

The Acquisition of Spanish Word-Initial Voiceless Stops:
Adult Language Learners in a Communicative Program

by

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ABSTRACT

This study examined the development and acquisition of second language (L2) sounds by adult students enrolled in a communicative language program. The investigation explored the acquisition of L2 phones by analyzing the voice onset time (VOT) of word-initial voiceless stops in Spanish by native English speakers. A total of 40 subjects participated in the study and were divided into three groups; one group of students enrolled in a first semester course, another group of students enrolled in a third semester course, and the last group enrolled in a fifth semester course. The duration of VOT was compared between groups reading from a word list consisting of 60 words during the 13th to 15th weeks of the semester. Significant differences in VOT were found between the first and fifth semester groups, as well as the third and fifth semester groups suggesting that accurate acquisition of L2 phones and the formation of new phonetic categories are possible for late L2 learners in accordance with the Speech Learning Model.

DEDICATION

This work is dedicated to all who have guided and pushed me along my path.

TABLE OF CONTENTS

	Page
LIST OF TABLES	v
LIST OF FIGURES	vi
CHAPTER	
1 INTRODUCTION	1
2 REVIEW OF LITERATURE	3
Theoretical Framework	3
Spanish and English Voiceless Stops /p, t, k/	4
Communicative Language Teaching	6
Previous Studies on the Acquisition of Voiceless Stops	8
Justification	16
Research Questions	16
3 METHODOLOGY	18
Subjects	18
Instruments	19
Procedures	20
Data Analysis	21
4 RESULTS	24
Demographic Questionnaire	24
Word List	29
5 DISCUSSION	35

CHAPTER	Page
Pronunciation in a Communicative Program.....	35
Acquisition of Short-Lag, Non-Aspirated Voiceless Stops.....	37
Limitations and Future Research	39
6 CONCLUSIONS	41
REFERENCES	42
APPENDIX	
A DEMOGRAPHIC QUESTIONNAIRE	44
B WORD LIST	47

LIST OF TABLES

Table		Page
1.	VOT Values for Native Spanish and English Speakers	5
2.	Difference in Pronunciation of /p, t, k/	25
3.	Description of Difference in Pronunciation of /p, t, k/	26
4.	Pronunciation Instruction of /p, t, k/	27
5.	Description of Pronunciation Instruction of /p, t, k/	28
6.	Descriptive Statistics for VOT	30
7.	Multiple Comparisons Tukey HSD Class	33
8.	Multiple Comparisons Tukey HSD PoA	34

LIST OF FIGURES

Figure		Page
1.	Waveform of the Spanish Word Queda ‘Stay’	5
2.	VOT Measurement of /k/ in Praat.....	22
3.	Boxplots of VOT Clustered by Class.	31
4.	Line Graph of Estimated Marginal Means of VOT in ms	32

CHAPTER 1

INTRODUCTION

Perhaps one of the first signs that a speaker is a second language (L2) learner and not a native speaker of a given language (L1) is the presence of a foreign accent. A foreign accent typically exists in the speech of an L2 learner who has not mastered the phonology of the target language. While beginners tend to produce a wide variety of articulations that stray from target-like speech because of the influence of their L1, it is expected that advanced learners will produce L2 speech with fewer noticeable contrasts to native speakers.

The cause of errors in pronunciation in the L2 can be explained by Contrastive Analysis (DiPietro, 1971). DiPietro investigated the interactions between languages and described them as falling into three different categories. The first is a feature that is shared by both languages such as the *ch* sound /tʃ/ found in Spanish and English. The second category describes a feature in one language that either does not exist or is represented by a different feature in the other. One example is the phonological distinction in English /b/ versus /v/ which Spanish lacks. The last category is observed when a feature is similar in two languages but differs in detail such as the pronunciation of /u/ in English *too* and Spanish *tú*. These last two interactions between languages are the main factors in the complexity of acquiring a second language.

Perception of differences between the L1 and L2 has also been cited as an important aspect of the acquisition of L2 phonology (Flege, 1995). Some studies have sought to test this relationship proposed by Flege (1995) and found that formal instruction of phonology and phonetics improves acquisition of L2 phones by second

language learners (González-Bueno, 1997a; González-López & Counselman, 2013).

However, many second and foreign language instructors follow the “Communicative Approach.” This model focuses on language use rather than language knowledge and tends to avoid explicit instruction in phonetics and phonology (Elliott, 1997).

Additionally, most research has dealt with intermediate level L2 learners and has neglected to study the acquisition of similar phones in an extended time frame through varying levels of proficiency (Elliott, 1997; González López, 2012; González-López & Counselman, 2013). This study seeks to provide a broader view by investigating the acquisition and development of similar L2 phones by adult students enrolled in a language program based on Communicative Language Teaching (CLT) by examining word-initial voiceless stop production in L2 Spanish by native English speakers.

CHAPTER 2

REVIEW OF LITERATURE

Theoretical Framework

The Speech Learning Model (SLM) was proposed by Flege (1995) to describe the interaction between the phonetic systems of languages. One of the main arguments of the SLM is that learners will perceive L2 phones as the closest phones that exist in L1 based on the hypothesis that learners have only one perceptual space formed by the L1 acquisition process. However, the SLM also states that accurate perception is necessary in order to attain native-like L2 pronunciation. This presents a problem as learners will need to form new phonetic categories in order to correctly perceive and produce L2 speech. However, as the SLM assumes that all of the same motor functions are available to form sounds throughout life, learners will be able to produce target-like speech.

Like the points described by DiPietro (1971), the SLM describes the three possible classifications in comparing phones between the L1 and L2 as identical, new and similar. Identical phones will be readily identified as the learner has already formed an L1 phonetic category that is equivalent. Some examples of identical phones shared by Spanish and English would be the nasals /m/ and /n/ as well as the fricatives /f/ and /s/. Flege (1995) argued that new phones facilitate the creation of a new phonetic category as they fall outside the realm of those already formed during L1 acquisition. New phones for English L1 learners of Spanish L2 would include the trill /r/ and the fricative /x/. Lastly, similar phones are defined by the SLM as phones that differ between languages in their acoustic and audible details. The voiceless stops /p, t, k/ in Spanish and English are considered to be similar phones.

In accordance with the basic tenets of the SLM, similar phones present the most difficult challenges in the acquisition of L2 sounds. These require the creation of new phonetic categories for the L2 that are only slightly different than those of the L1. Additionally, accurate perception of these similar L2 phones can be problematic as they contain variances that are minimal and may not be phonologically significant in the L1. The subtle differences in the articulation of the voiceless stops /p, t, k/ in Spanish and English represent an ideal focus of study.

Spanish and English Voiceless Stops /p, t, k/

Both Spanish and English contain the three voiceless stops /p, t, k/ although they differ slightly in their articulation. The place of articulation is shared by the bilabial /p/ and velar /k/ across both languages. However, /t/ is alveolar in English and dental in Spanish. Lisker and Abramson (1964) further presented differences in Spanish and English voiceless stops in relation to their VOT. VOT is defined as the time between the burst and the beginning of the initial voicing of the following vowel segment as shown in Figure 1.

In all contexts, Spanish voiceless stops are described as having short-lag VOT values and are not perceived as aspirated. In English however, voiceless stops have both short-lag, non-aspirated allophones as well as long-lag, aspirated allophones depending on context. This study focuses on word-initial voiceless stops as they are long-lag and aspirated in English. Table 1 presents the ranges and means (in parentheses) of Spanish and English VOTs for word-initial voiceless stops in milliseconds (ms) found by Lisker and Abramson (1964).

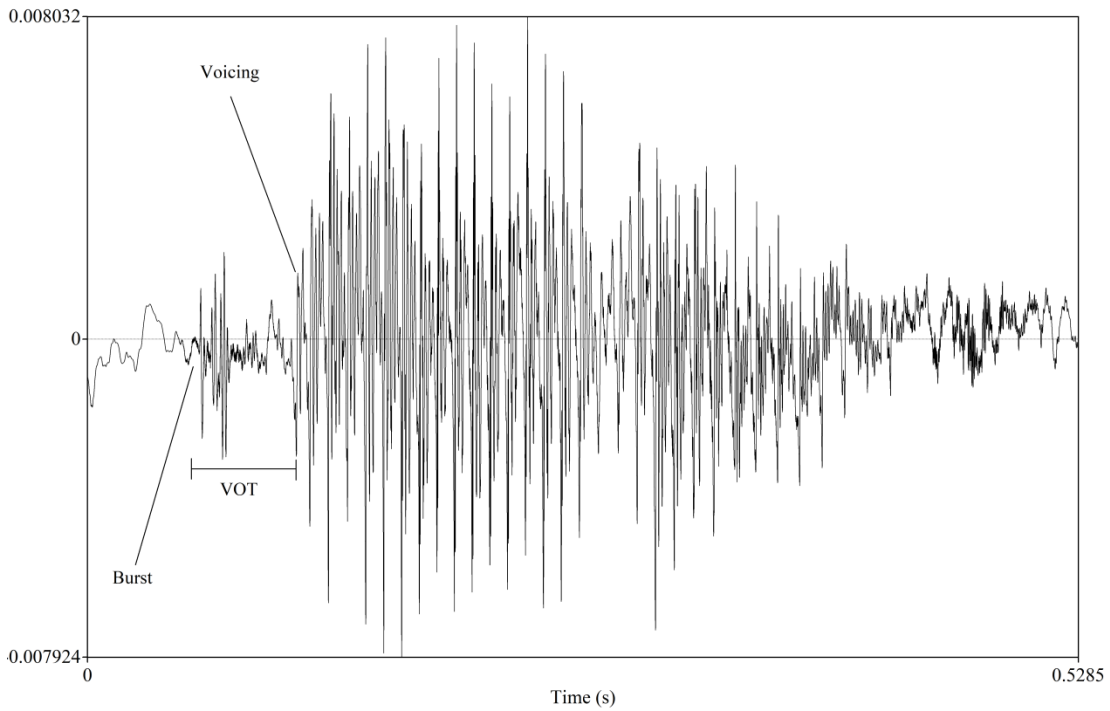


Figure 1. Waveform of the Spanish word queda ‘stay’. Produced by student M1_5.

The data show that although the lower bound for English /p, t/ approaches the upper bound for the range of VOT for Spanish /p, t/ the means differ by 54ms and 61ms

Table 1

VOT Values for Native Spanish and English Speakers

Stop	Spanish	English
	Range (Mean)	Range (Mean)
/p/	0-15 (4)	20-120 (58)
/t/	0-15 (9)	30-110 (70)
/k/	15-55 (29)	30-150 (80)

Note: Adapted from Lisker and Abramson (1964)

respectively. The difference in the mean values for the VOT of /k/ is similar at 51ms, yet there is an overlap in the range between the two languages. The large range of VOT for the voiceless stops in English in contrast with Spanish in Lisker and Abramson (1964) may be influenced by the number of participants in the study as there were four L1 English participants and only one L1 Spanish participant. However, all word-initial voiceless stops are long-lag and aspirated in English while they are short-lag and unaspirated in Spanish as is clearly shown here. This contrast, which may be difficult for L1 English learners of Spanish L2 to perceive and produce, (González-Bueno, 1997b) will be the context under study in this investigation.

The SLM (Flege, 1995) was primarily directed toward the ultimate attainment of native-like L2 pronunciation for advanced learners. However, as the SLM states, the difficulty of perceiving differences between L1 and L2 is proportionate to the age of the learner. Therefore a focus on the acquisition of accurate perception and production of L2 phones which only differ in detail must be sought as early as possible in the learning process. This study focuses on the application of the SLM by studying the acquisition of L2 phones by adult learners from a beginning to a more advanced level in a communicative style program.

Communicative Language Teaching

According to Celce-Murcia, Dörnyei and Thurrell (1997):

CLT grew out of dissatisfaction with earlier methods that were based on the conscious presentation of grammatical forms and structures or lexical items and did not adequately prepare learners for the effective and appropriate use of language in natural communication. (p.144)

Elliott (1997) stated that a lack of focus on pronunciation is prevalent in this model for teaching. CLT focuses on communicative tasks with an emphasis on language use rather than linguistic knowledge. Elliott (1997) described CLT as a “prevailing model for foreign language instruction in the United States” (p. 95). Although VanPatten (2015) argued that this may not be the case currently, he proposed that this is not because communicative methodologies have fallen out of favor in SLA theory but because language programs at major research institutions in the United States are composed of a majority of literature and culture experts compared to faculty members who specialize in linguistics and language acquisition. VanPatten (2015) presented various “fundamental facts” of SLA that appear to support this type of methodology including “that communicative ability cannot be practiced but develops from acts of learning in development” (p. 8). Additionally, Burston (2014) called for a movement toward technologies that more readily facilitate communicative activities in mobile assisted language learning, indicating the continued prevalence of communicative methodologies in present language programs.

Agostinelli (2013) argued that pronunciation instruction has been somewhat marginalized due to the idea that it is not an aspect of language that can be learned, but rather must be acquired. However, recent studies have shown that L2 learners improve pronunciation when formal instruction is included as part of the teaching methodology (Elliot, 1997; González-Bueno, 1997a; González-López & Counselman, 2013).

Regardless, the emphasis in the communicative classroom is not on explicit pronunciation instruction (Agostinelli, 2013). Further research must be conducted

regarding the development of pronunciation among students enrolled in communicatively oriented programs.

Previous Studies on the Acquisition of Spanish Stops

One study that showed results applicable to the process of acquisition of L2 phones was conducted by González-Bueno (1997b). The author studied the effect of variation of temporal characteristics of voiceless stops on the perception of foreignness of discourse. Using a seven point Likert scale, this study explored the reactions of 18 Spanish monolinguals to a recording of a native speaker (NS) of English pronouncing Spanish words. All of the Spanish NS participants resided in Seville (Spain) and while all had university-level instruction experience, none had received specific instruction regarding the articulatory differences between the two languages concerning /k/.

Although the speaker was considered to be at an intermediate level according to The American Council on the Teaching of Foreign Languages (ACTFL), the recording of the word *casa* had been manipulated to present both aspirated and unaspirated /k/ with different voice onset time (VOT) values in order to more accurately define the preferred range of VOT values for perceived, native-like pronunciation. The Spanish native speaker participants rated each Spanish L2 utterance based on its “foreign accentedness” from “most native” to “most foreign” and the means and standard deviations for each were calculated and compared.

A paired t-test was also performed to analyze the effect of both aspiration and VOT on the participants’ perception of the foreignness of speech in González-Bueno (1997b). The results showed a definitive preference by the Spanish NSs for VOT values between 15-35 ms, but aspiration alone did not prove to be a significant factor. Although

the data provide a goal for pronunciation of L2 learners concerning VOT for /k/, further research is needed concerning other phones such as the other voiceless stops in Spanish /p, t/. Additionally, more information regarding the acquisition of L2 phones is necessary to validate further research regarding the perception of “foreign speech” by native speakers.

Elliott (1997) studied the acquisition and teaching of pronunciation in a CLT classroom. He studied the Spanish pronunciation of 66 NSs of English in four different contexts: word repetition, sentence repetition, word reading, and spontaneous production. The experimental group of 43 students received 10-15 minutes of pronunciation instruction regarding the articulatory differences of specific sounds between the two languages each class period throughout the semester. A control group of 23 students received no specific pronunciation instruction. All of the participants were enrolled in university-level intermediate Spanish courses and their utterances were recorded during a pre-test in the second week of the semester and a post-test at the end of the semester were judged by a panel consisting of both native Spanish speakers and highly proficient near native Spanish speakers. The pronunciation for the first three contexts was judged on a three point Likert scale ranging from an incorrect target sound to correct target sound. A five point Likert scale from almost unintelligible to native was used to rate the spontaneous speech portion of the data.

The results of Elliott (1997) were analyzed using an analysis of covariance (ANCOVA) and the experimental subjects improved their overall pronunciation significantly whereas the control group did not. In a more specific analysis, the experimental group improved their pronunciation of the Spanish stops. These results

show the benefit of pronunciation instruction in a CLT classroom but the data were coded based on judgments of native and advanced Spanish speakers. Additionally, only intermediate learners were involved in the study. Furthermore, the time frame studied only consisted of one semester. Future research must investigate the development of pronunciation across a longer period of time and starting at the beginning level. A more refined method such as wave form analysis should also be used to measure pronunciation as it enables improved accuracy and diminishes the subjectivity of the results.

Zampini (1998) investigated L2 Spanish stops by measuring waveforms in order to study the relationship between production and perception. A total of 13 English NSs participated in the study. All of the subjects were students enrolled in a Spanish phonetics course at the University of Arizona. Recordings of 32 sentences split between English and Spanish were read by the students and used to gather data. The English portion was recorded in the second week of the semester. The Spanish sentences were recorded during the third, sixth and fifteenth weeks of the semester. No phonetics instruction regarding the voiceless stops was given until after the third week of the semester. The author measured the digitized waveforms and found significant differences between the English and Spanish /p/ produced by students with a trend toward shorter VOT over the course of the semester. The velar /k/ followed a similar trend but /t/ was not significantly different between the languages. The study concluded that the acquisition of voiceless stops was different across the PoAs. However, this study was conducted with participants from an advanced Spanish phonetics course and results cannot be generalized to other populations such as beginning level students.

González López (2012) investigated the availability of mechanisms to create new phonetic categories in second language learners who had passed the critical period. She completed a statistical analysis comparing the VOT of word initial voiceless stops in both monolingual and code switching (CS) Spanish and English utterances. The 16 participants studied were NS's of English in their 3rd or 4th year of college that were majoring or minoring in Spanish. All of the participants had similar L2 exposure as they had all participated in a study abroad program and were involved in formal classroom training. In addition, the participants were determined to be at an intermediate proficiency level according to guidelines established by ACTFL. Participants were recorded reading sentences on a computer screen and the VOT of the voiceless stops were analyzed and coded according to the place of articulation (PoA), site of code switch and language. The measurements were analyzed via the statistical program SPSS using a three-way repeated-measures analysis of variance (ANOVA). The results of the study showed statistically significant differences between the VOT of word initial voiceless stops in English and Spanish both in monolingual and code switched production.

The results from González López (2012) confirmed that late L2 learners have the ability to form new phonological categories. However, these results come only from intermediate level learners. The author also mentioned that /t/ may need to be researched further as it differs in PoA between the two languages. In addition, there is an overlap in the normally produced VOT for /k/ between the two languages which may have affected the participants' ability to produce VOT values similar to native monolingual speech. These aspects of the phenomena studied should be further analyzed in future research in order to fully consider all factors involved.

One study that concentrated on novice level students' production and perception of L2 sounds was conducted by González López and Counselman (2013). The focus of the research was the effect of explicit training of articulatory phonetics on the production and formation of new phonological categories in L2 Spanish by English NSs. The 26 participants in the study were all enrolled in a second semester Spanish course and considered to be at a novice level according to ACTFL guidelines. A pre-test was administered at the beginning of the semester consisting of 120 sentences divided evenly between English and Spanish with the target voiceless stops in both sentence-initial and sentence-medial positions. During the semester, the treatment group received 10-15 minutes of instruction per week as well as practice at home. A post-test was given at the end of the semester with the same format as the pre-test. The data obtained from the tests were analyzed using the statistical computing program SPSS. A 4-way repeated-measures ANOVA was calculated with the factors of language, site within sentence and PoA being studied in addition to the formal training. The results showed a significant improvement in the VOT in Spanish for the treatment group but not for the control group. However, both groups showed significant differences in VOT for /p, t/ between languages. These outcomes indicate that beginning level students may perceive the difference in similar phones between L1 and L2 and begin to form new categories as a result. However, given that there was no significant change in the Spanish VOTs for the control group between the pre- and post-test, further research must be conducted to study the development of the acquisition of these phones by focusing on learners from more than one level of proficiency.

Kissling (2013) studied the effectiveness of explicit phonetics instruction in the FL classroom for first, second and third year students. The study consisted of 95 adult English NSs studying Spanish at a university in the southeastern United States. A control group of 10 Spanish NSs was used to compare against the students. The participants were split into two groups. The first group received explicit articulatory phonetics instruction via interactive computer modules. The second group received similar computer-based modules that focused on listening and pronunciation activities but excluded any explicit phonetics instruction. The students read a word and short phrase list of 28 items during a pretest, a posttest 3 weeks later and a delayed posttest 6 weeks after the initial pretest. The investigator analyzed 8 phones including the three voiceless stops. VOT was measured manually in Praat. Independent sample t-tests were used to analyze the data. The difference between the Spanish NSs and the subjects was statistically significant for all phones. Additionally, although the VOT improved between the pretest and posttest, the only significant difference in the delayed posttest was found with /k/. The improvement in VOT was measured in both groups of students leading to the conclusion that focused listening tasks with dictation and practice were just as effective as explicit phonetics instruction in improving pronunciation. The effect for pronunciation instruction was the same across all three levels of students. Although no statistical test was performed to compare VOT between levels of proficiency, the mean VOT values of students from the first and second year participants were farther apart than the comparison of the second and third year students which suggests that some level of acquisition of VOT for voiceless stops occurs at earlier stages in learners' development. Future research will need to include statistical tests between these varying proficiency

levels in order to clarify the acquisition process. Furthermore, although the study showed no lasting effect other than for /k/, the time for the treatment and between the pretest and posttests was relatively short. More research examining development and treatment over extended periods of time must be conducted given that most students enroll in courses that last more than just three to six weeks.

Lord (2005) also studied the effect of pronunciation instruction on production by focusing on several sounds in Spanish that are considered to be problematic for most NSs of English including voiceless stops. The participants in this study were 17 university students enrolled in an upper-division Spanish phonetics course. A total of 10 native Spanish speakers were used as a control given that differences in equipment may attribute to different VOT values. The author noted that VOT represents an interesting and different contrast than most because it is not as clearly analyzed being on a scale versus simply present or not as in other Spanish and English contrasts. The study consisted of the reading of a paragraph taken from a novel which was recorded the second day of the semester as a pretest and then again as a posttest at the end of the semester. The phonetics course included the use of voice analysis software, contrasting articulations, transcriptions and self-analysis. Two-tailed t-tests were used to compare both the pretest and posttest against each other and the reading by the control group. The difference between the Spanish NSs and the L2 students' pretest scores was statistically significant. Furthermore, there was no statistically significant difference between the English NSs pretest and posttest VOT. However, the comparison between the students' posttest and the Spanish NSs was significant showing that the participants had attained native-like pronunciation values for VOT. These subjects were advanced learners that had received

explicit phonetics instruction in their course but there was no control group of students of the same proficiency level who received other input and exposure to Spanish. Therefore, it is rather difficult to attribute the ultimate attainment of native-like production by the participants in this study to the pronunciation and phonetics instruction and practice given during the course of the semester. The author suggested that self-analysis with pronunciation would be beneficial to include in future teaching methodologies as well as future research regarding the effects of these types of activities in more novice levels of proficiency.

The acquisition of word-initial voiceless stops in different learning contexts was studied by Díaz-Campos (2004). The investigation focused on 46 English NSs who were studying Spanish at the university level although the author does not qualify the participants according to any proficiency level. 26 of the students were studying abroad in Spain (SA) and 20 were studying at the University of Colorado in the United States (AH). The task used to elicit data was the reading of a paragraph consisting of 60 targets among which were various elements deemed to be difficult for native English speakers. Unlike previous studies mentioned, the investigator did not use VOT measured as an interval. VOT was designated as either aspirated (long-lag) or non-aspirated (short-lag) in order to fit the logistic regression analysis using VARBRUL which only accepts binary variables given that it is normally used in sociolinguistic variation studies. The results of the analysis showed that students in both learning contexts favored the use of non-aspirated VOT at the end of their term versus the beginning. The AH subjects had a stronger trend to improvement than the SA subjects which the author suggested was impacted by other factors such as amount of time with formal instruction and age of first

exposure. Although the use of logistic regression analysis required the conversion of VOT to a binary variable, this limits the findings in regards to the effect of learning context on the acquisition of voiceless stops because of the subjectivity involved in coding and designating the tokens as either aspirated or non-aspirated.

Justification

As previously mentioned, this study adds to the research regarding the acquisition of L2 phones. Specifically, the investigation seeks to focus on similar phones given that they present a particularly difficult challenge for L2 learners according to the SLM which states that accurate perception is necessary in order to acquire native-like production (Flege, 1995). Similar to previous research regarding these aspects of second language acquisition, this study focuses on Spanish word-initial voiceless stops by NSs of English. Prior research has focused mainly on intermediate level learners whereas this study investigates acquisition starting at the beginning (first semester university) level. While other research has investigated multiple levels of proficiency (Kissling, 2013), the data were not analyzed to test for significant differences between the VOT values between groups. This investigation seeks to describe development over two years' time by comparing first semester, third semester, and fifth semester adult students.

Research Questions

This study seeks to answer the following questions:

1. Do students recognize/perceive that there is a difference between the pronunciation of voiceless stops in English and Spanish?
2. Are students receiving pronunciation instruction as part of the communicative program at Arizona State University?

3. Is there a significant difference between the pronunciation of Spanish word-initial voiceless stops of first semester and third semester adult university students in a communicative language program as measured by the duration of VOT?
4. Is there a significant difference between the pronunciation of Spanish word-initial voiceless stops of first semester and fifth semester adult university students in a communicative language program as measured by the duration of VOT?
5. Is there a significant difference between the pronunciation of Spanish word-initial voiceless stops of third semester and fifth semester adult university students in a communicative language program as measured by the duration of VOT?

The null hypothesis states that there will be no difference between the VOT produced by the different groups of students.

CHAPTER 3

METHODOLOGY

Subjects

The participants in this study consisted of 40 adult English NSs who were enrolled in Spanish language courses at Arizona State University during the Fall Semester of 2017 (N=40). All participants were enrolled in one of three in-person Spanish courses at ASU consisting of first semester (SPA 101), third semester (SPA 201) and fifth semester (SPA 313) levels. A total of 18 students from SPA 101 participated in the study whereas 12 subjects were enrolled in SPA 201. The remaining 10 participants were enrolled in SPA 313.

The variable of gender was not controlled in this study with the aim of more accurately reflecting the population of Spanish students at ASU. In total, the female participants numbered 23 with the remaining 17 consisting of male students. The students in SPA 101 were divided fairly evenly by gender with eight females and 10 males. A perfect split of six female and six male participants represented SPA 201. SPA 313 provided the biggest discrepancy between the gender groups with nine female subjects to only one male.

All participants in the study were adults ranging in age from 18 to 42. The mean age of the students was 20 (SD=4.06). The subjects from SPA 201 and SPA 313 had all taken at least one other Spanish course at ASU previous to their current enrollment. Students with experience studying languages other than Spanish were removed from the investigation. Additionally, subjects who had spoken languages other than English in their home or considered themselves to be native speakers of additional languages

besides English were not selected for the final analysis. No subjects with speech or hearing impairments took part in the study.

Instruments

Demographic Questionnaire (Appendix A). The 13 question demographic questionnaire was adapted from Freed, Dewey, Segalowitz and Halter (2004) in order to assess the participants' experience with language both in formal and informal settings. The last two questions presented in the questionnaire focused on the students' knowledge of and experience with the voiceless stops /p, t, k/. Specifically, question 12 sought to study participants' conscious awareness of differences in the pronunciation of the voiceless stops between English and Spanish. Question 13 concentrated on the experiences students had with pronunciation instruction regarding the voiceless stops in Spanish.

Word List (Appendix B). A list consisting of 60 Spanish words was used to measure the pronunciation of the participants. This relatively simple task was chosen to allow the SPA 101 students to concentrate on pronunciation versus other L2 structures (Kissling, 2013). All of the words were disyllabic with the stress on the first syllable. The words were selected from a textbook for first year Spanish students (Hershberger, Navey-Davis, & Borrás Álvarez, 2008). The list contained 30 target structures and 30 fillers. The 30 targets were divided evenly to provide 10 for each voiceless stop /p,t,k/ in accented, word-initial position. Each target structure was followed by each of the Spanish vocalic sounds /a, e, i, o, u/ twice. A Tascam DR-05 portable digital recorder was used to record the participants in order to ensure high quality audio.

Procedures

All of the students were recruited from their classes after a brief presentation by the investigator regarding the general requirements and procedure of the study. The recruitment and data collection occurred between the 13th and 15th weeks of the 15 week semester. All of the participants voluntarily took part in the investigation and received participation credit in their Spanish courses upon completion of the tasks. Students who did not participate were given an alternate assignment by their instructors in order to receive the same amount of credit. Students were not otherwise compensated for their participation in the study.

All students reported to an empty classroom in the same building where they attended their ASU Spanish course. These locations consisted of the G. Homer Durham Language and Literature building and the G Wing of the Engineering Center on the main campus in Tempe, as well as the Arizona Center in the downtown campus. Data collection occurred during the hours that participants were normally attending their Spanish courses. These locations and time periods were chosen to enable students to feel more comfortable and to provide a quiet and clean space in order to control for extraneous variables due to the environment.

Participants were seated at a desk on the other side of a partition and at a distance of approximately three meters from the investigator during the data collection process. After the students completed the first 11 questions on the front side of the questionnaire, they were instructed to read the word list from a physical sheet of paper with a slight and natural pause between each word. Additionally, the participants were asked to place the

recorder with the microphone close to their mouth to ensure a clear recording. After completing the reading, the students completed the questionnaire by responding to the final two questions on the back side of the paper.

Upon completion of both tasks, the investigator recorded an individual identifier according to the order in which the tasks were completed, the gender of the participant and the course in which the student was currently enrolled. Thus, the first female student to participate from the SPA 313 course was assigned the designation F3_1 whereas the third male student to participate from the SPA 201 course was designated M2_3. Each audio file was saved with the same designation in order to match responses to the questionnaire with the data collected through the recording.

Data Analysis

The data obtained from the first 11 questions of the demographic questionnaire were not included in the final analysis. They were used to determine which participants to include or exclude from the final study according to the students' knowledge and experience with language. The data collected from the responses to the final two questions of the demographic questionnaire were used as a survey in order to better understand students' perception of and experience with instruction regarding the differences between the voiceless stops in Spanish and English.

As shown in Figure 2, the data obtained from the recordings were analyzed acoustically by measuring the VOT duration via the speech waveform analysis computer program Praat (Boersma & Weenink, 2017). VOT was measured in accordance with Lisker and Abramson (1964) as the time between the start of the release burst and the beginning of the vibration of the vocal chords displayed in F1 of the subsequent vowel.

Although Kissling (2013) stated that the measurement of VOT is “objective and reliable” (p. 728), Flynn and Thomas (2011) pointed out that dorsal stops tend to have more than

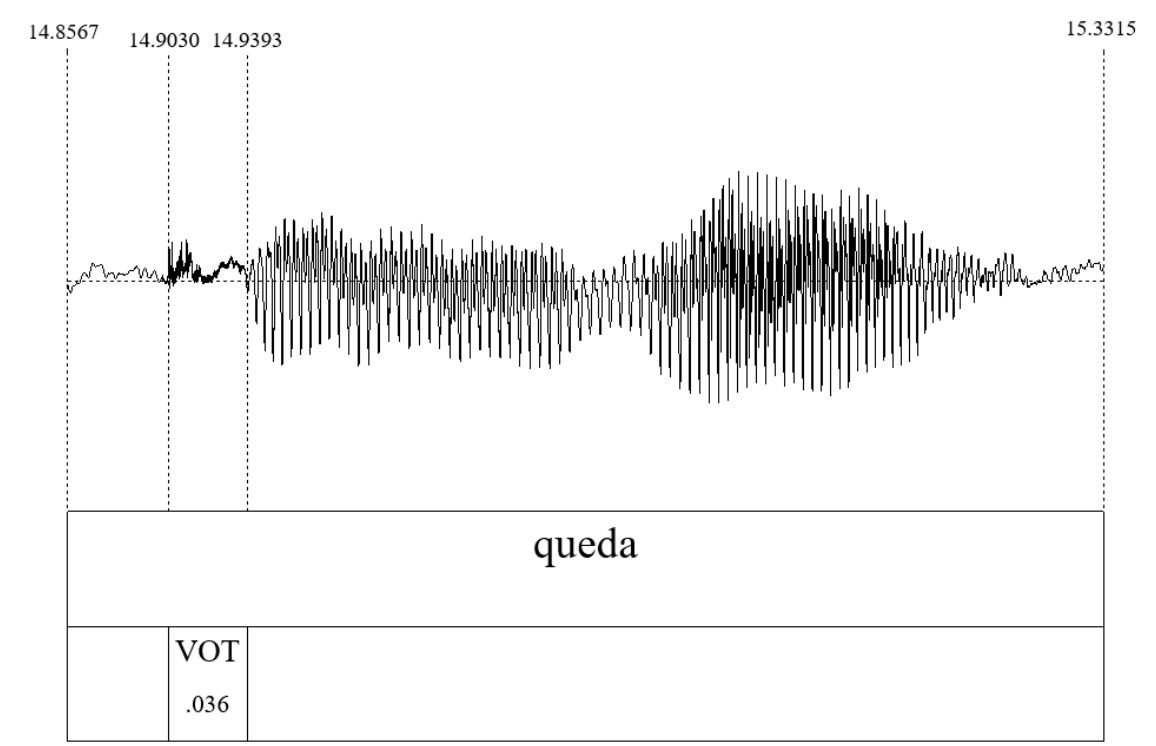


Figure 2. VOT measurement of /k/ in Praat (Boersma & Weenink, 2017). Produced by student F2_5

one burst and that ‘breathiness or aspiration frequently make it ambiguous where the vocal pulses begin’ (p. 117). In order to ensure accuracy, the measurements for this study were taken using a manually controlled cursor with 10% of the data being randomly selected and re-measured as in González-López (2012). Original data files recorded from four different students were used to test accuracy. Data collected from two participants from SPA 101, and one participant each from SPA 201 and SPA313 showed no difference in most measurements with only a few instances of discrepancy amounting to less than .5 ms. Additionally, the tokens containing more than one burst were measured

from the first instance. Although this differs from past research (Cho & Ladefoged, 1999), measurements were consistent throughout and VOT values may vary considerably across studies due to differences in recording instruments and analysis software (Lord, 2005).

The statistical analysis consisted of a two-way (3 classes vs. 3 PoA) ANOVA to compare the VOT. The class (or level) factor enabled the study of the development and acquisition of VOT over two years' time. PoA was highlighted as an important independent variable due to the different VOT values expected across the different PoA. Moreover, each phone presents unique characteristics and opportunities for further study. A Tukey honestly significant difference (HSD) post hoc test was used for multiple pairwise comparisons between unequal sample sizes (Spjotvoll & Stoline, 1973).

CHAPTER 4

RESULTS

The results of the study will be presented in two sections. The responses to the last two questions of the demographic questionnaire will be presented first, followed by the results of the reading task. The data collected from the demographic questionnaire was not analyzed by any statistical test but will be presented as an overview of the general thoughts and experiences students have had with Spanish voiceless stops and pronunciation instruction within the communicative Spanish program. The descriptive statistics for the data collected through the reading task will be followed by the results of the ANOVA and Tukey HSD post hoc test.

Demographic Questionnaire

Student responses to question number 12 of the demographic questionnaire are displayed in Table 2 and Table 3. The question was the following: “Are there any differences in the pronunciation of the sounds p,t,k in Spanish versus English? If yes, please explain and describe the differences.” Table 2 presents the results of the student responses to the question in regards to their affirmation or negation of a difference between the two languages. In total, 73% (29) of the students reported that there are differences between /p, t, k/ in Spanish and English while 27% (11) denied any difference. SPA 201 students had the highest percentage of affirmative responses with 83% (10) which was very similar to SPA 313 with 80% (8). The SPA 101 class had the lowest percentage of affirmative responses with 61% (11) and inversely, the highest percentage of negative responses with 39% (7).

Table 2

Difference in Pronunciation of /p, t, k/

Class	Response	Percentage (Number)
SPA 101	Yes	61 (11)
	No	39 (7)
SPA 201	Yes	83 (10)
	No	17 (2)
SPA 313	Yes	80 (8)
	No	20 (2)
Total	Yes	73 (29)
	No	27 (11)

Note: Percentage Rounded to Nearest Whole Number

Table 3 displays the descriptions of the differences between /p, t, k/ in Spanish and English by the students who affirmed that differences exist. Student responses were coded and placed into one of four categories: Alphabet/Orthography, Perception, Production, None. Responses citing perceptual differences formed the highest percentage with 45% (13). A total of 31% (9) of students' explanations were based on reasoning from differences in the alphabet and orthography and resulted in the second highest response. Differences in production were cited by 17% (5) of students. No explanation was given by 7% (2) of the students.

SPA 101 had the highest percentage of student descriptions referencing the alphabet and orthography with 36% (4) although it was not much different than 30% (3) of SPA 201. SPA 313 was similar as well with 25% (2). Perception had similar

Table 3

Description of Difference in Pronunciation of /p, t, k/

Class	Description	Percentage (Number)
SPA 101	Alphabet/Orthography	36 (4)
	Perception	46 (5)
	Production	9 (1)
	None	9 (1)
SPA201	Alphabet/Orthography	30 (3)
	Perception	40 (4)
	Production	20 (2)
	None	10 (1)
SPA 313	Alphabet/Orthography	25 (2)
	Perception	50 (4)
	Production	25 (2)
	None	0 (0)
Total	Alphabet/Orthography	31 (9)
	Perception	45 (13)
	Production	17 (5)
	None	7 (2)

Note: Percentage Rounded to Nearest Whole Number

percentages across the different levels with 50% (4) of SPA 313 as the highest, followed by 46% (5) of SPA 101 and lastly, 40% (4) of SPA 201. SPA 313 also had the highest rate of responses citing differences in production at 25% (2) with 20% (2) of SPA 201

following and 9% (1) of SPA101 the lowest. All students from SPA 313 gave a description whereas no description was given by 10% (1) of SPA 201 and 9% (1) of SPA 101.

Table 4 and Table 5 display the results from question number 13 of the demographic questionnaire: “Have you received specific instructions regarding pronunciation of the sounds p,t,k in Spanish in the classroom? If so, please explain.” The affirmative and negative responses to the reception of pronunciation instruction of /p, t, k/ are presented in Table 4. In total, 45% (18) of students responded that they had received pronunciation instruction for /p, t, k/ in class whereas 55% (22) denied having received pronunciation instruction. The 56% (10) of students in SPA 101 that claimed

Table 4

Pronunciation Instruction of /p, t, k/

Class	Response	Percentage (Number)
SPA 101	Yes	56 (10)
	No	44 (8)
SPA 201	Yes	42 (5)
	No	58 (7)
SPA 313	Yes	30 (3)
	No	70 (7)
Total	Yes	45 (18)
	No	55 (22)

Note: Percentage Rounded to Nearest Whole Number

pronunciation instruction were the highest. SPA 313 had the lowest percentage of students who had received pronunciation instruction with 30% (3).

The descriptions of the pronunciation instruction received by students are presented in Table 5. Participant responses were coded and placed into one of three

Table 5

Description of Pronunciation Instruction of /p, t, k/

Class	Description	Percentage (Number)
SPA 101	Alphabet/Orthography	40 (4)
	Online Practice	0 (0)
	Unable to Specify	60 (6)
SPA 201	Alphabet/Orthography	40 (2)
	Online Practice	20 (1)
	Unable to Specify	40 (2)
SPA 313	Alphabet/Orthography	100 (3)
	Online Practice	0 (0)
	Unable to Specify	0 (0)
Total	Alphabet/Orthography	50 (9)
	Online Practice	6 (1)
	Unable to Specify	44 (8)

Note: Percentage Rounded to Nearest Whole Number

categories: Alphabet/Orthography, Online Practice, Unable to Specify. Descriptions of pronunciation instruction that fell into the alphabet and orthography category made up 50% (9) of the total responses. Another 44% (8) of subjects were unable to specify or

recall the instruction given. The remaining 6% (1) referred to instruction and practice that was based on online listening and speaking activities.

Most SPA 101 students were unable to specify the instruction they had received as 60% (6) were coded into that category. The remaining 40% (4) of SPA 101 cited alphabet and orthography with none falling into the online classification. SPA 201 also had 40% (2) who received instruction based on the alphabet and orthography with another 40% (2) unable to specify the instruction received. All of the SPA 313 class reported alphabet and orthography instruction.

Word List

The means and standard deviations for VOT as recorded from the reading of the word list are displayed in Table 6. The mean values for VOT increase as the PoA moves from front to back with the exception of SPA313 where the dental /t/ had the lowest VOT followed by the bilabial /p/. The mean VOT is highest for the SPA 201 class across all places of articulation with /p/ (M = 43.66, SD = 23.04), /t/ (M = 47.98, SD = 25.19), and /k/ (M = 59.64, SD = 24.85). However, the means for SPA 101 are very similar to the SPA 201 results which differs from the findings by Kissling (2013). The SPA 313 group had the lowest mean VOT for all voiceless stops with /p/ (M = 29.2, SD = 24.87), /t/ (M = 28.31, SD = 18.41), and /k/ (M = 45.63, SD = 24.74). The combined means for all participants fall below the mean English VOT values found by Lisker and Abramson (1964).

Table 6

Descriptive Statistics for VOT

Class	PoA	Mean	Std. Deviation	N
101	/p/	40.79	24.87	180
	/t/	47.13	27.23	180
	/k/	58.32	25.81	180
	Total	48.75	26.93	540
201	/p/	43.66	23.04	120
	/t/	47.98	25.19	120
	/k/	59.64	24.85	120
	Total	50.43	25.23	360
313	/p/	29.2	19.94	100
	/t/	28.31	18.41	100
	/k/	45.63	19.65	100
	Total	34.38	20.87	300
Total	/p/	38.75	23.80	400
	/t/	42.68	25.98	400
	/k/	55.55	24.74	400
	Total	45.66	25.85	1200

Note: VOT measured in ms

Figure 3 shows a visual representation of the data presented in box plots. The box plots display all of the VOTs for the voiceless stops /p, t, k/ grouped by class. The far left and right hashes mark the shortest and longest VOTs respectively apart from outliers

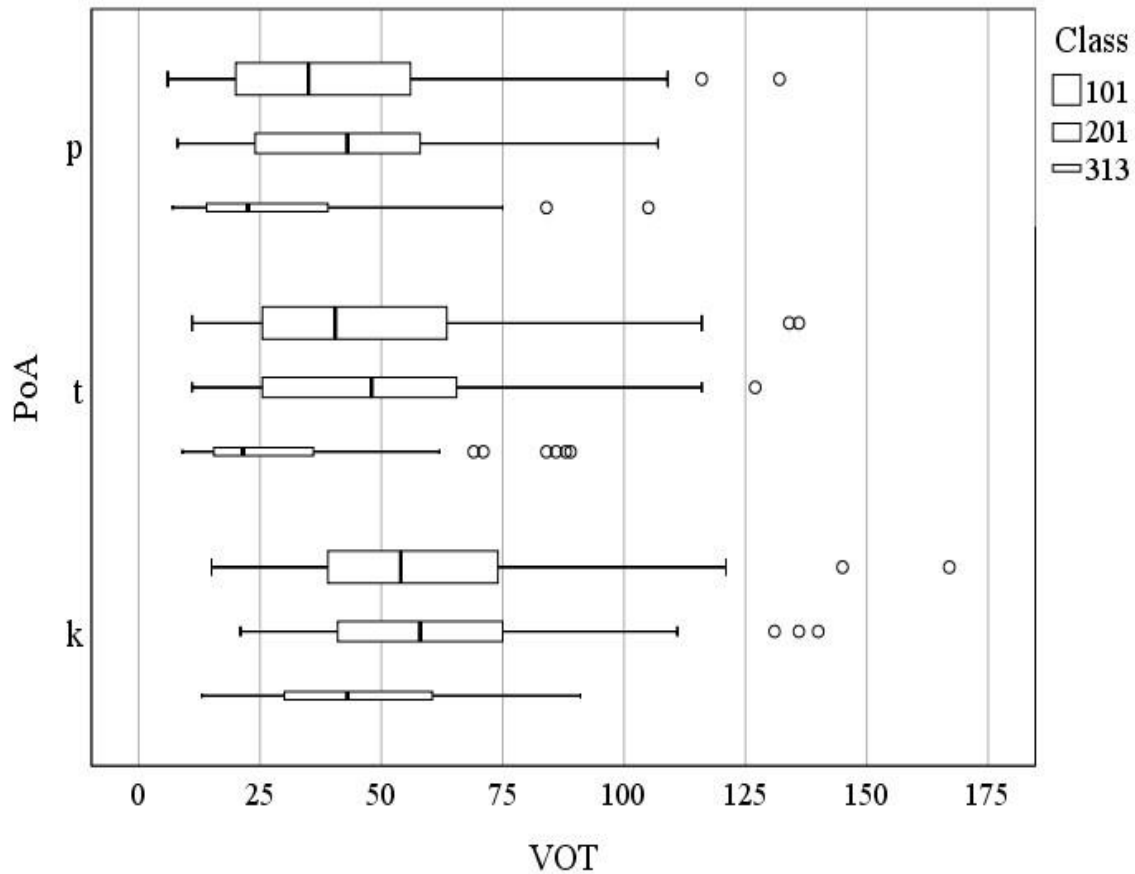


Figure 3. Boxplots of VOT clustered by class. Time in ms.

represented by circles. The median is represented by the line dividing the boxes with the boxes representing the middle 50% of the data. The box plots show that students are able to produce short-lag VOT within the native speaker range found by Lisker and Abramson (1964) given that the lower bound for the range is fairly similar for all PoA and classes. Additionally, the data displayed show that the range of VOT is far smaller for SPA 313 when compared to SPA 101 and SPA 201. This is most evident for /t/ in which the entire

range (ignoring outliers) falls below the upper quartile of the first and third semester participants' data.

The two-way ANOVA did not reveal a significant interaction at the $p < .05$ level between class and PoA ($F(4, 1191) = .903, p = .461$). Figure 4 displays the estimated marginal mean values of VOT for the different classes and PoA. Given that the interaction was not statistically significant, the main effects of class and PoA were analyzed. The main effect for class was found to be statistically significant ($F(2, 1191) = 44.722, p = .000$). The main effect for PoA also resulted as statistically significant ($F(2, 1191) = 50.917, p = .000$).

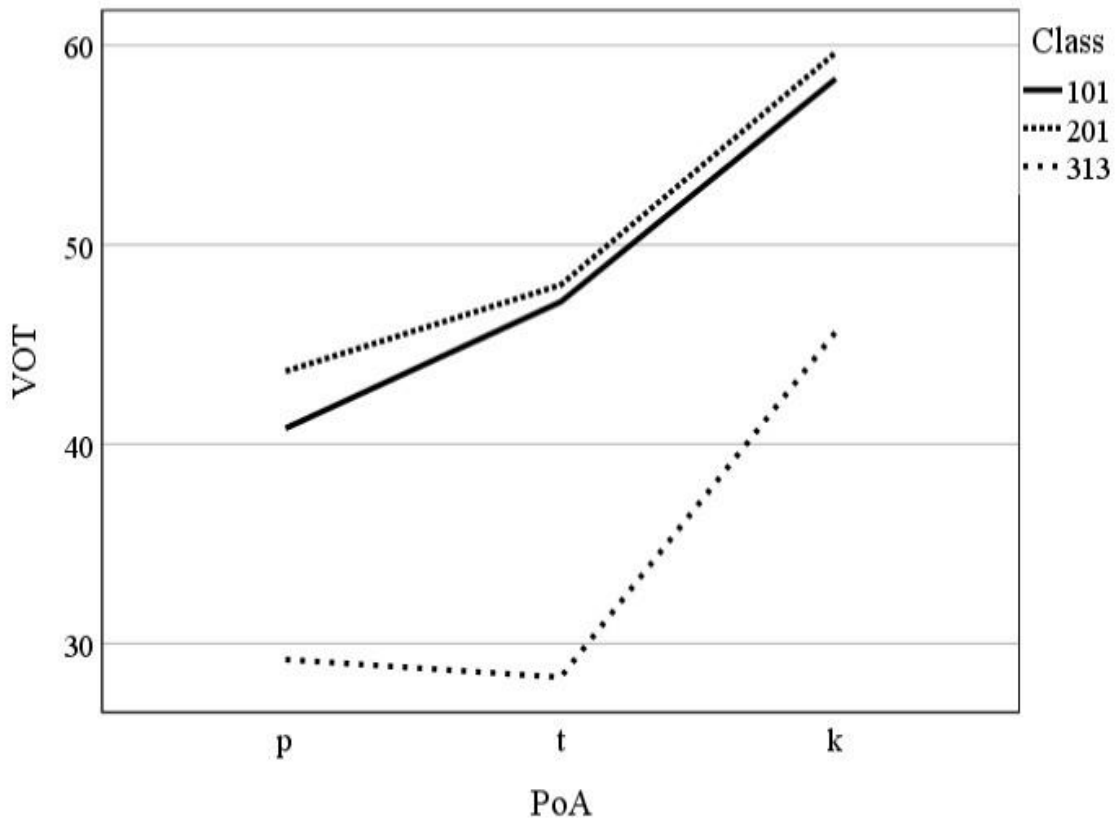


Figure 4. Line graph of estimated marginal means of VOT in milliseconds.

A Tukey HSD post hoc test was used to determine the pattern of mean differences among the class and PoA factors. Table 7 shows the results of the multiple comparisons of the Tukey HSD for class. Post hoc comparisons using the Tukey HSD test indicated that the mean VOT of SPA 101 ($M = 48.75$, $SD = 26.93$) was not significantly different than the mean VOT of SPA 201 ($M = 50.43$, $SD = 24.85$) at the $p < .05$ level ($p = .560$). However, the VOT of the SPA 101 class was significantly different than the mean VOT of the SPA 313 class ($M = 34.38$, $SD = 20.87$) at the $p < .05$ level ($p = .000$). Additionally, the VOT of SPA 201 was significantly different than the VOT of SPA 313 at the $p < .05$ level ($p = .000$).

Table 7

Multiple Comparisons Tukey HSD Class

Class		Mean Difference	Std. Error	Significance	95% Confidence	
					Lower Bound	Upper Bound
101	201	-1.68	1.633	0.560	-5.51	2.15
	313	14.37*	1.728	0.000	10.31	18.43
201	101	1.68	1.633	0.560	-2.15	5.51
	313	16.05*	1.876	0.000	11.65	20.45
313	101	-14.37*	1.728	0.000	-18.43	-10.31
	201	-16.05*	1.876	0.000	-20.45	-11.65

Note: The error term is Mean Square(Error) = 575.907.

*. The mean difference is significant at the 0.05 level

The results of the multiple pairwise comparisons of the Tukey HSD are shown in Table 8. Post hoc comparisons using the Tukey HSD test indicated that the mean VOT of /p/ (M = 38.75, SD = 23.8) was not significantly different than the mean VOT of /t/ (M = 42.68, SD = 25.98) at the $p < .05$ level ($p = .054$). However, the VOT of /p/ was significantly different than the mean VOT of /k/ (M = 55.55, SD = 24.74) at the $p < .05$ level ($p = .000$). Additionally, the VOT of /t/ was significantly different than the VOT of /k/ at the $p < .05$ level ($p = .000$).

Table 8

Multiple Comparisons Tukey HSD PoA

PoA		Mean Difference	Std. Error	Significance	95% Confidence	
					Lower Bound	Upper Bound
/p/	/t/	-3.93	1.697	0.054	-7.91	0.05
	/k/	-16.79*	1.697	0.000	-20.77	-12.81
/t/	/p/	3.93	1.697	0.054	-0.05	7.91
	/k/	-12.86*	1.697	0.000	-16.84	-8.88
/k/	/p/	16.79*	1.697	0.000	12.81	20.77
	/t/	12.86*	1.697	0.000	8.88	16.84

Note: The error term is Mean Square(Error) = 575.907.

*. The mean difference is significant at the 0.05 level

CHAPTER 5

DISCUSSION

Pronunciation and Perception in a Communicative Program

The responses to the last two questions on the demographic questionnaire help shed light on the current status of pronunciation instruction in the communicative program at ASU according to the students currently enrolled. Of note is that about half of the participants affirmed that they had received pronunciation instruction regarding the voiceless stops. This seems to differ from most communicative approaches as discussed earlier in this study (Elliot, 1997). However, the number of subjects who negated having received pronunciation instruction increased over 25% between SPA 101 and SPA 313. This may demonstrate that instructors spend more time on pronunciation instruction in lower levels. Yet, the question does not account for whether students are referring to their current course or across their entire experience with Spanish instruction. Learners' ability to recall prior instruction may also have influenced the responses.

The descriptions of said instruction given by the participants were split almost evenly between alphabet and orthography teaching and those who were unable to specify the type of instruction given. This leads to the conclusion that although pronunciation instruction may exist in the communicative program, it may not be frequent or emphasized as students cannot recall the lessons given. Additionally, there is a possibility

that participants did not clearly understand the question as it referred to sounds and not letters. Lastly, the subtle differences in the production of voiceless stops between English and Spanish may not be seen as important to the development of beginning and intermediate learners given that a long-lag VOT does not usually make for errors in meaning. Further research must be completed in order ascertain the effectiveness and frequency of pronunciation instruction in communicative based language programs.

In addition to the subjects' experience with pronunciation instruction, the demographic questionnaire sought to find if students perceived a difference in the voiceless stops between languages. Students from SPA 201 and SPA 313 affirmed differences around 20 percentage points higher than those from SPA101. It is somewhat expected as learners advance that they will more readily identify differences in between L1 and L2 according to the SLM (Flege, 1995). However, there are a few caveats to take into account. These data do not come from measurable perception tasks and there was no test used to determine learners' proficiency levels in Spanish. Given these limitations, it was not possible to include the variable of perception in the statistical analysis to test for significance.

The descriptions of the differences between the voiceless stops in English and Spanish included several interesting responses. About half of the students used a description of the sound in order to explain the variances such as the responses from M1_2 "T is a much sharper consonant in English than in Spanish." and M1_10 "T is quiet in Spanish, k is also quiet." Perhaps these students (including novices) are starting to form new phonetic categories as proposed by the SLM (Flege, 1995) and demonstrated by González López and Counselman (2013). Nevertheless, about a third of participants

responded with explanations regarding the alphabet and orthography which leads to the conclusion that once again, participants may not have understood the question correctly and focused on the letters versus the sounds. The most prevalent response citing differences in production referred to the difference in PoA between /t/ in the two languages. This illustrates that some learners are aware of a significant difference but presents another possible problem as it can be argued that /t/ does not represent a similar but a new phone according to the SLM.

Acquisition of short-lag, non-aspirated VOT

The descriptive statistics show that the mean VOT values for all combinations fall between the native pronunciation of Spanish and English according to Lisker and Abramson (1964). No monolingual English VOT was measured and therefore, the current study cannot state that the mean values of VOT across all classes are trending toward more Spanish native-like values. However, the mean VOT values of /p/ and /k/ produced by subjects from SPA 313 were closer to the lower bound of monolingual English VOT than to the mean values found by Lisker and Abramson (1964). Additionally, the mean VOT value of /t/ produced by SPA 313 students was shorter than the lower bound found in the same study and shorter than the mean VOT of /p/. This indicates that there may be a new phonetic category formation for Spanish /t/ among SPA 313 participants and differs from previous research (Zampini, 1998), but as noted earlier, this trend may also indicate that /t/ should be placed in a separate category than /p, k/ when comparing the phonetic systems of English and Spanish due to the contrast in PoA between languages.

The analysis of the data collected from the reading of the word list answers the research questions about differences between the groups of students in relation to their

VOT. The results of the two-way (3 classes vs. 3 PoA) ANOVA confirmed statistically significant differences in the mean VOT values between class and PoA. The statistically significant difference between mean VOT values of SPA 313 participants and both the SPA 101 and SPA 201 levels, as proven by the Tukey post hoc test, demonstrates that the SPA 313 students are trending to a more native-like pronunciation of Spanish voiceless stops and seem to be producing compromise VOT values (Zampini, 2013). Although no assessment was administered in order to place participants in this study into different categories according to their proficiency in L2 Spanish, these results concur with the improvement among intermediate level learners in Elliott (1997) as well as the other upper-division university students (Lord, 2005; .

The lack of statistical significance between SPA 101 and SPA 201 coincides with the results of González López and Counselman (2013) which showed no significant improvement in VOT for novice students who received no formal pronunciation instruction. González López and Counselman (2013) also found that novice learners who did receive formal pronunciation instruction improved in VOT which may indicate the benefit of more pronunciation instruction in communicatively focused programs. However, these results do not account for possible attrition in other aspects of L2 acquisition when other tasks and methodologies are replaced in favor of pronunciation instruction. Furthermore, the data from Kissling (2013) seem to suggest the opposite. Namely, the greater difference between VOT was between first and second year students versus second and third year learners, and that there was no significant difference between those subjects who received explicit phonetics instruction and those who only practiced through listening and pronunciation tasks.

The multiple comparisons of the Tukey post hoc test proved an absence of statistical significance between /p/ and /t/ but confirmed a significant difference between both phones and /k/. A comparison of these results with those of Lisker and Abramson (1964) shows another trend toward the possible formation of new phonetic categories. In Lisker and Abramson (1964) the difference in the mean values of VOT in monolingual Spanish /p/ and /t/ was 5ms whereas the difference between the same mean values of VOT in English was 12ms. Nevertheless, there was no statistical analysis performed by the authors to test for a significant difference between PoA within languages which creates a problem with forming a concrete conclusion by comparing results across the studies.

Limitations and Future Research

There were several limitations in the study that will need to be addressed in future research in order for the results to be applied to a more general population. The investigation did not control for gender and the SPA 313 class had a much higher percentage of females (90%) than the other classes which were close to evenly split between genders. This may have skewed the data and results given that women tend to lead linguistic change (Labov, 2001). The study also consisted of unequal sample sizes. Although a Tukey HSD post hoc test was used to account for the unequal sample sizes, a more accurate analysis with equal n could be performed. The reading of the word list enabled for more control over linguistic factors such as stress and fluency as well as served as a more appropriate task for beginning level students. However, no naturalistic data were collected and therefore the results did not account for differences in VOT according to style or task. Additionally, the three groups of students were simply divided

by the course in which they were enrolled which may have grouped students together incorrectly according to their proficiency levels as evidenced by various outliers in the data. Lastly, this study was confined to one population of students enrolled in hybrid courses at ASU. Future research can mitigate these problems and provide more generalizable data and results.

CHAPTER 6

CONCLUSIONS

Overall, the responses to the final two questions of the demographic questionnaire led to more questions than conclusions. Future research may answer some of these questions in regards to the pedagogy and methodology of pronunciation instruction in communicative programs. There were significant differences between the pronunciation of Spanish word-initial voiceless stops of first semester and fifth semester adult university students in a communicative language program as measured by the duration of VOT. Significant differences were also found between third semester and fifth semester students. The results seem to validate the findings of other studies that the creation of new phonetic categories is possible for late L2 learners. Future research will need to focus on increased and equal sample sizes as well as other methodological refinements in order to better understand the acquisition of L2 phones by adult learners in other communicative programs.

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APPENDIX A
DEMOGRAPHIC QUESTIONNAIRE

1. Age: _____
2. Gender: Male/Female
3. Native language: 1. English 2. Spanish 3. Other _____
4. What language do you currently speak at home?
5. What language did you speak at home as a child (if different from question 4.)?
6. Do you speak Spanish outside the classroom? With whom? _____ How often? _____
7. Have you been to a Spanish speaking country? Yes/No For how long (in weeks)? _____ If so, for what purpose?
8. What other Spanish courses have you taken? Include any courses starting in elementary school till now.
9. Do you speak another language (other than English or Spanish) outside the classroom? With whom? _____ How often? _____
10. Have you been to any other countries to study a language? If so, what country and what language?
11. What other languages have you studied in school? Include any courses starting in elementary school till now.

12. Are there any differences in the pronunciation of the sounds p,t,k in Spanish versus English? If yes, please explain and describe the differences.
13. Have you received specific instructions regarding pronunciation of the sounds p,t,k in Spanish in the classroom? If so, please explain.

APPENDIX B

WORD LIST

Please enunciate clearly into the microphone and do your best to maintain an equal volume. Also, please pause slightly between each word. Thank you!

1. Talla
2. Cinco
3. Voto
4. Vago
5. Tanto
6. Tiza
7. Piso
8. Sala
9. Queso
10. Quince
11. Bella
12. Visto
13. Rana
14. Queda
15. Ruso
16. Sube
17. Tonto
18. Tumba
19. Pecho

20. Ropa
21. Curso
22. Bosque
23. Rojo
24. Pone
25. Come
26. Vamos
27. Ramo
28. Tuyo
29. Beso
30. Pollo
31. Vino
32. Casa
33. Tela
34. Paso
35. Cuba
36. Baño
37. Padre
38. Rubio
39. Rico
40. Verde
41. Cena
42. Suyo

43. Sabe
44. Valle
45. Pelo
46. Techo
47. Quito
48. Sopa
49. Puro
50. Vida
51. Río
52. Pude
53. Pide
54. Sobre
55. Cita
56. Costa
57. Cero
58. Tigre
59. Toca
60. Calle