panama</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Costa Rica, Mexico and, Chile</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cuba</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Ecuador</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>El Salvador</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Mexico</td>
<td>2.9</td>
<td>6</td>
<td>34.4</td>
</tr>
<tr>
<td>Mexico and Honduras</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Mexico, the Dominican Republic, and Guatemala</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Panama</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Spain</td>
<td>0</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Spain, Costa Rica, and Ecuador</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Spain, Honduras, and Panama</td>
<td>0</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>The Dominican Republic</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>The Dominican Republic, and Mexico</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.89</strong></td>
<td><strong>1.25</strong></td>
<td><strong>4.67</strong></td>
</tr>
</tbody>
</table>

The beginner group has spent .89 weeks abroad on average in a Spanish-speaking country, whereas the advanced and linguistics groups spent an average of 1.25 weeks and 4.67 weeks respectively. The beginner participants have been to Costa Rica (3), Costa Rica and Mexico (5), the Dominican Republic (1), Mexico (2.9), Panama (2) and Puerto Rico (3). In the advanced group, the participants have been to the Dominican Republic (1), Mexico (6), Mexico, the Dominican Republic and Guatemala (8), Puerto Rico (3), Spain (4), and Spain, Costa Rica and Ecuador (3). In the linguistics group, participants have been to Bolivia and Ecuador (16), Costa Rica (2), Costa Rica, Mexico, and Panama (3), Cuba (1 week), Ecuador (4), El Salvador (1), Mexico (34.4), Mexico and Honduras (3), Nicaragua (2), Spain (3), Spain, Honduras and Panama (24). Next, Table 5 provides information on the places and social events where participants use Spanish outside of the classroom. The number of students per place appears under each group.
Table 5

*Place for interaction*

<table>
<thead>
<tr>
<th>Interaction place</th>
<th>Beginners</th>
<th>Advanced</th>
<th>Linguistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>With friends</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>At home</td>
<td>2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>With family</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Social media</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>At Mexican restaurants</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>At Spanish meetings</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>On trips and vacations</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>At work</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6</strong></td>
<td><strong>12</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>

A total of six participants reported Spanish interaction outside of the classroom in the beginner group and 12 and 10 participants in the advanced and linguistics groups respectively. In the beginner group, 2 participants interact in Spanish at home and 2 on social media, 1 interacts with family, and 1 on trips and vacations. In the advanced group, 3 participants interacted with friends and 5 at home. For the rest of the places, 1 on social media, 2 in Spanish meetings, and 1 on vacation. Finally, in the linguistics group, 1 participant reported interacting at home in Spanish, 1 with friends, 1 on social media, and 1 at a Mexican restaurant. In addition, 2 participants interacted with family, 2 on trips and vacations, and 2 at work.

Table 6

*Native speakers of Spanish: bibliographical information*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Time spent in the USA</th>
<th>Gender</th>
<th>Country of origin</th>
<th>Use of other languages different from English and Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24 years old</td>
<td>4 years</td>
<td>masculine</td>
<td>Honduras</td>
<td>no</td>
</tr>
<tr>
<td>2</td>
<td>32 years old</td>
<td>6 years</td>
<td>feminine</td>
<td>Venezuela</td>
<td>no</td>
</tr>
<tr>
<td>3</td>
<td>45 years old</td>
<td>6 years</td>
<td>feminine</td>
<td>Colombia</td>
<td>no</td>
</tr>
<tr>
<td>4</td>
<td>25 years old</td>
<td>3 years</td>
<td>feminine</td>
<td>Honduras</td>
<td>no</td>
</tr>
<tr>
<td>5</td>
<td>35 years old</td>
<td>2 years</td>
<td>feminine</td>
<td>Venezuela</td>
<td>no</td>
</tr>
<tr>
<td>6</td>
<td>48 years old</td>
<td>3 years</td>
<td>feminine</td>
<td>Cuba</td>
<td>Italian, French</td>
</tr>
<tr>
<td>7</td>
<td>50 years old</td>
<td>27 years</td>
<td>feminine</td>
<td>Mexico</td>
<td>no</td>
</tr>
<tr>
<td>8</td>
<td>39 years old</td>
<td>12 years</td>
<td>masculine</td>
<td>Mexico</td>
<td>no</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>37.2 years old</td>
<td>7.8 years</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

60
The youngest participant is number 1 (24 years old) and the oldest is 50 years old and the average age is 37.2 years old. Participant number 6 has the fewest number of years spent in the United States (3), while participant number 7 has spent the highest number (27) and the average time is 7.8 years. There are six women and two men. All eight speakers weaken the /s/ phone to varying degrees. Two participants are from Venezuela, two are from Mexico, two from Honduras, one from Colombia, and one from Cuba. Only speaker number 6 speaks more languages than Spanish and English. The rest were born in Latin American countries and speak Spanish and some English.

4.2 Perception Task Scores and Inferential Statistics

This section presents the quantitative results obtained by using the statistical computing program R (RStudio Team, 2022) as well as percentages illustrated in graphs. Each item in this section corresponds to a research question whose answers include the statistic procedures, percentage calculations, and observations about the data. The results of research question number 1 provide the perception task scores by the population and the native Spanish speakers and an analysis of the task items per environment. For research question number 2, I compared the Spanish L2 groups´ perception scores. The object of research question number 3 deals with whether metalinguistic knowledge aided in the perception of the aspirated coda /s/. Research question number 4 tests the perception of the aspirated coda /s/ in various environments. For research question number 5, I sought to determine whether Spanish L2 participants understand the aspirated coda /s/ as a dialect trait or as a deficit in learning. Research question number 6 examines the participants´ comprehensibility ratings. Research question number 7 consists of comparing the word sets. For research question number 8, the hierarchies of perception difficulty are set up.
Finally, research question number 9 tackles the contribution of biographical variables to the perception of the aspirated coda /s/.

Research question number 1 sought to determine whether the population (the beginner, advanced, and linguistics groups) perceived the aspirated coda /s/ that distinguishes between phrasal and sentence pairs that sound alike. Figure 2 shows that the participants perceived the aspirated coda /s/ in 55% (N = 663) of the statements and failed in 45% (N = 537) of them. Also, a one-proportion z-test to compare the percentages of correct and incorrect responses was run. The results revealed a p-value of 0.0027, which means that is a statistically significant difference for the proportion of correct responses. Hence, the population successfully perceived the aspirated coda /s/.

**Figure 2**

*Population: Perception task scores*

![Bar chart showing correct and incorrect responses]

In this part of the section, a descriptive analysis shows the perception accuracy in detail. It consists of the perception task scores (correct and incorrect responses) per environment and item, which are represented by bars. Figure 3 shows the actual number of the items in the perception task sheet at the bottom of each environment (see Appendix B), and the number of
correct responses in blue and the incorrect ones in orange. Henceforth, the aspirated phone \[h\] will appear in bold within the transcription.

**Figure 3**

*Population: Perception task scores per item and environment*

As shown in Figure 3, the stressed word medial environment corresponded to items 1, 12, 22, and 33. Both items 1 and 33 got 53 (83.3%) correct and 7 (16.7%) incorrect responses, implying that these environments favor perception.
On the contrary, item 12 obtained 25 (41.7%) correct and 35 (58.3%) incorrect responses, while item 22 got 16 (26.7%) correct and 44 (73.3%) incorrect responses. Perception results are mixed in this environment.

The unstressed word medial environment had items 3, 14, 24, and 35. Item 3 obtained 46 (76.7%) correct and 14 (23.3%) incorrect responses, item 14 got 51 (85%) correct and 9 (15%) incorrect responses, item 24 got 45 (75%) correct and 15 (25%) incorrect responses, and item 35 got 35 (58.3%) correct and 25 (41.7%) incorrect responses. These highest scores showed this environment aided the task.

The stressed word final environment comprised items 5, 16, 26, and 39. Item 16 had 51 (85%) correct and 9 (15%) incorrect responses, item 26 got 59 (98.3%) correct responses and
1 (1.7%) incorrect response, item 39 had 37 (61.7%) correct and 23 (38.3%) incorrect responses, and item 5 got 16 (26.7%) correct and 44 (73.3%) incorrect responses.

Items 16, 26 and 39 aided perception, but item 5 did not, although it was expected to do so for being salient. These mixed results were also seen in the stressed word medial environment. On the other hand, the stressed resyllabified environment had items 10, 20, 31 and 41. Item 31 obtained 54 (90%) correct and 6 (10%) incorrect responses, item 41 obtained 46 (76.7%) correct and 14 (23.3%) incorrect responses, item 10 got 5 (8.3%) correct and 55 (91.7%) incorrect responses, and item 20 obtained 4 (6.7%) correct and 56 (93.3%) incorrect responses.

The perception results are mixed in this environment.

16. (a) 
(estado)

(b) 
[es.ke.so.'öe.li.'sjo.so] It is delicious cheese.

16. (b) 
Es que eso es delicioso.

[e'h.ke.'e.so.'ez.öe.li.'sjo.so] It is that it is delicious.

26. (a) 
Margarita es la más bonita.

Margarita is the prettiest.

(b) 
Margarita isla más bonita.

Margarita, most beautiful island

39. (a) 
¿Qué es esto?

[ke.e.'hes.to] What is this?

(b) 
¿Qué gesto?

[ke.'xes.to] What a gesture?

5. (a) 
El bus que está en el puerto.

The bus that is in the port.

(b) 
El buque está en el puerto.

The ship is in the port.

31. (a) 
Tú sí les haces una historia.

You make up a story for them.

(b) 
Tú sí lees y haces una historia.

You read and make up a story for them.

41. (a) 
Si es esta quiero quedarme

If this is the one, I want to stay.

(b) 
¡Siesta, quiero quedarme!

A nap, I want to stay

10. (a) 
Las aulas de estudiantes

The students’ classrooms

(b) 
Las jaulas de estudiantes

The students’ cages

20. (a) 
Las alas de la parte trasera

The back wings

(b) 
Las jalas de la parte trasera

Pull them from behind.
Items 8, 18, 29, and 37 constitute the unstressed resyllabified environment. Item 8 obtained 20 (33.3%) correct and 40 (66.7%) incorrect responses, item 18 got 12 (20%) correct and 48 (80%) incorrect responses, item 29 got 18 (30%) correct and 42 (70%) incorrect responses, and item 37 got 16 (26.7%) correct and 44 (73.3%) incorrect responses.

Next is a summary of the items’ scores that includes both groups of items with a score of over 50% correct and incorrect perception.

**Table 7**

**Summary of item scores**

<table>
<thead>
<tr>
<th>Items with over 50% correct perception</th>
<th>Items with over 50% incorrect perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent correct</td>
<td>Environment</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Margarita es la más bonita. Margarita isla más bonita</td>
<td>98.3%</td>
</tr>
<tr>
<td>Tú sí les haces una historia. Tú sí lees y haces una historia.</td>
<td>90%</td>
</tr>
<tr>
<td>La mitad del camino</td>
<td>85%</td>
</tr>
<tr>
<td>Es queso delicioso</td>
<td>85%</td>
</tr>
<tr>
<td>El pasto está bonito</td>
<td>83.3%</td>
</tr>
<tr>
<td>Hasta los zapatos rojos.</td>
<td>83.3%</td>
</tr>
<tr>
<td>Estado de emergencia.</td>
<td>76.7%</td>
</tr>
<tr>
<td>Si es esta quiero quedarme. ¡Siesta, quiero quedarme!</td>
<td>76.7%</td>
</tr>
<tr>
<td>Sus patillas son importantes.</td>
<td>75%</td>
</tr>
</tbody>
</table>

8.
(a) Hemos orado mucho. ['e.mo.'hra.'do.'mu Trường]
   We have prayed a lot.
(b) He mejorado mucho. ['e.me.xo.'ra.'do.'mu Trường]
   I have improved a lot.

18.
(a) Nos hablamos los lunes. [no.'ha.'bla.moz.'loz.'lu.nes]
   We will talk on Mondays.
(b) No hablamos los lunes. [no.a.'bla.moz.'loz.'lu.nes]
   We don't talk on Mondays.

29.
(a) ¡Vas a cenar con nosotros! ['ba.'ha.se.'nar.kon.no.'so.tros]
   You will have dinner with us!
(b) Baja a cenar con nosotros. ['ba.xa.se.'nar.kon.no.'so.tros]
   Come down to have dinner with us!

37.
(a) A los amigos en el hotel. ['a.lo.'ha.'mi.yo.se.ne.lo.'tel]
   To the friends at the hotel
(b) Aloja amigos en el hotel. ['a.lo.xa.'mi.yo.se.ne.lo.'tel]
   Put up your friends at the hotel
The summary shows that eleven (55%) out of twenty items reached over fifty percent of accuracy in the perception task. Of the eleven items, nine (82%) were in the within word set and two (18%) in the between word set. This finding shows that the within word set environments are more conducive for perception than resyllabified ones. The two resyllabified items displayed a high score: ‘Tú sí les haces una historia’ (90%) and ‘Si es esta quiero quedarme’ (76.7%). However, nine (45%) out of twenty items got less than 50%. Of the nine items, six (66.7%) were in the between word set and three (33.3%) in the within word set. This finding shows these between word environments are less favorable to perception. The three items in the within word environment were expected to be among those that exceeded the fifty percent of correct responses (see research questions and hypothesis): ‘Un cisne cerca del lago’ (73.3%), ‘El bus que está en el puerto’ (73.3%), and ‘Tengo muchos gastos’ (58.3%). However, they were mostly incorrectly understood.

Next, a descriptive analysis presents the perception accuracy by the native speakers of Spanish. The significance of this summary, which lies in finding common challenging items for both the Spanish L2 learners and the native Spanish speakers, consists of task scores per environment and item. Figure 4 shows the correct responses in blue and the incorrect in orange, and the actual item’s number in the task perception sheet under the bars.
Most items in the five environments received more correct than incorrect responses. The more challenging items were in the stressed resyllabified environment (10) and the unstressed resyllabified environment (29). Item 10 and 29 obtained 4 (50%) correct and 4 (50%) incorrect responses.
Items 10 and 29 in the stressed resyllabified environment along with all the items in the unstressed resyllabified environment were among the most challenging for the Spanish L2 participants.

The results of this section revealed that the L2 learners got statistically significant perception accuracy (55%) of the aspirated coda /s/, implying that they successfully perceived the aspirated coda /s/. However, certain environments and items were more favorable for the task. The unstressed resyllabified environment had the most challenging items (items 8, 18, 29, and 37) followed by the stressed resyllabified environment (items 10 and 20) and the stressed word medial environment (items 12 and 22). For the native Spanish speakers, two stressed resyllabified items were the most challenging (items 10 and 20). In the stressed word final environment, the L2 learners obtained a low score in only one item. Both the within word and the between word environments had challenging items but there were more in the latter. With some exceptions, the within word items achieved over 55% of accuracy in the perception task. These tendencies are confirmed in the statistical analysis presented in the subsequent research questions.

Research question number 2 investigated whether each Spanish L2 group perceived the aspirated coda /s/ that distinguishes between phrasal and sentence pairs that sound alike. Figure 5 displays the perception task scores of each group.
**Figure 5**

*Intelligibility results within each group*

The beginner group got 160 (40%) correct and 240 (60%) incorrect responses, the advanced group got 257 (64%) correct and 143 (36%) incorrect, and the linguistics group got 246 (62%) correct and 154 (38%) incorrect. These results show that the advanced and linguistics groups obtained scores statistically significant higher than the beginner group did, but the scores by the advanced and linguistics groups do not statistically differ from each other. Furthermore, a logistic regression was run in which, the dependent variable was perception task results (ptr), and the independent variables were language proficiency (level), environment, degree of difficulty (dod), years learning Spanish (yls), and place for Spanish interaction (wsoc) with the participant and item variables included as random effects.\(^\text{14}\) Table 8 shows the results of the logistic regression.

\(^{14}\)Several trial models were run before the final one. The final model only includes the variables that were statistically significant.
The advanced group was statistically significant better than the beginner group (p<0.001). The odds that a beginner participant perceives the aspirated coda /s/ lowers by 0.24 times compared to that of the advanced participants (intercept). The closeness in the perception task scores between the advanced (64%) and linguistics groups (62%) (Figure 5) rejects any statistically significant difference between them, and indeed, the model shows no statistically significant effect on perception task accuracy for the linguistics group as compared with the advanced group. Thus, only the advanced and linguistics participants succeeded in perceiving the aspirated coda /s/.

Research question number 3 dealt with whether metalinguistic knowledge facilitated the perception of the aspirated coda /s/ and, consequently, the intelligibility of s-aspirated phrases and sentences. The results provide evidence to reject the contribution of metalinguistic knowledge on perception. Since the advanced group (64%) and the linguistics group (62%) (Figure 5) obtained similar results in the perception task, the logistic regression did not display statistically significant differences between the two groups (see Table 8).

Research question number 4 focused on whether the perception of the aspirated coda /s/ is equally challenging in the various environments where it occurs. The logistic regression model, the same used in Table 8, revealed a statistically significant difference in the environment

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15 For the group variable, an additional regression model with the linguistics group as the intercept was run. The results confirmed a statistically significant difference between the linguistics and beginner groups (p = <.001).
variable, with the unstressed word medial environment as the intercept. Table 9 shows the results.

**Table 9**

*Environment*

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>z-value</th>
<th>OR</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stressed resyllabified</td>
<td>-1.7625</td>
<td>1.1405</td>
<td>-1.545</td>
<td>0.1715</td>
<td>0.1223</td>
</tr>
<tr>
<td>Stressed word final</td>
<td>0.0488</td>
<td>1.1424</td>
<td>0.043</td>
<td>1.0500</td>
<td>0.9659</td>
</tr>
<tr>
<td>Stressed word medial</td>
<td>-0.4549</td>
<td>1.1339</td>
<td>-0.401</td>
<td>0.6344</td>
<td>0.6883</td>
</tr>
<tr>
<td>Untressed resyllabified</td>
<td>-2.5034</td>
<td>1.1332</td>
<td>-2.209</td>
<td>0.0818</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Reference environment: Unstressed word medial

A statistically significant difference was found between the unstressed resyllabified and the unstressed word medial environment. The odds for a participant to perceive the aspirated coda /s/ in the unstressed resyllabified environment decreases by .08 times compared with that of perceiving it in the unstressed word medial environment (<0.05). However, that test does not show the behavior of this variable in each group. Hence, due to the need to investigate the interaction of the environments between each other; and the demand of more models (6), a one-way ANOVA was run followed by a pairwise t-test (Bonferroni) (“Biostatsn,” n.d.) in each subset of the group. Figure 6 presents the perception task scores per environment obtained by the beginner group.
The perception task scores obtained by the beginner group within each environment are shown in Figure 6. The results show that the beginner group obtained more incorrect than correct responses in the two stressed resyllabified environments and the stressed word medial. Contrarily, they obtained more correct than incorrect responses in the unstressed word medial and the stressed word final although the differences are small. The stressed word medial environment obtained 34 (42%) correct and 46 (57%) incorrect responses, the unstressed word medial environment got 43 (54%) correct and 37 (46%) incorrect, the stressed word final environment got 41 (51%) correct and 39 (49%) incorrect, the stressed resyllabified environment got 28 (35%) correct and 52 (65%) incorrect, and the unstressed resyllabified environment got 14 (18%) correct and 66 (82%) incorrect responses. Next, a one-way ANOVA was run followed by a pairwise t-test (Bonferroni) to pinpoint the specific environments in which the statistically significant differences were revealed. Both tests had the perception task results as the dependent variable and environment as the independent variable for each of the three groups. The results revealed a statistically significant difference ($F(4) = 7.558, p < .001$). Table 10 shows the results.
Table 10

Beginner group: comparisons of environments

<table>
<thead>
<tr>
<th></th>
<th>Uwm</th>
<th>Swm</th>
<th>Swf</th>
<th>Sr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swm</td>
<td>$p = 1.0000$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swf</td>
<td>$p = 1.0000$</td>
<td>$p = 1.0000$</td>
<td>$p = .3114$</td>
<td></td>
</tr>
<tr>
<td>Sr</td>
<td>$p = .1297$</td>
<td>$p = 1.0000$</td>
<td>$p &lt; .001$</td>
<td>$p = .2034$</td>
</tr>
<tr>
<td>Ur</td>
<td>$p &lt; .001$</td>
<td>$p = .0096$</td>
<td>$p &lt; .001$</td>
<td></td>
</tr>
</tbody>
</table>

Stressed word medial (Swm), Unstressed word medial (Uwm), Stressed word final (Swf), Stressed resyllabified (Sr), Unstressed resyllabified (Ur)

The beginner group got low scores in most environments as their perception task scores indicate (Figure 6), yet the unstressed resyllabified environment was statistically significant worse than the unstressed word medial environment (the Ur vs the Uwm, $p < .001$) and the stressed word final environment (the Ur vs the Swf, $p < .001$). Although the stressed resyllabified environment received a low score, it was not statistically significant worse than the within word set environment as the unstressed resyllabified environment was. Finally, there were no statistically significant differences between the environments or the within word set. Figure 7 presents the perception task scores per environment obtained by the advanced group.

---

16 The statistically significant difference between the unstressed resyllabified with respect to the unstressed word medial environment and the stressed word final was not reported as successful perception because the perception task scores (Figure 6) in these environments did not reach 50%.
Advanced group’s perception within each environment

The perception task scores obtained by the advanced group within each environment are shown in Figure 7. The within word set environments received more correct than incorrect responses, but the between word set received more incorrect than correct responses in the unstressed resyllabified and an equal number of responses in the stressed resyllabified environment. The stressed word medial environment obtained 63 (79%) correct and 17 (21%) incorrect responses, the unstressed word medial environment got 74 (92%) correct and 6 (8%) incorrect, the stressed word final environment got 60 (75%) correct and 20 (25%) incorrect, the stressed resyllabified environment got 40 (50%) correct and 40 (50%) incorrect, and the unstressed resyllabified environment received 20 (25%) correct and 60 (75%) incorrect responses. The one-way ANOVA revealed a statistically significant difference between the environments ($F(4) = 5.735, p < 0.001$), and a pairwise t-test (Bonferroni) displayed the specific environments pairs between in which it arose. Table 11 shows the results.
The perception accuracy of the advanced group is mixed. The advanced students succeeded in each environment of the within word set but failed in the environments of the between word set as the statistically significant differences point out (the Swm vs the Sr, \( p < .001 \); the Swm vs the Ur, \( p < .001 \); the Uwm vs the Sr, \( p < .001 \); the Uwm vs the Ur, \( p < .001 \); the Swf vs the Sr, \( p = .0018 \); the Swf vs the Ur, \( p < .001 \)). Nevertheless, the unstressed word medial environment, which is non-salient, was statistically significant better for perception than the environments in the between word set. Finally, although the advanced participants failed in the between word set, the stressed resyllabified environment was statistically significant better than the unstressed resyllabified (\( p < .01 \)). Figure 8 shows the perception task scores per environment obtained by the linguistics group.

### Table 11

**Advanced group: comparisons of environments**

<table>
<thead>
<tr>
<th></th>
<th>Uwm</th>
<th>Swm</th>
<th>Swf</th>
<th>Sr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swm</td>
<td></td>
<td></td>
<td></td>
<td>( p = .3802 )</td>
</tr>
<tr>
<td>Swf</td>
<td>( p = .0838 )</td>
<td></td>
<td></td>
<td>( p = 1.0000 )</td>
</tr>
<tr>
<td>Sr</td>
<td>( p &lt; .001 )</td>
<td>( p &lt; .001 )</td>
<td>( p = .0018 )</td>
<td></td>
</tr>
<tr>
<td>Ur</td>
<td>( p &lt; .001 )</td>
<td>( p &lt; .001 )</td>
<td>( p &lt; .001 )</td>
<td>( p = .0018 )</td>
</tr>
</tbody>
</table>

Stressed word medial (Swm), Unstressed word medial (Uwm), Stressed word final (Swf), Stressed resyllabified (Sr), Unstressed resyllabified (Ur)
The perception task scores obtained by the linguistics group within each environment are shown in Figure 8. The results show that the linguistics group obtained more correct than incorrect responses in all environments of the within word set and in the stressed resyllabified environment, but they got more incorrect than correct scores in the unstressed resyllabified environment. The stressed word medial environment obtained 51 (64%) correct and 29 (36%) incorrect responses, the unstressed word medial environment got 60 (75%) correct and 20 (25%) incorrect, the stressed word final environment got 62 (78%) correct and 18 (22%) incorrect, the stressed resyllabified environment got 41 (51%) correct and 39 (49%) incorrect, and the unstressed resyllabified environment received 32 (40%) correct and 48 (60%) incorrect responses. Then, after a one-way ANOVA revealed a statistically significant difference \( F (4) = 9.217, p < .001 \), a pairwise t-test (Bonferroni) showed in which pairs of environments those differences existed. Table 12 shows the results.
Table 12

Linguistics group: comparisons of environments

<table>
<thead>
<tr>
<th></th>
<th>Uwm</th>
<th>Swm</th>
<th>Swf</th>
<th>Sr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swm</td>
<td>p = 1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swf</td>
<td>p = 1.0000</td>
<td>p = .6406</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sr</td>
<td>p = .0145</td>
<td>p = .9217</td>
<td>p = .0044</td>
<td></td>
</tr>
<tr>
<td>Ur</td>
<td>p &lt; .001</td>
<td>p = .0145</td>
<td>p &lt; .001</td>
<td>p = 1.0000</td>
</tr>
</tbody>
</table>

Stressed word medial (Swm), Unstressed word medial (Uwm), Stressed word final (Swf), Stressed resyllabified (Sr), Unstressed resyllabified (Ur)

Overall, as in the advanced group, the perception accuracy of the linguistics group is mixed. The unstressed word medial environment received statistically significant higher scores than the unstressed resyllabified ($p < .001$). Likewise, the stressed word final environment got statistically significant higher scores than the unstressed resyllabified ($p = .0044$). In addition, the stressed word final environment was statistically significant better for perception than the stressed resyllabified context ($p < .001$). Finally, there were no statistically significant differences between the environments in the within word set.

To sum up, the perception of the aspirated coda /s/ is not equally challenging in all environments. It depends on the group and the word set. In the beginner group, all environments got low scores, displaying poor perception by the students. In the advanced and linguistics groups, the within word set environments reached better perception accuracy than the between word set environments.

Research question number 5 was concerned with whether Spanish L2 participants understood that the aspirated coda /s/ was a dialect trait not a deficit. Figure 9 shows the answers for the three options of the appreciation section. For each pair of utterances, participants indicated whether what they heard were a) the same dialect as theirs, b) a different dialect as theirs or c) a deficit in the speaker.
Overall, there were 1,200 responses, 656 (54.67%) responses for “same dialect as mine,” 453 (37.75%) for “different dialect from mine,” and 91 (7.8%) for “deficit.” The two dialect options were combined into one. Figure 10 presents the scores obtained by each group.

In the beginner group, 379 (95%) responses were for dialect and 21 (5%) for deficit; in the advanced group, 352 (88%) responses for dialect and 48 (12%) for deficit; and in the

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17 Here, the term dialect comprises the options “same dialect as mine” and “different dialect from mine” in the appreciation section of the survey. Their number of correct responses was added up and reported as one. The term deficit refers to the “deficit” option, whose number of correct responses was reported as a single option.
linguistics group, 378 (94%) for dialect and 22 (6%) for deficit. Thus, the dialect option got the highest scores, suggesting that the three Spanish L2 groups overwhelmingly perceived the aspirated phone as either the “same dialect as mine” or as a “different dialect from mine.”

Research question number 6 sought to establish whether the beginner, advanced, and linguistics groups differed from one another in their comprehensibility ratings. Figure 11 illustrates the comprehensibility scores of each group.

**Figure 11**

*Comprehensibility results*

<table>
<thead>
<tr>
<th></th>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginner group</td>
<td>0.5</td>
<td>4</td>
<td>20</td>
<td>27</td>
<td>26</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Advanced group</td>
<td>0</td>
<td>4.25</td>
<td>20.25</td>
<td>27.5</td>
<td>22.5</td>
<td>10.5</td>
<td>14</td>
</tr>
<tr>
<td>Linguistics group</td>
<td>2.5</td>
<td>0.5</td>
<td>20</td>
<td>29</td>
<td>21.5</td>
<td>13.75</td>
<td>12.75</td>
</tr>
</tbody>
</table>

*Note:* The numbers in the table are the percentages of responses

In the beginner group, the “extremely difficult” category received 0.5% of the responses, “very difficult” 4%, “difficult” 20%, “average” 27%, “easy” 26%, “very easy” 11%, and “extremely easy” 11%. In the advanced group, the “extremely difficult” category got no responses, “very difficult” 4.25%, “difficult” 20.25%, “average” 27.5%, “easy” 22.5%, “very easy” 10.5%, and “extremely easy” 14%. In the linguistics group, “extremely difficult” got 2.5%,
“very difficult” 0.5%, “difficult” 20%, “average” 29%, “easy” 21.5%, “very easy” 13.75%, and “extremely easy” 12.75%. Seventy percent of the responses centered on the middle categories (“average,” “difficult,” and “easy”), while the high degree categories (“extremely difficult,” “very difficult,” “extremely easy,” and “very easy”) received fewer responses. The main differences between the groups lie in the percentages for “easy” and “very difficult”. While the linguistics group obtained 0.5% in the “very difficult” category, the beginner and advanced group obtained 4% and 4.25% respectively, 3.5 and 3.7 percentage points lower. With respect to the “easy” category, the beginner group (26%) obtained 3.5 and 4.5 percentage points more than the advanced (22.5%) and linguistics groups (21.5%) respectively. In a subsequent step, the logistic regression exhibited no statistically significant difference between the ratings. Hence, no statistically significant results were reported.

Research question number 7 dealt with whether the perception of the aspirated codas /s/ was equally challenging in the within word set and the between word set. Figure 12 shows the perception task scores in word sets by the beginner group.18

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18 It was necessary to run a second regression model (alternative) with the category variable and without the environment variable because, given the overlap between the variables, the first model did not allow both variables together.
The perception task scores in the word sets by the beginner group are shown in Figure 12. The results revealed a higher number of incorrect over correct responses in both word sets. In the within word set, the beginner group perceived 118 (49.16%) items and failed 122 (50.83%), while in the between word set, they responded to 42 (26.25%) items correctly and 118 (73.75%) incorrectly. Nevertheless, the pairwise t-test (Bonferroni) showed that the within word set received statistically significant higher scores than the between word set ($F (1) = 5.042, p < .001$). Figure 13 illustrates the perception task scores in word sets by the advanced group.
The perception task scores in the word sets by the advanced group are shown in Figure 13. The results show there were more correct than incorrect answers in the within word set, but in the between word set, there were more incorrect than correct answers. In the within word set, the participants responded to 197 (82.08%) items correctly and 43 (17.92%) incorrectly; while in the between word set, they responded to 60 (37.5%) correctly and to 100 (62.5%) incorrectly. The pairwise t-test (Bonferroni) revealed that the within word set received a statistically significant higher score than that of the between word set ($F(1) = 104.3, p < .001$). Figure 14 shows the perception task scores in the word sets by the linguistics group.
The perception task scores in the word sets by the linguistics group are shown in Figure 14. The results show there were more correct than incorrect answers in the within word set, but in the between word set, there were more incorrect than correct answers. The within word set received 173 (72.08%) correct responses and 67 (27.92%) incorrect, while the between word set received 73 (45.62%) correct and 87 (54.37%) incorrect. This group did better in the within word set than in the between word set, as well. In addition, the comparison between the two categories by means of a pairwise t-test (Bonferroni) revealed a statistically significant difference ($F(1) = 30.4, p < .001$) for the within word set.

To sum up, the perception of the aspirated coda /s/ is not equally challenging in the within word set and the between word set. In the beginner group, both word sets got low perception accuracy, but the within word set was less challenging than the between word set. In both the advanced and linguistics groups the within word set got statistically significant better
scores than the between word set, providing evidence on behalf of the within word set being more conducive to perception.

Research question number 8 sought to set up the hierarchy of environments’ difficulty for perceiving the aspirated coda /s/ for each group. Figure 15 shows the beginner group’s hierarchy.

**Figure 15**

*Hierarchy of difficulty for the beginner group*

Based on the perception task scores (correct responses) for each environment in the beginner group (Figure 6), the hierarchy emerges: 1) unstressed word medial (54%), 2) stressed word final (51%), 3) stressed word medial (42%), 4) stressed resyllabified (35%), 5) unstressed resyllabified (18%). Furthermore, the logistic regression (Table 8) and the group’s perception task scores (correct responses) (Figure 5) revealed that beginner participants performed poorly at perception, yet the results of the pairwise t-test (Bonferroni) for category split the environments into two sets (within and between word sets) (description of Figure 13) held apart by an empty space that represents a statistically significant difference as Figure 15 shows. The first three
places in the hierarchy correspond to the within word set (left to right), and the fourth and fifth places correspond to the between word set. The beginner group’s scores (correct responses) in the between word set were lower than those in the within word set.

**Figure 16**

*Hierarchy of difficulty for the advanced group*

![Hierarchy of difficulty for the advanced group](image)

According to the perception task scores (correct responses) for each environment in the advanced group (Figure 7), the hierarchy arises: 1) unstressed word medial (92%), 2) stressed word medial (79%) and stressed word final (75%), 3) stressed resyllabified (50%), and 4) unstressed resyllabified (25%). Like in the beginner’s group hierarchy, the results of the pairwise t-tests (Bonferroni) for both category (description of Figure 13) and environment for the advanced group (Figure 7 and Table 11) distinguish two sets of environments separated by an empty space for the statistically significant difference as Figure 16 shows. The first three places (left to right) in the hierarchy are for the within word set environments, which obtained high perception accuracy, while the fourth and fifth places make up the between word set whose
perception accuracy was low. Figure 17 illustrates the hierarchy of difficulty for the linguistics group.

**Figure 17**

*Hierarchy of difficulty for the linguistics group*

![Hierarchy of difficulty for the linguistics group](image)

Using the perception task scores (correct responses) for each environment in the linguistics group (Figure 8), the hierarchy of difficulty is built: 1) stressed word final (78%), 2) unstressed word medial (75%), 3) stressed word medial (64%), 4) stressed resyllabified (51%), and 5) unstressed resyllabified (40%). The pairwise t-tests (Bonferroni) for category (Figure 14) grouped the environments into two sets held apart by an empty space for the significant difference as Figure 17 shows. The first three places (left to right) belong to the within word set and got high perception accuracy, but the last two places belong to the between word set and got low perception accuracy. This hierarchy patterns with that of the advanced group in that in both perception accuracy depends on the word set.
Research question number 9 studied the contribution of biographical factors to the perception of the aspirated coda /s/. Recall that to improve the model, home, family, and friends were combined into one category called social group, while the factors trips and vacations were combined into travel. The rest of the factors were Mexican restaurants, podcast, Spanish meetings, work, and social media. Table 13 presents the regression model result.

Table 13

Regression model

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>z-value</th>
<th>OR</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexican restaurants</td>
<td>1.29559</td>
<td>0.71288</td>
<td>1.817</td>
<td>3.65</td>
<td>0.0692</td>
</tr>
<tr>
<td>Podcast</td>
<td>0.06821</td>
<td>0.66842</td>
<td>0.102</td>
<td>0.93</td>
<td>0.9187</td>
</tr>
<tr>
<td>Spanish meetings</td>
<td>0.62035</td>
<td>0.49590</td>
<td>1.251</td>
<td>1.85</td>
<td>0.2109</td>
</tr>
<tr>
<td>Travel</td>
<td>0.19706</td>
<td>0.31136</td>
<td>0.633</td>
<td>0.82</td>
<td>0.5268</td>
</tr>
<tr>
<td>Work</td>
<td>0.33211</td>
<td>0.49356</td>
<td>0.673</td>
<td>1.39</td>
<td>0.5010</td>
</tr>
<tr>
<td>Social media</td>
<td>0.06754</td>
<td>0.38424</td>
<td>0.176</td>
<td>1.06</td>
<td>0.8605</td>
</tr>
<tr>
<td>Social group</td>
<td>0.89777</td>
<td>0.21830</td>
<td>4.113</td>
<td>2.45</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>

Reference factor: nowhere

The odds that a participant who uses Spanish in a social group perceive the aspirated coda /s/ increases by 2.45 times compared to that of a participant who does not as the statistically significant difference indicates (P < .001). The other interaction places did not condition the perception of /s/ aspiration. Thus, social interaction in a group whether it be at home, with family, and friends contributes to the perception of the aspirated coda /s/.

Finally, it is important to list the variables not reported in the section because several trial regression models revealed that they were not statistically significant. These variables are heritage speaker status, number of Spanish courses taken, frequency of TV watching time, newspaper reading time, music listening time in Spanish, and time spent in Spanish-speaking regions.
4.3 Summary of Results

Across the board, the participants displayed statistically significant perception. The advanced and linguistics groups showed statistically significant perception scores of the aspirated coda /s/ in the within word set but not in the between word set, yet no statistically significant difference was recorded between the two groups. The within word set helped with perception accuracy, while the between word set did not. In addition, the L2 participants mainly rated the aspirated coda /s/ as a dialect, rather than as a deficit. The task items with the lowest scores were in the unstressed resyllabified environment (items 8, 18, 29, and 37), the stressed resyllabified environment (items 10 and 20), and the stressed word medial environment (items 12 and 22). However, the pairwise t-test (Bonferroni) for environment and category showed that the advanced and linguistics groups got statistically significant better scores in the stressed word medial environment, and the stressed resyllabified context received low scores across the three groups. Items 10 and 20 received the lowest scores by the native speakers of Spanish. Probably, because of the imperceptible difference between the two utterances having the phone /x/ and the allophone [h]. Additionally, the unstressed resyllabified environment obtained a statistically significant worse score than the stressed resyllabified environment in the advanced group. Finally, the advanced and linguistics groups got statistically significant perception in the unstressed word medial environment, despite its lack of salience.
CHAPTER V
DISCUSSION

This chapter interprets the results of the study providing answers to each research question. This study investigated the perception of the aspirated coda /s/ in various environments by three Spanish L2 groups. The participants completed a survey with a biographical information section, a perception task, an intelligibility section, and an appreciation section. First, regarding research question number 1, the overall perception task scores by the population were obtained, as well as the scores of the individual perception task items by the population and the native speakers of Spanish. Next, to answer research question number 2, the perception task scores per group were calculated, and two logistic regressions were run to determine which group reached statistically significant perception. Research question number 3 compared the advanced and linguistics groups’ perception task scores to test the role of metalinguistic knowledge on the perception of the aspirated coda /s/. Regarding research question number 4, the task perception scores per environment were obtained for each group. Furthermore, several one-way ANOVA tests and pairwise t-tests (Bonferroni) were performed to obtain between-level comparisons in the environment variable for each group.

Concerning research question number 5, the scores of the appreciation section were compared to one another (“same dialect as mine,” “different dialect from mine,” and “deficit”). The search question number 6 was based on the ratings of the difficulty in perceiving the s-aspirated phrases and sentences (e.g., “extremely difficult,” “very difficult,” “difficult,”
“average,” “easy,” “very easy,” and “extremely easy”), which were also compared to one another. Next, to answer research question number 7, the perception task scores per environment were obtained. Furthermore, the word sets perception accuracy (the within word set and the between word set) was compared to each other in each group using one-way ANOVA tests followed by pairwise t-tests (Bonferroni). To answer research question number 8, a difficulty ranking was set up within each group based on the perception task scores for each environment and the results of the pairwise t-tests (Bonferroni) (Figure 12, 13, and 14; Table 10, 11, and 12). Finally, to answer research question number 9, the logistic regression results for the social variables were used.

The results are now discussed regarding the research questions. Research question number 1 was concerned with whether the population could perceive the aspirated coda /s/. The answer is yes but with varying perception accuracy. Across the board, the participants displayed statistically significant perception, comprehending a little more than half of the items (55%) and failing the rest (45%), which implies that perception of the aspirated coda /s/ affects meaning comprehension of pair of perceptually ambiguous utterances.

Most previous studies did not report an overall perception accuracy score and used different labels to refer to groups of participants, so the present´s study overall perception rate is not comparable to previous ones. Table 14 shows a comparison between the groups that succeeded at perceiving the aspirated coda /s/ in previous studies and the present one.
Table 14

Successful groups

<table>
<thead>
<tr>
<th>Study</th>
<th>Percentages and means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level four</td>
</tr>
<tr>
<td>Schmidt (2011)</td>
<td>48%</td>
</tr>
<tr>
<td></td>
<td>Intermediate-high learners</td>
</tr>
<tr>
<td>Escalante (2018)</td>
<td>56.1%</td>
</tr>
<tr>
<td>Trimble</td>
<td>59.5</td>
</tr>
<tr>
<td>Present study</td>
<td>Advanced group</td>
</tr>
<tr>
<td></td>
<td>64%</td>
</tr>
</tbody>
</table>

In Schmidt (2011), level four (fourth-year advanced topics courses in Spanish literature and linguistics) got 48%, and level five (master’s and doctoral students of Spanish literature) obtained 57.9%. In Escalante (2018), the intermediate-high learners got 56.1%. In Trimble (2014), the four advanced students obtained an average of 59.5. In the present study, the advanced group\(^1\) got 64% and the linguistics group received 62%. These results show that the advanced and linguistics groups in the present study reported the highest perception scores followed by Escalante (2018). All the successful groups have three variables in common: advanced proficiency, time spent in Spanish-speaking regions, and more Spanish courses taken than the intermediate and beginner groups. At the same time, they differ in the task type, and the characteristics of the stimuli. Each variable will be discussed in the subsequent answers to research questions.

The task items with the lowest scores were in the unstressed resyllabified environment (items 8, 18, 29, and 37), the stressed resyllabified environment (items 10 and 20), and the

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\(^{19}\) The label ‘advanced’ in the present study differs from that used in Escalante (2018). Escalante (2018) used the Versant scores (OPT equivalent) to classify the participants as advanced, while in the present study, the advanced participants were in different courses post-intermediate courses. Hence, it is difficult to accurately compare them. In fact, some other authors may call the advanced label here as intermediate.
stressed word medial environment (items 12 and 22). Items 10 and 20 received the lowest scores by the native Spanish speakers. The first reason for this is concerned with the fricative velar voiceless /x/ being realized as the aspirated phone [h] by the speaker who recorded the stimuli, who speaks a dialect with that characteristic. Second, the definite article *las* in the noun phrase in b is not resyllabified and has the additional phone [s] that is weakened in the definite article in the noun phrase in a. Hence, the two noun phrases sound alike, causing listeners to doubt on which item they heard.

Item 10

a. Las aulas de estudiantes (correct)  
   [la.ˈħaw.ˈlaz.ðe.es.tu.ˈdʒan.tes]  
   the students’ cages

b. las jaulas de estudiantes  
   [las.ˈxaw.ˈlaz.ðe.es.tu.ˈdʒan.tes]  
   the students’ cages

Likewise, the participant had issues distinguishing the verb followed by a preposition in Item 29

a. ¡Vas a cenar con nosotros! (correct)  
   [ˈba.ˈha.se.ˈnaɾ.kon.no.ˈso.tros]  
   You are going to have dinner with us!

b. Baja a cenar con nosotros.  
   [ˈba.ˈxa.se.ˈnaɾ.kon.no.ˈso.tros]  
   Come down to have dinner with us!

Both items posed a high degree of difficulty because the noun phrases in both utterances sounded similar (*vas a* vs *vaja a*). Many participants failed to segment the right word in the resyllabified environment and distinguish between the aspirated phone [h] in *vas a* and the velar voiceless [x] in *vaja a*. More details about the difficulty posed by resyllabification are shared in research question number 4.

Research question number 2 was concerned with whether distinct Spanish L2 groups perceived the aspirated coda /s/ differently. Language proficiency alone likely accounted for the
success of the advanced and linguistic groups in the present study since the successful advanced and linguistic groups had advanced proficiency, whereas the unsuccessful beginner group had low proficiency. These results resemble those of Schmidt (2011) and Escalante (2018) whose advanced participants were also successful at the task, but beginners failed. Because attention plays a crucial role in acquiring L2 variants (Schmidt, 1990, 2001), and beginner learners must spend their linguistic resources on general comprehension, they could not notice the aspirated /s/.

Hence, they need to reinforce the one-to-one form meaning connection (L1 to L2 standard forms) before moving on to a one-to-two or more form meaning associations (L1 to L2 standard and L2 variant forms) as suggested by the one-to-one principle (Andersen, 1984, 1990; Bardovi-Harlig, 2017). On the contrary, advanced learners do not have to be too concerned about general comprehension, so they have available linguistic resources left to notice the variants in the input as the vertical and horizontal continuum (Young, 1988) and the Type I variation frameworks indicate (Adamson & Regan, 1991). That is, these successful L2 learners first needed to develop language proficiency to deal with dialectal forms.

Previous studies show that language proficiency and time spent in s-weakening regions are the main perception accuracy facilitators. In Schmidt (2011), the advanced level four had taken advanced topics courses in Spanish literature and linguistics, and level five were university instructors in master’s and Ph.D. programs in Spanish literature. Furthermore, both groups had taken between 7.2 and 14.4 (M = 10.8) Spanish courses and reported between 4.5 and 15.5 (M = 10) months of living abroad respectively. In Escalante (2018), intermediate-high participants had between three to four years in post-secondary Spanish education and from five days to sixteen weeks of study abroad experience, and the study was conducted as part of an immersion program. Moreover, the four participants who succeeded in Trimble (2014) were advanced, had
spent five months in Venezuela and Chile, and had taken four additional courses that included literacy, cultural, and linguistics classes.

In the present study, the successful participants (the advanced and linguistics) spent more time in s-weakening regions than the beginner group (beginner group = 0.89, advanced group = 1.25 weeks, linguistics group = 4.67 weeks). However, the role of time spent in Spanish-speaking regions was insignificant, probably due to its uneven distribution. Of the 40 participants in the advanced and linguistics groups, 23 did not report time spent in Spanish-speaking regions (see Table 4), rendering language proficiency and social interaction (social group) as the only predictor of perception accuracy. At the same time, this finding raises questions on whether language proficiency here refers only to advanced listening skills or a more complex competence.

A factor that could also affect perception accuracy deals with exposure to several dialectal input from Spanish instructors. In the present study, the advanced and linguistics groups had 3.7 and 5.4 Spanish courses taken on average respectively, while the beginner group had 1.35 course taken on average. In addition, various instructors at the university where this study was conducted are from Spanish-speaking regions, so having more Spanish courses means more input from different Spanish dialects, which do not necessarily include s-aspirating types. That could provide L2 learners with advanced listening skills that reinforced the effect of higher language proficiency on the perception of the aspirated coda /s/. It may explain why the advanced participants in George (2014a) without time spent in Spanish-speaking regions failed at the task. They did not have that previous exposure to aspirated input either from study abroad experience or from instructors. This claim, which needs further research to be confirmed, would then define higher language proficiency as listening abilities to understand natural speech from
different dialects effectively acquired in the language classroom. All in all, the hypothesis for this research question was met, and language proficiency has been found to be the most influential variable for perception accuracy in the present study.

Research question number 3 attempted to determine if metalinguistic knowledge affected the perception of the aspirated coda /s/. Metalinguistic knowledge was defined as having taken the “Introduction to Hispanic Linguistics” (intermediate course), and the linguistics group was the only one with that course. Nevertheless, because their scores were not higher than those of the advanced group, the metalinguistic knowledge did not exert any influence on perception accuracy. Hence, the hypothesis for this research question was not met. This demonstrates that classroom explanations about the realization of dialectal phones are insufficient for acquisition. Instead, learners need more exposure to the target phone to complement the linguistic explanations they get from instruction. It is unknown whether participants had plenty of examples of the aspirating dialects in the classroom, so this variable needs more research. Naturalistic context, study abroad and immersion have proven to be more influential in acquiring L2 dialectal forms (Howard et al., 2013). Input activates the internal mechanism for second language acquisition (Ellis, 2008) and fosters the development of competences and mental representations (Patten & Benati, 2010). Furthermore, learners need to process the input to convert it into intake (VanPatten et al., 2020), and instruction restricted to articulatory explanations does not offer that. In Schmidt (2011), metalinguistic knowledge predicted the perception accuracy of participants in levels three to five who had at least one metalinguistic course and had reported between 4.5 and 15.5 (M = 10) months of living abroad. Hence, metalinguistic knowledge also needs exposure to aspirated input in order to stand out. Otherwise, its contribution is limited to raising students’ awareness of the aspirated phone’s pronunciation.
Research questions number 4, 7, and 8 examined whether the perception of the aspirated coda /s/ is equally challenging in all environments and the word sets. Additionally, research question number 8 established the hierarchy of environments’ difficulty for perception. The within word set got statistically significant better scores than those of the between word set (resyllabified ones) across the three groups. The results supported the hypothesis for research questions number 4, 7, and 8 in that salience shaped perception in the within word set. However, the present study provides evidence to define salience in two separate forms. The first one is stress, which makes a syllable longer, louder, and higher in pitch (Ortega-Llebaria & Prieto, 2007). It accounts for statistically significant perception in the stressed word medial and stressed word final environments. However, stress does not explain the second form of salience, which makes a syllable prominent for perception as well. That second form may be due to phonological factors such as the realization of voiceless stops and vowel lengthening, for which this study does not offer evidence, such as an acoustic analysis. They may account for the statistically significant perception in the unstressed word medial environments given the presence of the clusters -st and sc, so the hypothesis for this environment was met. Similarly, in Escalante (2018) the unstressed word final environment before consonants (49.1%) got the second highest score despite being non-salient. Why? The closure stage of the realization of voiceless stops in the -st and -sc clusters produces a blockage effect on the glottal turbulence of the aspirated /s/ that signals that the space after the nucleus of one syllable and the onset of the following one is filled, making the aspiration more salient (Escalante, 2018). Participants in Schmidt (2011) and Escalante (2018) got statistically significant perception in the stressed word medial environment. In vowel lengthening, the compensation for losing a consonant in the coda lengthens the
preceding vowel in the same syllable and makes it more salient for perception (Figueroa, 2000; Hammond, 1978; Hayes, 1989).

In addition, L1 input frequency could influence the perception accuracy of the limited number of participants who spent time in Spanish-speaking or s-weakening regions. Since aspiration is more frequent word medially in Spanish (stressed and unstressed) (Alba, 2000; Fontanella de Weinberg, 1967; Poplack, 1980; Terrell, 1978b), L2 listeners who got exposure from -aspiring speakers got used to hearing it in these environments, so if they perceived it, it was likely there. Chappell (2016) showed that L1 Miskitu-L2 Spanish participants aspirated the coda s between words that they were more exposed to in Nicaraguan Spanish (e.g., paz eterna [pa.he.'ter.na] ‘eternal peace’). Nevertheless, this hypothesis cannot be confirmed in the current data as time spent abroad did not have a statistically significant effect on aspirated /s/ perception.

On the other hand, resyllabified environments (between words) were challenging for the L2 participants. The first challenge this environment posed lies in the difficulty in segmenting aspirated resyllabified environments where the coda of one syllable becomes the onset of the next one (e.g., es otro [e.'so.tro] ‘it is another’) (Barrutia & Terrell, 1994; Morgan, 2010). Hence, the hypothesis for these environments in research question number 4 was met. Escalante (2018) reinforces this finding with participants performing poorly in the unstressed word final context before vowels (15.5%). Additionally, because participants´ L1 parsing strategy relies on onsets to parse spoken stimulus, they interpret the resyllabified segment in las alas [la.'ha.las] ‘the wings’ as jalas [xa.las] ‘you pull’ (Dumay et al., 2001; Norris et al., 1997), distracting or delaying the listener from getting the right word alas [a.las] ‘wings.’ The second challenge is concerned with the absence of salience in the unstressed resyllabified environment. The prosodic stress affected
the scores in the resyllabified environment to certain extent since its salient character made it less challenging than the unstressed resyllabified.

Finally, the hierarchy of difficulty ranked the environments from the least challenging or most conducive for perception to the most challenging ones. There were no statistically significant differences between the environments in the within word set, but the within word set was statistically significant better than the between word set. Figure 18 shows the hierarchy of difficulty from the easiest to the most challenging environments based on the perception task scores and the pairwise t-test (Bonferroni)\textsuperscript{20} and built as follows: 1) Unstressed word medial (74%), 2) Stressed word final (68%), 3) Stressed word medial (62%), 4) Stressed resyllabified (45%), 5) Unstressed resyllabified (28%).

**Figure 18**

*Hierarchy of difficulty for the population*

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\textsuperscript{20} The same procedure used for the groups was followed for setting up the hierarchy for the population: the percentages of correct responses were calculated and two pairwise t-tests were run (Bonferroni): one for the category and one for the environment variables.
These hierarchy partially confirms the hypothesis for research question number 8 in that the unstressed word medial environment favored perception accuracy, but its place in the hierarchy was not predicted to be in the first one as it is. In addition, this hierarchy resembles Escalante’s (2018) results with the within word set favoring perception accuracy, but the between word set (before vowels) disfavoring it: stressed word medial (70.7%), unstressed word final before consonants (49.1%), unstressed word final before pauses (27.7%) or unstressed word final before vowels (15.5%). While the stressed word medial environment got 62% in the present study, Escalante (2018) got 70.7%. In the unstressed resyllabified, the participants obtained 28% in the present study, while Escalante (2018) got 15.5%. The other two environments in Escalante (2018) are different from the other environments of the present study, so they cannot be compared. These results confirm the ease of perceiving the aspirated coda /s/ in the stressed word medial environment and the high difficulty posed by the between word environments before vowels.

Moreover, three possible scenarios can describe the role of the prosodic stress and phonological factors, which are thought to influence the perception of the aspirated coda /s/. In the first scenario, the prosodic stress alone favored perception accuracy in stressed environments (stressed word medial and stressed word final), and the phonological factors accounted for perception accuracy in the unstressed word medial environment. In the second scenario, the prosodic stress combines with the phonological factors to account for perception accuracy in the stressed environments within words, while the phonological factors alone were responsible for perception accuracy in the unstressed word medial environment. In the third scenario, the prosodic stress affected perception in the resyllabified environments. In spite of being challenging for perception, participants did slightly better in the stressed resyllabified
environment than in the unstressed one, possibly due to its salience. Escalante (2018) provides the main empirical evidence to support part of these three scenarios since her participants reached statistically significant perception in stressed word medial and performed poorly between word before vowels. She attributes perception accuracy in the within word set to stress, the realization of voiceless stops, vowel lengthening, and possibly post-aspiration. Because no acoustic analysis was conducted neither in the present study nor in Escalante (2018), more research is needed to confirm this claim.

Research question number 5 sought to determine whether the Spanish L2 participants understood that the aspirated coda /s/ is a dialect trait, not a deficit. Dialect got the highest scores, and the three Spanish L2 groups perceived the aspirated phone as a dialect, either “same dialect as mine” or “different dialect from mine.” Across the board, the groups’ scores were similar (beginner group = 95%, advanced = 88%, linguistics group = 94%). However, it is interesting that the linguistics group obtained a higher score than the advanced group did. The fact that the linguistics group took “Introduction to Hispanic Linguistics” (intermediate course) and the advanced group did not could account for that difference. However, it is unclear why this alleged advantage was not observed in the perception task scores, which had the advanced group with 64% and the linguistics group with 62%. Probably, the metalinguistic knowledge helped a little, but it was not sufficient to raise the task perception scores. On the other hand, because the beginner group was unsuccessful at perception, their high scores for the dialect option most likely occurred by chance and were irrelevant to the analysis. This item was absent in previous studies and represents an advance in the study of aspiration since its results can impact assimilation. If listeners perceive the target phone as a deficit, they may ignore it; and consequently, they will not learn it. However, in
the present study, almost none of the participants thought it was a deficit, which means that most will likely assimilate it if they need to.

Research question number 6 compared the three groups’ comprehensibility ratings of the aspirated coda /s/, but no significant differences were found. Consistently in the three groups, seventy percent of the responses centered on the middle categories (“average,” “difficult,” and “easy”), and the high degree categories (“extremely difficult,” “very difficult,” “extremely easy,” and “very easy”) received fewer responses. As the beginner group failed at the task, obtaining similar comprehensibility ratings to those of the advanced and linguistics groups shows their unawareness of the presence of the aspirated coda /s/, so those ratings were given by chance. Hence, the hypothesis for this research question was not fully met. On the contrary, the similarity in comprehensibility results by the advanced and linguistics groups are consistent with their intelligibility scores (advanced group = 64, linguistics group = 62).

These results differ from those of Trimble (2014) and Zampini (2010), the only studies addressing comprehensibility. In Trimble (2014), the intermediate and advanced groups rated the Caribbean dialect as difficult despite doing relatively well in the intelligibility task, while in Rasmussen and Zampini (2010) both groups provided high comprehensibility ratings. Unlike Rasmussen and Zampini (2010), in Trimble (2014) the participants had to rate several dialects. Hence, the difficult ratings for the Caribbean dialect showed participants’ view about it compared with the other dialects.

Research question number 9 investigated the contribution of biographical variables that contribute to the perception of the aspirated coda /s/. The results show that social group conditioned the aspirated /s/ perception. Participants that interacted socially, whether at home, with family or with friends in Spanish were more likely to be able to perceive the aspirated /s/.
While it is unknown what type of Spanish input the students that interacted outside of the classroom socially in Spanish received, if they received input from individuals who speak aspiring dialects, this would certainly lead them to achieve higher perception scores. This hypothesis, however, remains to be confirmed in future studies.

Unlike Schmidt (2011), in the present study, time spent in Spanish-speaking regions was not statistically significantly for perception. Why? Probably because participants in this study had not spent sufficient time in s-weakening regions (beginner group = 0.89 weeks, advanced = 1.25 weeks, linguistics group = 4.67 weeks). In fact, it is uncertain whether they spent time in s-weakening regions since the places they reported have both conservative and aspiring dialects, and the biographical information section did not ask them which specific dialect they were exposed to. Hence, this study’s results are not comparable to Schmidt (2011) in that regard.

Additionally, of the 40 students in the advanced and linguistics groups, 23 did not report any time spent in Spanish-speaking regions, showing an uneven distribution. In Schmidt (2011), successful participants spent 4.5 and 15.5 months on average in s-weakening regions. In Escalante (2018), the study was conducted during a year-long immersion program, with the successful participants having advanced proficiency and at least two weeks of interaction with Spanish speakers before the immersion. In Trimble (2014), of the four advanced participants who succeeded at the task, three participants had spent one semester in Venezuela and one student five months in Chile.

Other factors can also account for the statistically insignificant contribution of time spent in Spanish-speaking regions. Previous research suggests that L2 learners may not assimilate a second language phone even if they get immersed in the target language community owing to reasons, such as: negative feelings towards the dialect speakers, limited contact with native
Spanish speakers, emphasis on native-like pronunciation (Drummond, 2012; Fox & McGory, 2007; Knouse, 2012; Wolfram et al., 2004). Therefore, their experience abroad did not help them boost their perception task scores. This could be the case of a limited number of participants who reported time spent in Spanish-speaking regions but failed at the task, although this study does not include that specific analysis. Finally, the hypothesis for this research question was partially met since time spent in Spanish-speaking regions was not statistically significant, but social group was.
CHAPTER VI

CONCLUSION

This chapter summarizes the main findings of the present study and suggests future research directions. The factors that shaped the perception of the aspirated coda /s/ by Spanish L2 learners are higher language proficiency, word set, environment, and social group.

Language proficiency was one of the main responsible factor for perceiving the aspirated allophone. The advanced and linguistics groups were capable of noticing the aspirated allophone in the input and demonstrated that were ready for the one-to-two or more form meaning associations (Andersen, 1984, 1990; Bardovi-Harlig, 2017) and advanced in the vertical and horizontal continuum (Young, 1988) and the Type I variation frameworks (Adamson & Regan, 1991). Because in this study time spent Spanish-speaking regions was not statistically significant, higher language proficiency appears as the most contributing variable for perception accuracy. Additionally, exposure to instructors from various Latin American countries maybe reinforced the effect of higher language proficiency. That is, being used to listening to various Spanish dialects allows learners to develop listening skills that can facilitate dialect perception.

The present study refines the role of the phonological environment (word set and environment variables) in the perception of s-aspiration by Spanish L2 learners, which Escalante (2018) started investigating. It distinguishes between the within word set and the between word set, with the former being more conducive to perception than the latter. The prosodic stress and maybe other phonological phenomena (vowel lengthening and the realization’s effect of
voiceless stops) were responsible for the perception accuracy in the within word set. The fact that an unstressed environment was statistically significant shows that an unstressed environment can become salient for perception, possibly due to phonological phenomena. Additionally, the present study draws attention to the difficulties that resyllabification poses for perception, which due to L1 parsing strategies were the most challenging.

Interacting at home, with family or with friends is likely to contribute to the perception of s-aspiration, although it is uncertain whether participants in this study had encounters with s-weakening speakers. Furthermore, since time spent in Spanish-speaking regions does not seem to be a requisite for the perception of s-aspiration as it was in previous studies, higher language proficiency and social interaction (social group) are the most important predictor of the perception of s-aspiration.

The main contributions of this research deal with new insights into the perception of s-aspiration, such as the role of language proficiency, social interaction (social group), environments, word set. The results of the present study reveal that higher language proficiency and social interaction (social group) are sufficient for perceiving the aspirated coda /s/ within but not between words. Furthermore, perception accuracy depends on the word set. In real life, Spanish L2 learners interacting with s-aspiring speakers are likely to have perception difficulties in the resyllabified environments, if the exchange of utterances contains words that sound ambiguous. Successful perception of the aspirated coda /s/ does not necessarily seem to require time spent in s-weakening or Spanish-speaking regions. Instead, social interaction (social group) with Spanish speakers and higher language proficiency are even more important. The fact that social group resulted statistically significant, and that it is unknown whether participants interacted with s-aspiring speakers could support this bold claim, although more research needs
to be done. Additionally, unlike previous studies, the task type in the present study allowed testing perception using actual phrases and sentences that resemble content from real life. Using perceptually ambiguous pairs of utterances in the task avoided the facilitation effect of lexical knowledge, which is thought to aid perception. Escalante (2018) used pseudowords to investigate the perception of the aspirated coda /s/ in various environments in an effort to prevent that effect. Hence, this task represents a step forward in the research into the perception of the aspirated allophone perception.

Of course, limitations are noticed in this study. The present study needed to include a larger control group with more participants to compare with the performance of the L2 learners. The control group in the present study was small (N = 8), and the perception task scores were only used to pinpoint the most challenging environments and items, but they were not included in the statistical model due to their size. Another limitation deals with the environments not included in this research. Escalante (2018) investigated the unstressed word final environment before consonants and before pauses. In designing a task with ambiguous pairs of phrases and sentences that sound alike, those two environments were not included here because it was difficult to find stimuli that fit with them. Hence, future studies should include more tasks and environments.

The pedagogical implications in this research consist of two specific recommendations for classroom practices. Suggestions arise as a concern for the poor perception accuracy of the participants in this research, mostly in the resyllabified environments. The first one is about teaching resyllabification as part of the elementary and intermediate Spanish courses. Instructors spend most instruction time emphasizing grammar and conversation, and textbooks do not usually devote time to teaching prosodic features. Being good at resyllabifying phrases can better
prepare participants for aspiration tasks. That is, the former could be the prerequisite stage for
the latter. The second pedagogical implication is concerned with the incorporation of linguistic
analysis that can accompany the cultural sections about the Caribbean or Southern Spain. This
model includes a brief presentation, explanation, and practice of the aspirated coda /s/. The
presentation consists of telling students where Spanish speakers speak this dialect. The
explanation provides modeling the production of the aspirated coda /s/, including simple
explanations of articulatory features. Finally, the practice stage consists of a brief perception test
similar to some task items presented here. Aspiration exposure is part of natural conversation for
a more expansive repertoire of language variation to improve listening skills (Gilmore, 2004;
Valdman, 2003).

Finally, future studies should continue investigating the factors that aid the perception of
s-aspiration. Particularly, it is necessary to confirm the role of higher language proficiency
defined as advanced listening skills with exposure to different dialects that do not necessarily
include the s-aspirated coda /s/. That type of research needs to compare two groups of
participants with higher language proficiency: one group with exposure to various dialects,
including input from instructors and another group without that exposure. Furthermore, it is
necessary to use more than one aspirated phone in the stimuli since aspiration is a broad dialectal
phenomenon, perception accuracy can vary depending on the number of aspirated phones in the
stimuli. Hence, the stimuli can be more challenging with additional aspirated allophones or
combined with other dialectal phenomena, such as consonant deletion, as it occurs in real life.
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REFERENCES


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Appendix A: Biographical Information

Participant’s number: ________

Biographical information

Read each item carefully and provide the requested information:

1. Gender: masculine______ feminine_____ other____________
2. Date of birth: month_____ day_____ year_____
3. Age_____
4. Do you speak any languages other than English and Spanish?
   If so, what? ______________
5. Do your relatives speak Spanish? Yes_____ No_____
6. Are you a heritage speaker? Yes_____ No_____
7. How many years have you been learning Spanish?
   1 year_____ 2 years_____ More than 2 years? How many? ______
8. How many Spanish courses have you taken in the university? ____________
9. Have you taken any linguistics class such as phonology or Spanish linguistics?
   Yes_______ No_______ If so, Which class (es)? _________________
10. Do you interact in Spanish outside of Spanish class?
    If so, where? ______________
11. Do you watch television in Spanish? Yes___ No_______
    If so, how often? ______________
12. Do you read newspapers in Spanish? Yes___ No_______
    If so, how often? ______________
13. Do you listen to music in Spanish? Yes___ No_______
    If so, how often? ______________
14. Have you been in a Spanish-speaking country?
    If so, which one (include the region/city)? ______________
    How long? ______________

21 Heritage language: A heritage language is a minority language (either immigrant or indigenous) learned by its speakers at home as children. The speakers grow up with a different dominant language in which they become more competent. They may develop different levels of proficiency of their heritage language, ranging from passive abilities (understanding but not speaking) to a strong level of fluency (Adapted from Wikipedia).
Appendix B: Perception Task

Directions: You will listen to a set of statements in Spanish. Choose the one sentence you think you hear out of the group. In addition, rate the degree of difficulty in understanding the statement you hear and answer the yes-no question.

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<tr>
<th>Item 1</th>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
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</table>
| a. El pasto está bonito.  
| b. El pato está bonito.  
| This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds. |

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<th>Item 2</th>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
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</thead>
</table>
| a. Dijo que caminará al parque.  
| b. Dijo que caminará al parque.  
| This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds. |

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<th>Item 3</th>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
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</table>
| a. Estado de emergencia  
| b. He estado de emergencia.  
| This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds. |

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<tr>
<th>Item 4</th>
<th>Extremely difficult</th>
<th>Very difficult</th>
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<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
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</table>
| a. Habla muy despacio.  
| b. Hablan muy despacio.  
| This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds. |

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<th>Item 5</th>
<th>Extremely difficult</th>
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<th>Average</th>
<th>Easy</th>
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| a. El bus que está en el puerto  
| b. El buque está en el puerto.  
| This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds. |

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<th>Item 6</th>
<th>Extremely difficult</th>
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<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
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<th>Extremely easy</th>
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</table>
| a. Deseo que vuelva.  
| b. Deseo que vuelvan.  
<p>| This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds. |</p>
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<th>Item</th>
<th>Extremely difficult</th>
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<td>Profesor, escuche el comentario</td>
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<td>b.</td>
<td>Profesor, escuché el comentario</td>
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<td>This speaker: a.<strong><strong>does not have problems with pronunciation and speaks the same Spanish dialect as me, b.</strong></strong> does not have problems with pronunciation and speaks a different Spanish dialect as me, and c._______ has difficulties with pronouncing certain sounds.</td>
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<td>a.</td>
<td>Hemos orado mucho.</td>
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<td>b.</td>
<td>He mejorado mucho.</td>
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<td>This speaker: a.<strong><strong>does not have problems with pronunciation and speaks the same Spanish dialect as me, b.</strong></strong> does not have problems with pronunciation and speaks a different Spanish dialect as me, and c._______ has difficulties with certain sounds.</td>
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<td>Han comido mucho pan.</td>
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<td>b.</td>
<td>Ha comido mucho pan.</td>
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<td>las jaulas de estudiantes</td>
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<td>Las aulas de estudiantes</td>
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<td>This speaker: a.<strong><strong>does not have problems with pronunciation and speaks the same Spanish dialect as me, b.</strong></strong> does not have problems with pronunciation and speaks a different Spanish dialect as me, and c._______ has difficulties with pronouncing certain sounds.</td>
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<td>No le gustó.</td>
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<td>b.</td>
<td>No le gusto.</td>
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<td>This speaker: a.<strong><strong>does not have problems with pronunciation and speaks the same Spanish dialect as me, b.</strong></strong> does not have problems with pronunciation and speaks a different Spanish dialect as me, and c._______ has difficulties with pronouncing certain sounds.</td>
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<td>Tengo muchos gatos.</td>
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<td>b.</td>
<td>Tengo muchos gastos.</td>
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<td>This speaker: a.<strong><strong>does not have problems with pronunciation and speaks the same Spanish dialect as me, b.</strong></strong> does not have problems with pronunciation and speaks a different Spanish dialect as me, and c._______ has difficulties with pronouncing certain sounds.</td>
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<td>This speaker: a.<strong><strong>does not have problems with pronunciation and speaks the same Spanish dialect as me, b.</strong></strong> does not have problems with pronunciation and speaks a different Spanish dialect as me, and c._______ has difficulties with pronouncing certain sounds.</td>
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</tbody>
</table>
Item 14

<table>
<thead>
<tr>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
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<tbody>
<tr>
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<td>o</td>
<td>o</td>
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<td>o</td>
<td>o</td>
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</tbody>
</table>

a. La mitad del camino
b. La amistad del camino

This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ______ has difficulties with pronouncing certain sounds.

Item 15

<table>
<thead>
<tr>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
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</thead>
<tbody>
<tr>
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<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

a. Insistí en que saqué una buena nota.
b. Insistí en que saqué una buena nota.

This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ______ has difficulties with pronouncing certain sounds.

Item 16

<table>
<thead>
<tr>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>o</td>
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<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

a. El queso es delicioso.
b. Es que eso es delicioso.

This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ______ has difficulties with pronouncing certain sounds.

Item 17

<table>
<thead>
<tr>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
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</thead>
<tbody>
<tr>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

a. Estoy cansao.
b. Estoy cansado.

This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ______ has difficulties with pronouncing certain sounds.

Item 18

<table>
<thead>
<tr>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>o</td>
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<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

a. Nos hablamos los lunes.
b. No hablamos los lunes.

This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ______ has difficulties with pronouncing certain sounds.

Item 19

<table>
<thead>
<tr>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

b. Buscó los bolígrafos.

This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ______ has difficulties with pronouncing certain sounds.

Item 20

<table>
<thead>
<tr>
<th>Extremely difficult</th>
<th>Very difficult</th>
<th>Difficult</th>
<th>Average</th>
<th>Easy</th>
<th>Very easy</th>
<th>Extremely easy</th>
</tr>
</thead>
<tbody>
<tr>
<td>o</td>
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<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

a. Las alas de la parte trasera
b. las jalas de la parte trasera

This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ______ has difficulties with pronouncing certain sounds.
**Item 21**

1. El mal es azul.
2. El mar es azul.

This speaker: **a.** does not have problems with pronunciation and speaks the same Spanish dialect as me, **b.** does not have problems with pronunciation and speaks a different Spanish dialect as me, and **c.** has difficulties with pronouncing certain sounds.

**Item 22**

1. Un cisne cerca del lago
2. Un cine cerca del lago

This speaker: **a.** does not have problems with pronunciation and speaks the same Spanish dialect as me, **b.** does not have problems with pronunciation and speaks a different Spanish dialect as me, and **c.** has difficulties with pronouncing certain sounds.

**Item 23**

1. No contesto el teléfono.
2. No contestó el teléfono.

This speaker: **a.** does not have problems with pronunciation and speaks the same Spanish dialect as me, **b.** does not have problems with pronunciation and speaks a different Spanish dialect as me, and **c.** has difficulties with pronouncing certain sounds.

**Item 24**

1. Sus patillas son buenas.
2. Sus pastillas son buenas.

This speaker: **a.** does not have problems with pronunciation and speaks the same Spanish dialect as me, **b.** does not have problems with pronunciation and speaks a different Spanish dialect as me, and **c.** has difficulties with pronouncing certain sounds.

**Item 25**

1. Está ahogao.
2. Está ahogado.

This speaker: **a.** does not have problems with pronunciation and speaks the same Spanish dialect as me, **b.** does not have problems with pronunciation and speaks a different Spanish dialect as me, and **c.** has difficulties with pronouncing certain sounds.

**Item 26**

1. Margarita es la más bonita.
2. Margarita isla más bonita.

This speaker: **a.** does not have problems with pronunciation and speaks the same Spanish dialect as me, **b.** does not have problems with pronunciation and speaks a different Spanish dialect as me, and **c.** has difficulties with pronouncing certain sounds.

**Item 27**

1. Cuente conmigo mañana
2. Cuenten conmigo mañana

This speaker: **a.** does not have problems with pronunciation and speaks the same Spanish dialect as me, **b.** does not have problems with pronunciation and speaks a different Spanish dialect as me, and **c.** has difficulties with pronouncing certain sounds.
Item 28
a. Siempre limpien aquí.
b. Siempre limpie aquí.

This speaker: a. ____ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ____ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds.

Item 29
a. ¿Vas a cenar con nosotros!
b. Baja a cenar con nosotros.

This speaker: a. ____ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ____ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds.

Item 30
a. Canta bien en eventos.
b. Cantan bien en eventos.

This speaker: a. ____ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ____ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds.

Item 31
a. Tu sí les haces una historia.
b. Tu sí lees y haces una historia.

This speaker: a. ____ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ____ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds.

Item 32
a. Está pintao.
b. Está pintado.

This speaker: a. ____ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ____ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds.

Item 33
a. ...hasta los zapatos rojos
b. Ata los zapatos rojos.

This speaker: a. ____ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ____ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds.

Item 34
a. ¿Pór qué escribe así?
b. ¿Pór qué escriben así?

This speaker: a. ____ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ____ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. _______ has difficulties with pronouncing certain sounds.
Item 35
a. El pecado causa problemas.
   Easy
b. El pescado causa problemas.
   Average

This speaker: a.___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ________ has difficulties with pronouncing certain sounds.

Item 36
a. Un viaje corto
   Easy
b. Un viaje colto
   Very easy

This speaker: a.___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ________ has difficulties with pronouncing certain sounds.

Item 37
a. A los amigos en el hotel.
   Easy
b. Aloja amigos en el hotel.
   Very easy

This speaker: a.___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ________ has difficulties with pronouncing certain sounds.

Item 38
a. Quiero que haga la tarea.
   Easy
b. Quiero que hagan la tarea.
   Very easy

This speaker: a.___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ________ has difficulties with pronouncing certain sounds.

Item 39
a. ¿Qué es esto?
   Average
b. ¿Qué gesto?
   Very easy

This speaker: a.___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ________ has difficulties with pronouncing certain sounds.

Item 40
a. Tiene dos computadores.
   Very easy
b. Tienen dos computadores.
   Extremely easy

This speaker: a.___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ________ has difficulties with pronouncing certain sounds.
Item 41

a. ¡Sí es esta, quiero quedarme!

b. ¡Ciesta, quiero quedarme!

This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ______ has difficulties with pronouncing certain sounds.

Item 42

a. Ojalá juegue hoy.

b. Ojalá jueguen hoy.

This speaker: a. ___ does not have problems with pronunciation and speaks the same Spanish dialect as me, b. ___ does not have problems with pronunciation and speaks a different Spanish dialect as me, and c. ______ has difficulties with pronouncing certain sounds.
### Appendix C: Target Items in the Perception Task

<table>
<thead>
<tr>
<th>Environment</th>
<th>Translation</th>
<th>Wrong interpretation</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stressed word medial</strong> Item 1</td>
<td>El pasto está bonito.</td>
<td>The grass is beautiful.</td>
<td>El pato está bonito.</td>
</tr>
<tr>
<td>[el.'pah.to.es.'ta.βo.'ni.to]</td>
<td></td>
<td>[el.'pa.to.es.'ta.βo.'ni.to]</td>
<td>The duck is beautiful</td>
</tr>
<tr>
<td>Item 12</td>
<td>Tengo muchos gastos</td>
<td>I have many expenses</td>
<td>Tengo muchos gatos</td>
</tr>
<tr>
<td>[t'en.go.'mu.ʃo.z.'ya.ʃ.to]</td>
<td></td>
<td>[t'en.go.'mu.ʃo.z.'ya.to]</td>
<td>I have many expenditures.</td>
</tr>
<tr>
<td>Item 22</td>
<td>Un cisne cerca del lago</td>
<td>A swan near the lake</td>
<td>Un cine cerca del lago</td>
</tr>
<tr>
<td>[un.'si.h.ne.'ka.ðel.'la. yo]</td>
<td></td>
<td>[un.'si.ne.'ser.ka.ðel.'la.yo]</td>
<td>A movie theater near the lake</td>
</tr>
<tr>
<td>Item 33</td>
<td>…hasta los zapatos rojos</td>
<td>…even the red shoes</td>
<td>Ata los zapatos rojos</td>
</tr>
<tr>
<td>['a.ta.lo.sa.'pa.tos.'ro.xos]</td>
<td></td>
<td>['a.ta.lo.sa.'pa.tos.'ro.xos]</td>
<td>tie the red shoes.</td>
</tr>
<tr>
<td><strong>Unstressed word medial</strong> Item 3</td>
<td>Estado de emergencia</td>
<td>State of emergency</td>
<td>He estado de emergencia</td>
</tr>
<tr>
<td>[e.es.'ta.ðo.ðe.e.mer.'xe.n.sja]</td>
<td></td>
<td>[e.es.'ta.ðo.ðe.e.mer.'xe.n.sja]</td>
<td>I have been in a critical condition</td>
</tr>
<tr>
<td>Item 14</td>
<td>La amistad del camino</td>
<td>The friendship of the road</td>
<td>La mitad del camino</td>
</tr>
<tr>
<td>[la.mi.'aθ.ðel.ka.'mi.no]</td>
<td></td>
<td>[la.mi.'aθ.del.ka.'mi.no]</td>
<td>The halfway point</td>
</tr>
<tr>
<td>Item 24</td>
<td>Sus pastillas son importantes.</td>
<td>His pills are important to him.</td>
<td>Sus patillas son importantes.</td>
</tr>
<tr>
<td>[s.us.pah.'ti.jas.so.nim.por.'tan.tes]</td>
<td></td>
<td>[s.us.pa.'ti.jas.so.nim.por.'tan.tes]</td>
<td>His sideburns are important to him.</td>
</tr>
<tr>
<td>[el.peh.'ka.ðo.'kaw.sa.pro.'ble.mas]</td>
<td></td>
<td>[el.pe.'ka.ðo.'kaw.sa.pro.'ble.mas]</td>
<td>Sin causes problems.</td>
</tr>
<tr>
<td><strong>Stressed word final</strong> Item 5</td>
<td>El bus que está en el puerto.</td>
<td>The bus that is in the port.</td>
<td>El buque está en el puerto.</td>
</tr>
<tr>
<td>[el.'buh.ke.es.'ta.e.'nel.'pwer.to]</td>
<td></td>
<td>[el.'buh.ke.es.'ta.e.nel.'pwer.to]</td>
<td>The ship is in the port.</td>
</tr>
<tr>
<td>Item 16</td>
<td>Es que eso es delicioso.</td>
<td>It is that it is delicious.</td>
<td>Es queso delicioso.</td>
</tr>
<tr>
<td>['ch.ke.'e.so.ez.de.li.'sjo.so]</td>
<td></td>
<td>['es.ke.so.'ð e.li.'sjo.so]</td>
<td>It is delicious cheese.</td>
</tr>
</tbody>
</table>
**Item 26**
Margarita es la más bonita.
Margarita is the prettiest.
Margarita isla más bonita.
Margarita, most beautiful island

**Item 39**
¿Qué es esto?
What is this?
¿Qué gesto?
What a gesture?

**Unstressed resyllabified**
**Item 8**
Hemos orado mucho.
We have prayed a lot.
He mejorado mucho.
I have improved a lot.

**Item 18**
Nos hablamos los lunes.
We will talk on Mondays.
No hablamos los lunes.
We don’t talk on Mondays.

**Item 29**
¿Vas a cenar con nosotros!
You are going to have dinner with us!
Baja a cenar con nosotros.
Come down to have dinner with us!

**Item 37**
A los amigos en el hotel
Aloja amigos en el hotel.
Put up your friends at the hotel

**Unstressed resyllabified**
**Item 10**
Las aulas de estudiantes
the students’ classrooms
las jaulas de estudiantes
the students’ cages

**Item 20**
Las alas de la parte trasera
the back wings
Las jaulas de la parte trasera.
pull them from behind

**Item 31**
Tu sí les haces una historia.
You do make up a story for them.
Tu sí lees y haces una historia.
You do read and make up a story for them.

**Item 41**
Sí es esta quiero quedarme
If this is the one, I want to stay.
Siesta, quiero quedarme!
A nap, I want to stay

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# Appendix D: Distractor Items

<table>
<thead>
<tr>
<th>Dialectal phenomenon</th>
<th>Translation</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paronyms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 2 Dijo que caminará al parque. He said he would walk to the park. Dijo que caminara al parque. He said that I walk to the park</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 7 Profesor, escuche el comentario Professor, listen to my comment. Profesor, escuché el comentario Professor, I listened to the comment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 11 No le gustó. He did not like it. No le gusto. She doesn’t like me</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 15 Insistí en que saqué una buena nota. I insisted that I got a good grade. Insistí en que saque una buena nota. I insisted that I can get a good grade.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 19 Busco los bolígrafos. I am looking for the pens Buscó los bolígrafos. He looked for the pens.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 23 No contesto el teléfono. I do not answer the phone. No contestó el teléfono. She did not answer the phone.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Singular and plural verb distinction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 4 Habla muy despacio. She speaks slowly. Hablan muy despacio. They speak slowly.</td>
</tr>
<tr>
<td>Item 6 Deseo que vuelva. I wish she comes back. Deseo que vuelvan. I wish they come back.</td>
</tr>
<tr>
<td>Item 9 Han comido mucho pan. They have eaten so much bread. Ha comido mucho pan. She has eaten so much bread.</td>
</tr>
<tr>
<td>Item</td>
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<tr>
<td>--------</td>
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<tr>
<td>13</td>
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<td>36</td>
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<tr>
<td>17</td>
</tr>
<tr>
<td>Item 25</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Está ahogao. He is drown</td>
</tr>
<tr>
<td>[es.'ta.a.o.'ya o]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 32</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Está pintao. It is painted.</td>
<td>Está pintado.</td>
</tr>
<tr>
<td>[es.'ta.pin.'ta.o]</td>
<td>[es.'ta.pin.'ta.do]</td>
</tr>
</tbody>
</table>
Appendix E: Biographical Information Section for the native Speakers of Spanish

Participant’s number: ________

Biographical information

Read each item carefully and provide the requested information:

1. Gender: masculine______ feminine_____ other_________________

2. Age______________________________________________________

3. Country of origin: _________________________________________

4. How long have you been in The United States? ________________

5. Do you speak any languages other than English and Spanish? ______
   If so, what? ________________________________
VITA

Work Experience

• August 2020 – May 2023. Spanish Teaching Assistant, University of Mississippi Ole Miss, Oxford, MS, USA.
• August 2016 - May 2018. Spanish Teaching Assistant, West Virginia University, Morgantown, WV, USA.
• January 2010 - June 2016. English Classroom Teacher EAFIT University, Medellín, Colombia.

Education and Training

• May 2018. Master of Arts (TESOL), West Virginia University, Morgantown, WV, USA.
• December 2006. Specialization in English Teaching, University Pontificia Bolivariana, Colombia.
• August 2003. Bachelor of Arts in Modern Languages, University of Cordoba, Colombia.

Paper Presentations


Research Interests

Second language pedagogy, Second Language Phonology, and Spanish variation.