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Voice Onset Time of Voiceless Stops in the English of the El Paso del Norte Region

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VOICE ONSET TIME OF VOICELESS STOPS IN
THE ENGLISH OF THE EL PASO
DEL NORTE REGION

KYLA ANN MCMILLAN
Master’s Program in Linguistics

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Dean of the Graduate School
DEDICATION

I would like to dedicate this thesis to all those who have ever been judged by their accent. Hopefully, one day, more people will recognize accents as a mark of the beautiful interaction of languages and cultures that they are.
VOICE ONSET TIME OF VOICELESS STOPS IN
THE ENGLISH OF THE EL PASO
DEL NORTE REGION

by

KYLA ANN MCMILLAN, B.A.

THESIS

Presented to the Faculty of the Graduate School of
The University of Texas at El Paso
in Partial Fulfillment
of the Requirements
for the Degree of

MASTER OF ARTS

Department of Languages & Linguistics
THE UNIVERSITY OF TEXAS AT EL PASO
May 2018
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Lastly, I would like to thank Dr. Charles Elerick and Dr. Dennis Bixler-Márquez for being a part of the committee for my thesis. I greatly appreciate your time and advice in helping me mold my thesis.
ABSTRACT

This study analyzes the English voice onset time (VOT) for voiceless stops in stressed initial position in the El Paso del Norte Region and compares the results to those from previous studies. This was done in order to determine if the English in the El Paso area, on the border with Juárez, México is being influenced by Spanish. VOT is a great measure to analyze voiceless stops in initial stressed position due to the noted short lag of Spanish stops and long lag of English stops in this phonological environment. To test whether the English of this region conformed more to the short lag of Spanish or long lag of English, 45 participants were recruited and split into three different language groups, those who acquired English as their first language, those who acquired Spanish as their first language, and those who acquired both English and Spanish before the age of five. Participants completed different speaking tasks which were recorded and then analyzed in Praat for their VOT. The average VOT values, by place of articulation, were shorter for all language groups than those previously recorded for monolingual English speakers. Although previous studies have found that VOTs are shorter when located within sentences rather than in single words, that is likely not the only reason in this study. The values are consistently shorter, as shown in the current study, for first language English speakers who have had some degree of exposure to Spanish, than for monolingual English speakers, as represented by previous studies. The detailed language background questions which were asked in this study become of particular interest in the discussion of the results. Given that the study sought to analyze the English of the El Paso del Norte region and the majority of the first language Spanish speakers primarily use English to communicate, a correct analysis of the English of region could not exclude them. Therefore, the first language English speakers are not the only representatives of English in El Paso and the average VOT of this combined group is affected.
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INTRODUCTION

Languages in contact unquestionably influence one another. Though it is often a question of how and in which direction. El Paso, Texas, being on the border with Ciudad Juárez, México is a prime location for language contact and consequential language change. The purpose of this study is to use voice onset time as a possible indicator, utilizing voiceless stops in word initial stressed position in naturalistic speech, of influence of Spanish on English in the El Paso del Norte region.

1.1 Languages in Contact

One of the great instigators of language change is language contact. In *Bilinguality and Bilingualism*, Hamers and Blanc consider languages in contact to be “the use of two or more codes in interpersonal and intergroup relations as well as the psychological state of an individual who uses more than one language (Hamers and Blanc, 2000, p. 6). This definition focuses first on the bilinguality within social groups which is then relayed onto an individual’s bilingualism and becomes reflective of the larger area’s (region, country, etc.) bilinguality.

Regional bilinguality can be affected by language shift, which is the change in language use from generation to generation. This can be observed through the data in Alba’s 2004 study on home language of immigrant children between the ages of 6 and 15 from first generation to the third generation. 5.1 percent of Mexican first-generation children use only English at home. That number increases to 11.1 percent for second-generation children and then makes a considerable jump to 71.2 percent for third-generation children (Alba, 2004). This signals a significant loss in the family’s native language over time.
1.2 El Paso del Norte

El Paso del Norte, which originally included the villages on either side of the river has grown into a binational complex with the border city El Paso, Texas to the north and Ciudad Juárez to the south. The area is home to an estimated population of 2.3 million (United Nations, 2016; U.S. Census Bureau, 2016). The name El Paso del Norte is still utilized today. The demographics of the area and their linguistic makeup will, without a doubt, impact language contact.

According to the 2016 U.S. Census, of El Paso’s population of 837,918, 82.2 percent are Hispanic or Latino. All participants in the study are students at The University of Texas at El Paso (UTEP), who, according to UTEP’s website (2018), are 80 percent Hispanic and an additional 5 percent are from México. Many students commute back and forth daily from Juárez to El Paso to attend school or college. According to U.S. Customs and Border Protection, 600-1,000 children cross the border daily to attend school (as cited in Nieves, 2017). In addition, an average of 22,000 people cross the border every day to visit family, go shopping, access healthcare, or seek entertainment (Nieves, 2017).

Language shift (the loss of language through generations) occurs less in border regions, where travel back and forth from one country to the other is more common, as is the situation between El Paso and Ciudad Juárez. The percent of Mexican children who speak only English at home in El Paso is 8.6 for the first-generation, 6.7 for the second-generation, and only 37.4 for the third-generation (Alba, 2004). These percentages are significantly lower than those cited above for the entire United States, indicating a relative retention of native language in areas on the border. According to information from the U.S Census Bureau, in 2016, 72.2 percent of people living in El Paso over the age of five speak a language other than English at home. With
this overwhelming majority, it is reasonable to assume that in border regions, such as El Paso del Norte, Spanish may be influencing English.

1.3 Bilingualism

Bloomfield (1935) defines bilingualism as “the native-like control of two languages” (as cited in Hamers and Blanc, 2000). Though, there are as many definitions of bilingualism as there are types of bilinguals. Some may be balanced bilinguals and speak each of their languages fluently or with low proficiency. Bilinguals are often dominant in one language over the other, though their dominance may vary by skill, reading, listening, writing, and speaking. They may mix their two languages as in code switching or they may separate their language use and reserve one language for school or work and another for family or home. All of these factors are essential in describing a bilingual and are distinctive for each individual.

The above variables are often dependent on the age and way in which a bilingual acquires their two languages. Those who acquire each of their languages from birth are considered simultaneous bilinguals. Simultaneous and early consecutive bilinguals, who acquire both languages before the age of six are more likely to achieve balanced fluency and native-like status in each language. By school-age, children are introduced to their second language in a different way, with more ties to literacy or media. Those who learn a second language in school, even as early as Kindergarten, likely speak a different language at home, leading to possible disproportionate input.

Although there is debate on the degree that the Critical Age Hypothesis affects second language acquisition, most studies point to better language retention in those who acquire a second language before puberty. A study of Chinese and Korean immigrants by Johnson and Newport in 1989 and 1991 found that there was no difference in proficiency for those who
arrived before the age of seven and native speakers, but that there was a decline, consistent with age, thereafter (as cited in Bialystok, 1997). Specific areas of language acquisition, such as the development of native-like phonetic categories, seem to be more sensitive to the critical age of six years (Fledge, 1992; Abello-Contesse, 2008). This is attributed to the way children and adults categorize new information. Adults tend to add information to existing categories, which could lead adults, who acquire a second language later in life, to assimilate phonetic categories of the new language to their first language. On the other hand, children tend to create new categories for new information and would therefore keep the phonetic categories of each of their languages separate (Bialystok, 1997).

1.4 Voiceless Stops

All languages are made up of sounds. If the sounds are distinguishable between one another within a language and create variance in words and phrases, they are known as phonemes. Each sound is described by its voicing, place of articulation, and manner of articulation. A sound is voiced if the vocal cords vibrate when making the sound, caused by a narrowing of the glottis and rush of air over it. The place of articulation refers to where in the vocal apparatus sounds are made. Finally, manner of articulation refers to the way in which the places of articulation interact to produce the sound.

For the purposes of this study, we will only be looking at voiceless stops. Stops are formed when the flow of air is stopped by the parts of the vocal apparatus, which are involved. In both English and Spanish there are three (other languages may have more or less) voiceless stops and they are further distinguished by their place of articulation. The voiceless stops which are of concern for this study are /p,t,k/. To describe their places of articulation, /p/ is bilabial, formed when the two lips come together to stop the flow of air. /t/ is formed at the alveolar ridge (in
English), by the tip of the tongue touching the roof of the mouth right before the teeth. In Spanish, the place of articulation for /t/ is slightly further forward than the alveolar ridge and is identified as dental. Finally, /k/ is formed by the back of the tongue touching the roof of the mouth and is known as a velar stop.

The sounds within a language’s inventory are not necessarily all phonemic. They may vary in predictable environments based on the surrounding sounds. These variations are known as allophones and are not contrastive within a language. A common allophonic variation of voiceless stops is aspiration. Voiceless stops may be aspirated or unaspirated depending on the phonetic environment and language. In English, the phonemes /p,t,k/ always become aspirated before stressed vowels but remain unaspirated in all other environments. When occurring in the stated phonetic environment, these allophones are represented as [pʰ], [tʰ], [kʰ], with the superscript [h] used to show aspiration. While this is an allophonic variation in English, it may be a phonemic distinction in other languages, for example, Korean. However, this variation may not exist in the language at all; such is the case in Spanish. Spanish also has the phonemes /p,t,k/, but they do not vary based on environment and therefore do not have corresponding allophonic forms as in English.

1.5 Voice Onset Time (VOT)

Lisker and Abramson were the first to suggest that voicing could not only separate voiced sounds from voiceless ones but could also be used to show the degree of separation between aspirated and unaspirated voiceless stops (Lisker and Abramson, 1964). In the pioneer study of its kind, they analyzed the differences between voiced unaspirated, voiceless unaspirated, and voiceless aspirated stops within eleven languages, using a measure they introduced, voice onset time (VOT). They define voice onset time, subsequently identified as VOT, as the interval,
measured in milliseconds (ms), between the release of a stop closure and the onset of vibration in the vocal folds (Lisker and Abramson, 1964). VOT can be measured by viewing the acoustic recording of any sound as a spectrogram and/or waveform. The release of the stop is recognized as a sudden increase in the frequency of the sound waves and is measured until the onset of regular voicing of the following vowel (Lisker and Abramson, 1964). Acoustic recordings analyzed today most often utilize the program Praat to measure VOT (Boersma and Wennink, 2018). Figure 1 illustrates the beginning and end points for measuring VOT in Praat as indicated by Lisker and Abramson and repeated in following studies.
Figure 1:

Spectrogram (bottom) and waveform (top) of /t/ in the English word ‘teach’. The two arrows mark the release of the stop and the onset of voicing of the following vowel. Rounded to a whole millisecond, the VOT measured here would be 60 ms.

Lisker and Abramson described three conditions of stop voicing identification that apply across all of the eleven languages that they studied in 1964. Although, these specific ranges may still vary within each language. Sounds are voiced unaspirated when voicing occurs before the release of the stop. As the release of the stop is always marked 0 ms, these measurements are negative. This condition is also usually referred to as ‘lead’ and is the category of voicing for
Spanish voiced stops /b,d,g/ (Keating, 1984, p. 295). In the second category, voiceless unaspirated stops, voicing begins right after the release of the stop. These were later identified as ‘short lag’ as in the Spanish voiceless stops /p,t,k/, although some languages, such as Arabic, have an even shorter lag (Keating, 1984, p. 295). The final category, voiceless aspirated stops, describes voicing that occurs considerably after the release. These stops are known as ‘long lag’, as in English /p,t,k/ before stressed vowels (Keating, 1984, p. 295). From their study of eleven languages, Lisker and Abramson were able to identify the ranges of each of the above categories. They found that lead occurs between -125 and -75 ms, short lag occurs between 0 and +25 ms, and long lag occurs between +60 and +100 ms.

However, these ranges vary not only within languages, but also by place of articulation. In 1999, Cho and Ladefoged looked closely at the articulatory gestures to explain the differences in VOT by place of articulation. Typically, bilabial stops have the shortest VOT, followed by alveolar stops, leaving velar stops with the longest VOT (of the places of articulation relevant to the current study). Studies by Fischer-Jørgensen in 1954 and Peterson and Lehiste in 1960 found that the further back the closure, the longer the VOT (as cited in Cho and Ladefoged, 1999). This might also be due in part to the size of the supraglottal cavity behind the point of closure. This cavity would be smallest behind velars, causing greater air pressure, which must drop before voicing can occur (Cho and Ladefoged, 1999). A study in 1986 by Stevens, Keyser, and Kawasaki also found that greater contact areas often meant longer VOTs (as cited in Cho and Ladefoged, 1999). Each of these findings account for velars usually having longer VOTs than bilabials, dentals, and alveolars.

Furthermore, in 1973, Hardcastle found that shorter VOTs were typically attributed to fast-moving articulators, i.e., the tip of the tongue as opposed to the back of the tongue (as cited
in Cho and Ladefoged, 1999). With special focus on the articulatory gestures in play, Cho and Ladefoged suggested an update to Lisker and Abramson’s definition of VOT to be, “the time between the initiation of the articulatory gesture responsible for the release of a closure and the initiation of the laryngeal gesture responsible for the vocal fold vibration” (1999, p. 225). The main focus of this new definition being the inclusion of the gestures leading up to the release and the vibration. For all their talk on articulatory gestures, they place the greatest importance on VOT being a measure of how one sound is timed in relation to another. This definition update aside, little has been adjusted to the definitions and ranges laid out by Lisker and Abramson and their initial findings have continued to be the standard on VOT.

1.6 Previous Research

There have been many studies after Lisker and Abramson’s initial study in 1964 on the topic of VOT. The results of the most pertinent studies to the current topic of research will be discussed. Two of the languages that Lisker and Abramson focused on in 1964 were English and Puerto Rican Spanish. Although English stops have been found to have long lag VOTs in any position within a word, as long as the stop directly precedes a stressed vowel, Lisker and Abramson chose only to analyze those which occur word initially (before a stressed vowel). Many other studies have made this same decision, as it can sometimes be difficult to clearly see the release of the stop due to the continuation of voicing of previous segments. Their findings of having monolingual speakers of English and Puerto Rican Spanish read word lists containing each of the tokens /p,t,k/ in word initial stressed position can be found in Table 1. The results of this study also showed that VOTs in sentences were considerably shorter, averaging, by place of articulation, from 4-25 ms in Spanish and 28-43 ms in English. However, the sentences used
were prepared by the testers, so not reflective of natural speech, and only four of the total
speakers were tested in this portion.

Table 1:

Lisker and Abramson’s 1964 findings of average VOT and range in milliseconds for /p, t, k/.

<table>
<thead>
<tr>
<th></th>
<th>Puerto Rican Spanish</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average VOT (ms)</td>
<td>Range (ms)</td>
</tr>
<tr>
<td>p</td>
<td>4</td>
<td>0-15</td>
</tr>
<tr>
<td>t</td>
<td>9</td>
<td>0-15</td>
</tr>
<tr>
<td>k</td>
<td>29</td>
<td>15-55</td>
</tr>
</tbody>
</table>

Following their 1964 study, Lisker and Abramson carried out a focused study in 1967 on
stops in American English. They confirmed the importance of stress in relation to aspiration and
found that monosyllabic words had longer VOTs than multisyllabic words. Although they found
there was a greater lag, or longer VOT, in the final stress of a sentence, the overall averages of
VOT in sentences was found to be shorter. They also determined that vocalic environment had
no effect, but they would not rule out a possible effect in larger samples of running speech.

Subsequent studies have eliminated high vowels, as they have been shown to cause longer VOT
values due to increased pressure in the oral cavity behind the constriction (Keating, 1984; Cho
and Ladefoged, 1999). A study focusing on VOT in Mandarin also reports findings from Klatt in
1975, Weismer in 1979, and Port and Rotunno in 1979, which show that voiceless stops before
high tense vowels have longer VOTs than before low lax vowels (as cited in Chao and Chen,
2008). An interesting take-away from this study is that Mandarin diverges from the VOT length
pattern of other languages, and its alveolars have shorter VOTs than its labials.
Following her 1983 study of VOT in 51 languages, Keating argued for the creation of a binary category of voiceless aspiration as an addition to those discussed in Chomsky and Halle’s *The Sound Pattern of English*. Keating’s results of English post-pausal initial stops before twelve stressed vowels showed great variance in VOT among different speakers. These results can be seen in detail in Figure 2. The VOT of /p/ ranged between 30 ms to as long as 100 ms, though with the majority around 50 ms. The average VOT for /t/ was approximately 60 ms, but with ranges from 40ms to 110 ms. Finally, the average VOT for /k/ was about 70 ms with ranges from 50 ms to 120 ms (Keating, 1984). Looking then to compare effect of stress, Keating found longer lag in voiceless stops preceding secondary and no stress vowels than English /b,d,g/ (voiced stops). Despite these results, the VOTs of word-initial voiceless stops preceding main stress vowels had the longest lag.

In 1987, Flege and Eefting examined the production and perception of English voiced and voiceless stops in initial position by native Spanish-speaking adults and children. They found that the groups produced compromised values, which were in between the norms for Spanish and English. They hypothesized that the “incomplete approximation to L2 phonetic norms observed here may have been the result of non-authentic L2 input”, assuming that some of the children received English L2 input from non-native speakers (Flege and Eefting, 1987, p. 81). If compromised phonetic categories are the main source of input, it is possible that this would create non-native like pronunciation in regions with language contact.
Figure 2:

Keating’s 1984 data on VOT for English utterance-initial stops at three places of articulation. Measurements are for two speakers reading 72 words, one, four times each, and the other, two times each.

Recently, González López (2012) studied VOTs of word initial voiceless stops in Spanish and English in monolingual and code-switched sentences. For the purposes of this study, only the
results of the monolingual English values will be discussed. The participants were all first language English speakers who were majoring or minoring in Spanish. The stimuli for the study, as in the majority of others, was a reading task composed of predetermined tokens. However, these tokens were contained within sentences rather than single words. The VOTs in milliseconds of the English tokens were /p/ at 52, /t/ at 57, and /k/ and 64. As for the speakers’ results in Spanish (their second language), the velar /k/ levels were closest to the native Spanish levels. This is expected, as /k/ has the longest VOT values in Spanish and they are therefore closer to English levels. However, the participants showed particular difficulty with native-like production of /t/, perhaps because of its slightly different place of articulation. Spanish /t/ is often described as more dental than the English alveolar /t/.

1.7 Previous Research in El Paso

As El Paso, Texas’ location on the border is prime for language research, it has produced other studies, which analyze VOT. The important findings of those studies and how they may relate to the current study are discussed here. The first study of concern comes from Kilpatrick, who researched VOT of voiceless stops in bilingual English and Spanish speech of the El Paso/Juárez area in 2003. She recorded monolingual Spanish speakers, bilingual Spanish/English speakers, and monolingual English speakers reading passages in English and Spanish and examined their VOTs.

There are some points of concern in the definitions of her participant groups. The monolingual Spanish speakers were all enrolled in a beginning ESOL class and most had had other prior exposure to English, though this is expected in a border area. The bilingual speakers were all reported to have learned both English and Spanish before the age of ten. Because some of these participants acquired their second language before the often-cited critical age of six, but
not all of them. The homogeneity of this group could be affected. The monolingual English speakers also had some exposure to Spanish throughout their life. The biggest concern with this group, as it could be applied to the current study, is that only three of the eleven monolingual English participants were native to El Paso. Therefore, the results drawn from the monolingual English speakers in this study are more of that of a control group, rather than an accurate reflection of native El Paso area English speakers.

Kilpatrick does not separate her findings by place of articulation, but rather averages the VOTs of all voiceless stops together for each participant group. As expected, the monolingual Spanish speakers produced a shorter average VOT for English than the monolingual English speakers. The reverse is true of monolingual English speakers in their average Spanish VOT. Neither average of the opposing groups reaches native-like levels. However, the bilingual Spanish/English speakers produce a Spanish VOT, which is very close to the monolingual Spanish speakers, and conversely an average English VOT, which is also close to the monolingual English speakers. This shows their native-like proficiency in each language. The results of Kilpatrick’s study appear in Table 2.

Table 2:
Kilpatrick’s 2003 averages of VOT of voiceless stops in Spanish and English by participant group.

<table>
<thead>
<tr>
<th></th>
<th>Average Spanish VOT (ms)</th>
<th>Average English VOT (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monolingual Spanish</strong></td>
<td>28</td>
<td>46</td>
</tr>
<tr>
<td><strong>Monolingual English</strong></td>
<td>51</td>
<td>70</td>
</tr>
<tr>
<td><strong>Bilingual Spanish/English</strong></td>
<td>26</td>
<td>65</td>
</tr>
</tbody>
</table>
When analyzing the results, Kilpatrick separated the three monolingual English speakers native to El Paso to see if there was a significant difference in their averages from the rest of the monolingual English speakers. Their average VOT for Spanish was 51 ms, which is shorter than the overall monolingual English average for Spanish VOT. This level could be interpreted as a more authentic-like Spanish VOT. Most interestingly, the speakers of this isolated group also had a shorter average English VOT at 61 ms, which is less than the overall monolingual English average. This could indicate a possible influence of the Spanish salient El Paso area on its English speakers.

Another study, which analyzes VOT of voiceless stops in the El Paso region, comes from Morgan in 2011. The topic of his study was to see if there was an advantage for L1 (first language) English speakers learning Spanish over L1 Spanish speakers learning English. He hypothesized that Spanish speakers could be disadvantaged since voiceless aspirated stops do not occur as an allophonic variation in Spanish. Morgan analyzed the VOTs by having four different groups of participants read texts in English and Spanish (the monolinguals did not read the text for the other language). The four participant groups were monolingual English speakers, monolingual Spanish speakers, L1 dominant English speakers with L2 (second language) Spanish, and L1 dominant Spanish speakers with L2 English.

For the English monolingual group, Morgan purposely chose nine out ten participants, who were not from El Paso. This was done in order to avoid any influence of Spanish on the monolingual English speakers, which they would likely have, having been raised in the El Paso area. This is unfortunate, as that is exactly what the current study is concerned with, Spanish influence on English. Such results would have been beneficial for comparison. The monolingual Spanish group was made up of a majority of students who were taking the entry-level ESOL
class (just as in Kilpatrick’s study). The participants in the two bilingual groups were chosen if dominant in their first language. There was no discussion of their ages of acquisition of their L2.

As displayed below in Table 3, Morgan’s results showed expected ranges of short lag for the monolingual Spanish speakers and long lag for the monolingual English speakers. The L1 Spanish/L2 English bilinguals have shorter English VOTs than the monolingual English group, which points to influence from the short lag VOTs of their first language, Spanish. The L1 English/L2 Spanish bilinguals had shorter English VOTs than the monolingual English group. Also, pointing to a possible influence from Spanish. Diverging from the expected pattern of shorter to longer VOTs by place of articulation, as discussed by Cho and Ladefoged (1999), the /t/ values of both the monolingual English and L1 English speakers were longer than their /k/ values. There was no discussion in this study as to why the pattern of these values may have strayed from those in previous studies. However, referring back to the case of Mandarin voiceless alveolar stops having shorter VOTs than the labials, the pattern has been shown to waiver before (Chao and Chen, 2008). Also, as seen in the González López (2012) study, /t/ had a greater likelihood of not reaching native VOT values, possibly due to its different place of articulation in Spanish (dental) and English (alveolar).

Following the claims in previous research about the effect of vowel environment, Morgan compared the average VOT values before [–low] vowels and [+ low] vowels. The VOTs for monolingual Spanish speakers were only two milliseconds longer before [–low] vowels. For L1 English/L2 Spanish bilinguals, the English VOT average was seven milliseconds longer for [+ low] vowels. This is strange considering the previous research claiming longer VOTs came before high vowels (as cited in Chao and Chen, 2008). There was no significant difference
between the vowel environments for the monolingual English speakers or the L1 Spanish/L2
English bilinguals.

Table 3:
Morgan’s 2011 VOTs of /p,t,k/ for each participant group (the VOT values have been rounded to whole
numbers).

<table>
<thead>
<tr>
<th></th>
<th>Spanish VOTs (ms)</th>
<th>English VOTs (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>p</td>
<td>t</td>
</tr>
<tr>
<td>Monolingual Spanish</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>Monolingual English</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>L1 English/L2 Spanish</td>
<td>29</td>
<td>26</td>
</tr>
<tr>
<td>L1 Spanish/L2 English</td>
<td>20</td>
<td>23</td>
</tr>
</tbody>
</table>

Another study to take place in El Paso comes from Simental in 2014. Although its focus
is more on VOT in Spanish/English code switching and only the relevant findings will be
reviewed. Simental analyzed both unilingual and code-switched sentences to determine if their
voiceless stop VOT values were closer to Spanish or English values. The participants were
considered balanced early bilinguals with “native-like” proficiency in both languages, though
they acquired Spanish as their first language (Simental, 2014). This study sought to elicit natural
speech and due to the varying stress within phrases, the VOT values may be shorter (Lisker and
Abramson, 1964). The average VOTs for the unilingual English data were /p/ with 49
milliseconds, /t/ with 56 milliseconds, and /k/ with 64 milliseconds. These values are shorter than
those reported for monolingual English speakers from previous studies. This is likely because
they acquired English as a second language. Though their age of acquisition was not reported in
this study, their native-like proficiency in each language may indicate simultaneous or early
consecutive acquisition. Another point of interest from the results is that the English VOTs did not maintain their values in code-switched sentences, while the Spanish VOT values were not affected.

Recall that languages in contact was defined by Hamers and Blanc (2000) to refer not only to languages in society, but also languages within an individual. When two linguistic systems and their corresponding phonetic categories exist together, they will interact with one another. When there is a degree of compatibility between aspects of the two languages, such as the same phonemes, but a slight difference in one of the languages, such as allophonic variation, there is a greater likelihood of interference between the two languages. Continued interference by individual speakers can develop into influence, which is exhibited by multiple speakers of the languages in question. This influence over time can lead to language change. This is of particular concern for the study at hand.
CHAPTER TWO: THE CURRENT STUDY

2.1 Introduction

The purpose of the current study is to analyze the VOT of voiceless stops in the English of the El Paso del Norte region. Although there have been studies of VOT and voiceless stops in the region before, the influence of the Spanish language on English has been overlooked. The previous studies (Kilpatrick, 2003; Morgan 2011) took special care to exclude English speakers from El Paso due to the possible influence of Spanish on their speech. The majority of the English-speaking participants in those studies were not native to El Paso. The current study seeks to compare the VOT values of voiceless stops in the English of the El Paso del Norte region with monolingual English values presented in earlier studies. This study was also particularly concerned with obtaining VOT values found in natural speech. All of the cited previous studies, other than Simental 2014, did not utilize natural speech methodology.

Given the cited research on the VOT values for Spanish and English and the nature of the language contact environment of the El Paso del Norte region, the following is expected from this study. The average VOT of the first language English speakers will be shorter than previously recorded monolingual English values, due to the influence of Spanish. The average VOT of the Spanish/English bilinguals will show compromise and fall somewhere between the short lag of Spanish and the long lag of English. The first language Spanish speakers, who acquired their second language after the critical age, will have non-native like English VOTs, which are shorter than those produced by the simultaneous bilinguals. The first language Spanish speakers may also have particular difficulty producing English-like VOTs for /t/ given that its place of articulation is slightly different in Spanish and may take longer to acquire.
2.2 Participants

The initial aim of this study was to recruit and analyze the speech of 60 participants from the El Paso region. These participants would be split into two groups based on their first language, either Spanish or English. For the purposes of this study, there was no need for strictly monolingual speakers. During recruitment, a large number of participants self-identified as simultaneous bilinguals, having learned both English and Spanish before the age of five. This was chosen to be the cut off age because it is before the start of Kindergarten, where the method of L2 acquisition would change. Therefore, it was decided that instead, three language groups should be analyzed. The three groups split by language background are first language English speakers, first language Spanish speakers, and simultaneous Spanish/English bilinguals. The IRB Approval Letter for human subjects research for this study can be found in Appendix 1.

Participants were recruited from various undergraduate courses at UTEP. The professors who provided access guaranteed extra credit for any of their students who participated in the study. Participants were only told that they must be at least 18 years old to participate and were not any given any information about what was being tested. A sign-up sheet with open time slots was passed around each of the participating classes. Because part of the test would be completed in pairs, the voluntary participants were encouraged to sign up for an hour time slot with one other student. Due to this method of recruitment, the language background and gender of the participants were not known until they filled out the survey during testing.

Every effort was made to recruit an equal number of participants to represent each language group. However, the overwhelming majority, upon first recruitment, were first language Spanish speakers. Another round of recruitment, specifically in Spanish classes for non-native speakers, was made in order to add to the number of first language English speakers.
However, due to the demographics of El Paso, native English speakers were still difficult to find, and the numbers for the three groups are 14 first language English speakers, 15 simultaneous Spanish/English bilinguals, and 16 first language Spanish speakers, for a total of 45 participants. In order to reach this relative balance, seven participants were randomly cut from the group of first language Spanish speakers. When cutting the needed first language Spanish speakers from the study, one participant from the simultaneous group was also removed because of their pairing.

Although an effort was also made to recruit and test an equal number of males and females, the majority of participants who signed-up for the study were females. Of the 45 participants tested, 12 were male. 82% of the participants were from El Paso. Only two out of the 14 first language English speakers were not from El Paso. The participants were all current students at UTEP and ranged from 18 to 57 years of age, with a mode of 21 years old. More detailed information on the language background and demographics of the participants is presented in chapter three following the results.

2.3 Procedure

Only one of the studies discussed above dealt with language production in natural speech. The methodologies of previous studies typically utilized word lists, sentence lists, or passage readings. A goal of this study was to elicit natural language. The questions and tasks designed were intended to be a distraction so that participants would focus less on their production. The activities were split into two formal and two informal tasks. The formal tasks were completed one-on-one with the researcher. The informal tasks were to be completed in pairs of peers. However, during the course of testing some participants did not attend their selected time slot. This caused some participants to be without a partner for the informal activities. In these cases,
the individual participated in the formal section as usual and then completed only one of the pair activities with the researcher acting as their partner. Because these individuals did not have a peer to interact with, one of the informal activities, the pair conversation, was deemed too similar to the formal interview and was not administered to the individual participants without a partner.

In the first formal task, participants were shown three one-page comics from *The Calvin and Hobbes Lazy Sunday Book* by Bill Watterson. Participants were asked to read each comic to themselves and then retell the story to the researcher. Some participants described the comic frame by frame, while others gave a short summary. Scans of each of the comics used appear in Appendix 2.

The second formal task was a one-on-one interview with the researcher. All participants were asked the same three initial questions. If the participant did not speak for at least five minutes, a back-up question was asked. When a participant did not have a partner, back-up question one was often asked to elicit more speech time. The questions used for this segment of the study are in Appendix 3.

The first informal activity was a game. A homemade version, similar to a game called “Hedbanz”, was prepared for this task. Fifty-nine individual slips of paper with randomly chosen famous people or characters were placed in a bowl to be drawn by participants. Participants were explained the rules of the game. They would each draw a slip of paper and without looking at it, place it on their head for their partner to see. Then they would ask yes-or-no questions to guess who they were. Participants were told that they could be a famous person, dead or alive, or a character from a movie, book, television show, etc. They were given an example of a yes-or-no question that could be asked, often, “Am I a real person?” However, as adhering to the rules was not the point of the activity, any questions that were not yes-or-no were usually overlooked so as
to not disrupt the flow of speech. Participants were instructed to take turns, asking three questions in a row each. However, if participants strayed from this pattern, it was allowed as well. Each round of the game was timed, allowing for four minutes of questions before participants could each give each other one clue before a final guess. Two rounds were played for each pair. The full list of possible famous people and characters are in Appendix 4.

The second informal activity was a conversation between the two partners that was prompted by slips of paper with two questions. Participants drew a random slip and were then instructed to ask each other both questions. They were also instructed to think of their own follow-up questions and make it more like a conversation. Unlike the formal interview questions, which were based in fact, these questions were conditional and required participants to really think about the question. These questions were not asked of a participant if they were the only one at their time slot, because this activity would not have been very different from the one-on-one interview if not being asked by one of their peers. The questions used for this segment of the study are in Appendix 5.

The responses from all participants were recorded using a Handy Recorder H2, Zoom, which has dual microphones and equally records two participants facing each other. Each participant also answered a written survey with questions about their demographics and language background. Participants were identified both on their recording and written survey by a random number, which they had drawn at the beginning of the study. The questions used in the survey are in Appendix 6.

2.4 Analysis

Full transcriptions were made from all of the recorded material to assist in token identification. The recordings were then analyzed using Praat to measure the VOT of all tokens.
As with previous studies and shown in Figure 1, measurements were taken starting from the visual burst indicating the release of the stop until the voicing of the following vowel. The measurement, in milliseconds, was then rounded to the nearest whole number and recorded. Previous studies noted that occasionally, stops will present with two bursts, especially velar stops (Cho and Ladefoged, 1999). In these cases, Cho and Ladefoged took their measurements from the second burst. The same was done in this study. Tokens where the release of the stop was obscured by voicing from the previous segment were also eliminated (Keating, 1984).

Interference, such as multiple people talking at once, was common in the ‘conversation style’ tasks used. If the VOT of a token could not reliably be measured, it was eliminated.

2.5 Tokens

The tokens identified for this study were all voiceless stops, which occurred in word-initial position before a stressed vowel. To be sure to analyze tokens with the clearest VOTs, only tokens in lexical items were used. This eliminated all instances of prepositional ‘to’. The majority of which would not have been in stressed position anyway. Instances of /p/ in El Paso were also eliminated, as this is a Spanish word and even though the study was in English, participants may have pronounced it with a Spanish accent. Due to conflicting data on the effect vowel environment may have on VOT (i.e. Lisker and Abramson (1967) and Morgan (2011) finding no effect and Chao and Chen (2008) showing longer VOTs preceding high vowels), this was not chosen as a variable for the current study.

All readable tokens, for each participant, and the word they occurred in were put into an Excel sheet organized by place of articulation and split by formal and informal tasks. Once all tokens were recorded, the average VOT by place of articulation was found and these were added to an Excel sheet of all participants split by language group. However, some participants did not
produce enough tokens for a reliable average to be calculated. If a participant produced three tokens or fewer, the data for that voiceless stop was excluded from the study. Once all measurements were made, it became clear that a large majority of eliminated data occurred during the informal tasks. Refer to Figure 3 for visual representation of the impact this had on the overall data. All of the orange lines are data points, which had to be eliminated.

Figure 3:
Visual representation of eliminated data points (in orange).

Due to the clear lack of useable data from the informal tasks, the informal condition was removed from this study and none of this data is included in the results. Therefore, the total number of tokens for all participants that were analyzed was 2,938. 475 of these were /p/, 931 were /t/, and 1,532 were /k/. The number of unreadable tokens that were eliminated due to interference was 235.
2.6 Limitations

One of the aims of this study was to elicit data from natural speech. However, the chosen methodologies presented some difficulties in data analysis. The tasks were designed in the hope of allowing participants to speak freely and naturally, but an unfortunate side effect is that not enough tokens were produced for analysis in the informal section. Although unnatural, word lists and reading tasks can ensure that a specific number of tokens are produced by all participants. This is a clear drawback from the natural speech method. For future studies that wish to elicit natural speech, greater care needs to be taken to ensure enough tokens are recorded. Time is likely not the issue, as participants spoke nearly the same amount for formal and informal tasks. The majority of recorded time was 10 to 15 minutes for the formal individual tasks and 15 to 20 minutes for the informal pair tasks (talking time split between each participant). One thing that can be done in future studies is to condition the natural speech space with topics that may ensure a greater likelihood of needed tokens. Though not planned, this was the case for the task involving the Calvin and Hobbes comics. Most participants produced many /k/ tokens while discussing ‘Calvin’ and /t/ tokens while describing Hobbes, the tiger (Watterson, 1997).

Another drawback from the natural speech method was interference due to people talking over each other, or laughing. This resulted in some tokens’ VOTs being unmeasurable. There also could have been an issue caused by participants not showing up for their time slot. Had the informal section not been eliminated, the results of these participants would have needed to be analyzed separately from those that completed the task in pairs. Future studies utilizing pairs should keep this in mind when scheduling participants.
3.1 Results

The results of this study will be discussed in detail in this section. For the L1 English speakers, the average VOT for /p/ was 51 ms, for /t/ 67 ms, and for /k/ 64 ms. The average VOTs for the simultaneous bilinguals were 42 ms for /p/, 65 ms for /t/, and 61 ms for /k/. The L1 Spanish speakers had an average VOT of 43 ms for /p/, 62 ms for /t/, and 59 ms for /k/. These results are shown below in Table 4 and Figure 4.

Table 4:
Average VOT for /p,t,k/ in milliseconds by participant group.

<table>
<thead>
<tr>
<th></th>
<th>p</th>
<th>t</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 English</td>
<td>51</td>
<td>67</td>
<td>64</td>
</tr>
<tr>
<td>Simultaneous Bilinguals</td>
<td>42</td>
<td>65</td>
<td>61</td>
</tr>
<tr>
<td>L1 Spanish</td>
<td>43</td>
<td>62</td>
<td>59</td>
</tr>
</tbody>
</table>

The values for the simultaneous bilinguals and the L1 Spanish speakers are close to one another. Given the research linked to a critical age for acquiring native-like L2 phonetic categories, the average VOTs from the L1 Spanish speakers were expected to be shorter and more similar to Spanish VOT values than that of the simultaneous bilinguals (Fledge, 1992; Abello-Contesse, 2008). This is because the L1 Spanish speakers acquired English after the age of 5 and the simultaneous bilinguals acquired English earlier. However, this is not the case here and there is little difference between their average VOTs.
However, as expected, the values of both the L1 Spanish speakers and the simultaneous bilinguals do not quite reach the longer lag of monolingual English as reported by Lisker and Abramson (1964) to be /p/ 58, /t/ 70, and /k/ 80. The VOTs of the current study compared with that found by Lisker and Abramson are shown below in Figure 5.

The VOTs for L1 English speakers are also shorter than the monolingual English values of Lisker and Abramson, though not significantly. The L1 English average VOT of /t/ was only three milliseconds less than the monolingual English data. However, as can be viewed in the Table 4, the /t/ values across each group were longer than the /k/ values, deviating from past trends. Testing with a larger sample would need to be performed to see if this is more than a result of this study and a possible feature of El Paso area English. The /t/ values from the simultaneous bilinguals and L1 Spanish speakers could be due to the different place of
articulation, though this would not explain the also longer average VOT of /t/ from the L1 English speakers. Because the /t/ values of the current study are longer than the /k/ values, the /k/ values show the largest discrepancy between the past reported monolingual English VOT of 80 ms to the current study’s L1 English VOT of 64 ms.

Figure 5 also includes the monolingual Spanish (Puerto Rican) VOT values reported by Lisker and Abramson to show that the current two bilingual groups both produced VOTs that were much closer to monolingual English values and do not show as much compromise as expected. The shorter VOT values for English could be showing influence from the short lag norm of Spanish or, instead, could be due to their placement within sentences (Lisker and Abramson, 1967).

![Average VOT with Monolingual Values](image)

**Figure 5:**
This study’s average VOTs compared with monolingual English and Spanish values from Lisker and Abramson (1964).
Though previous studies have reported similar values for English VOTs, the values of the current study do fall shorter. Figure 6 represents the English VOT values from the current study and from three other studies that were previously discussed.

![Average VOT in Various Studies](image)

**Figure 6:**

The average VOT of /p,t,k/ in English as shown in four different studies.

The current study elicited natural speech from L1 English speakers primarily from the El Paso region who are not necessarily monolingual and may show influence of Spanish. The levels for this group are the shortest across nearly all groups in both the /p/ and /k/ columns and is shorter than the two monolingual English values for /t/. The next shortest average VOTs come from the González López (2012) study, which tested L1 English speakers who were at an intermediate or higher level of L2 Spanish (as this was one of the code switching studies). This
study utilized sentences which could explain the shorter VOTs compared to Lisker and Abramson’s values, which were instead derived from word lists. However, the longest average VOTs come from Morgan’s 2011 study which utilized a reading task, meaning that they were also found within sentences. Therefore, differences in methodology cannot be identified as the sole variable affecting the shorter average VOT that we find in the current study. Figure 6 clearly represents a trend dividing the L1 English speakers and the monolingual English speakers.

3.2 More on Demographics and Language Background

A more detailed look into the backgrounds of the participants of the current study is warranted. Consistent with the demographics of El Paso and UTEP, the majority of participants were of Hispanic background. The survey asked participants to fill-in-the blank to allow them to self-identify however they pleased. Because of this, a variety of responses was received. For quantitative representation, three groups were formed by combining the responses given. The racial and ethnic background of the participants is shown below in Figure 7. The smallest group identified as White or White and another race/ethnicity other than Hispanic. Only one of the 45 participants identified as just White with the other two participants in this group identifying as White-Asian and White-Native American. These three participants make up seven percent of all participants. The second group, which makes up 14 percent, is made up of seven participants who identified as Hispanic and another race, either White or Black. The other 79 percent of participants identified as either Hispanic, Latino, Mexican, Chicano, Mexican-American or a mix of these. With such a large majority of the tested participants identifying as Mexican, Hispanic, or similar and with El Paso’s location on the border, many of these participants may have extended contact with Spanish from their families.
The following data focuses on the language background of the participants. Although participants were separated into three language groups for the purpose of this study, their levels and use of English vary. Of the participants in this study, 16 learned English after the age of five, indicating there likely was not English in the home before they started school. The simultaneous bilinguals were most likely raised in a household were both Spanish and English were spoken at home. But, as these are only assumptions, the participants were asked what language they speak at home. Again, participants were allowed to fill in the blank, but all responses were either Spanish, English, or some mix of both (some participants simply wrote Spanish and English, while others said mostly Spanish or mostly English). The number of participants, separated by language spoken at home is show below in Figure 8. This graph also includes data for other locations and the predominant language used there.
Figure 8:

Graph indicating which languages are spoken at home and which languages participants used more with friends when they were in high school and currently at UTEP.

Though the numbers for home language are distributed in such a way as to nearly align with the number of participants in each language group, their placement varied. Two of the first language English speakers reported speaking Spanish at home. Five of the 16 first language Spanish speakers reported speaking both Spanish and English at home and one listed only English. It would have been beneficial to include a question about what their parents’ first languages were, as this could give even more insight into their language background and the input they grew up receiving.

The other data represented in this graph comes from questions concerning which language the participant spoke the most outside of the classroom during high school and which language they speak outside of the classroom at UTEP. The graph shows that the language spoken at home was pretty evenly split for Spanish, English, or Spanish/English. However,
English becomes the dominant language used in high school and even more so in college. Indicating, that even though participants grew up speaking Spanish (31 of the 45 participants), the dominant language the majority communicate in, is English, even if they learned it at a later age. However, they may still be utilizing Spanish, just in areas other than school.

The participants were also asked which language they use more with their friends. As could be hypothesized regarding the data above, most of the participants speak English with their friends. However, the majority answered that they ‘often’ did, indicating they still occasionally use Spanish with friends, possibly more so at home. They may also code switch between the two. This data is represented below in Figure 9.

![Figure 9: Participants responses to how often they speak English with friends.](image)

Although Figures 8 and 9 may lead one to assume that English is dominating Spanish in the region, this is not quite the case. Participants were also asked if they considered themselves bilingual. Of the 45 participants, 33 reported that they were bilingual, with another five participants considering themselves somewhat bilingual. This data is represented below in Figure 10. Only 16 percent of the participants reported that they were not bilingual.
Figure 10:
Percentages of participants who report as bilingual or not.

There is much to be said considering that 69 percent of the participants grew up speaking Spanish as their first language, but 82 percent of the participants communicate in English only outside of the classroom, while they are currently at UTEP. With this strong degree of language contact in the El Paso area, the study does not necessarily need to focus only on the VOT values of the L1 English speakers, as they made up 31 percent of those tested. To represent the participants, who reported to use English more outside of the classroom, while at UTEP, their VOT values were analyzed separately from the L1 English speakers. The average VOTs for this group, of 23 participants, were shorter than the L1 English speakers, at 42 ms for /p/, 63 ms for /t/, and 60 ms for /k/. These values show that there is an even larger gap between the English spoken in the El Paso del Norte region and previously recorded values for monolingual English speakers.

In order to take a closer look into the multiple variables that could be affecting the average VOT, group results were split in a variety of ways for comparison. Shown below in
Table 5, the average VOTs separated by gender are reported. As well as the average VOTs of native Spanish speakers separated by location of language spoken. The results for all but the gender variable exclude the L1 English speakers, so that a closer look at the VOTs of those in more direct contact with Spanish can be taken. This group of 31 participants then includes both the simultaneous bilinguals and the L1 Spanish speakers who learned English after the age of five. Their VOTs were then split by which language they used at home, English only, Spanish only, or English and Spanish. The same was done for the languages they identified to use the most outside of the classroom during high school and now at UTEP.

Table 5: Average VOTs split by various variables.

<table>
<thead>
<tr>
<th>Gender</th>
<th>p</th>
<th>t</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>43</td>
<td>63</td>
<td>59</td>
</tr>
<tr>
<td>Female</td>
<td>46</td>
<td>65</td>
<td>62</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average VOTs for 31 Spanish speakers (Simultaneous and L1)</th>
<th>p</th>
<th>t</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>English only at home</td>
<td>45</td>
<td>67</td>
<td>66</td>
</tr>
<tr>
<td>English/Spanish at home</td>
<td>44</td>
<td>64</td>
<td>63</td>
</tr>
<tr>
<td>Spanish only at home</td>
<td>41</td>
<td>62</td>
<td>57</td>
</tr>
<tr>
<td>Mostly English at UTEP</td>
<td>42</td>
<td>63</td>
<td>60</td>
</tr>
<tr>
<td>English/Spanish at UTEP</td>
<td>45</td>
<td>61</td>
<td>63</td>
</tr>
<tr>
<td>Mostly Spanish at UTEP</td>
<td>42</td>
<td>69</td>
<td>57</td>
</tr>
<tr>
<td>Mostly English in HS</td>
<td>42</td>
<td>63</td>
<td>60</td>
</tr>
<tr>
<td>English/Spanish in HS</td>
<td>44</td>
<td>61</td>
<td>62</td>
</tr>
<tr>
<td>Mostly Spanish in HS</td>
<td>43</td>
<td>68</td>
<td>59</td>
</tr>
</tbody>
</table>

Given the small sample of this study, there is not an obvious difference between these groups. However, the numbers are suggestive that perhaps another look needs to be taken with a
much larger sample that would allow for the detailed analysis of the variety of language environment variables seen in Figure 11.

Figure 11:
Average VOTs for the first language Spanish speakers of this study. Results are split by primary language used in different locations.

These values do seem to be longer for those that use English the most in the various environments than they are for those who use both or Spanish more. Although, overall, these values are still shorter than the monolingual English average VOTs.
CHAPTER FOUR: CONCLUSION

4.1 Summary of Current Study

The current study sought to compare the average English VOT for voiceless stops in stressed initial position in the El Paso del Norte Region to values from previous studies. 45 participants were recruited and split into three different language groups, those who acquired English as their first language, those who acquired Spanish as their first language, and those who acquired both English and Spanish before the age of five. The participants were asked to perform two formal speaking activities and two informal speaking activities, while having their speech recorded. Unfortunately, due to the low number of voiceless stops produced in the informal activities, this condition was removed before the results were complied. With this in mind, future studies that wish to elicit natural speech, should take special care to ensure that enough tokens will be produced by speakers.

The average VOTs found in this study for both the simultaneous bilinguals and the first language Spanish speakers were shorter the VOTs found for monolingual English by Lisker and Abramson in 1964. However, they were much closer to the English values than the monolingual Spanish values reported in the same study. These results disproved the hypothesis which expected that the values of the L1 Spanish speakers would show compromise and fall in between the average VOTs of monolingual English and monolingual Spanish. However, they support one other hypothesis that the L1 Spanish speakers would have shorter VOTs than the simultaneous bilinguals, even though they were quite close. The first language English speakers in this study also showed shorter VOTs than those reported by Lisker and Abramson, supporting this study’s hypothesis that these values would be shorter and more similar to those typical for Spanish. The
reason for this difference is likely not due to their place within sentences, because their VOTs were consistently shorter compared with the VOT values found in sentence production tasks in previous studies. Although these levels may not be significant here, an obvious trend is shown with L1 English speakers, who have had some contact with Spanish, producing shorter VOTs than monolingual English speakers. The last hypothesis for this study was that the L1 Spanish speakers would show difficulty producing native-like /t/ VOTs, due to the difference in place of articulation in Spanish and English. This group did have longer VOT values for /t/ than for /k/, which was not expected given prior research. However, this was also shown in the other two language groups, signifying that it likely wasn’t due to /t/’s place of articulation.

This study was interested in the English of the El Paso del Norte region. Thus, the results of the L1 English speakers may be thought to be the most important. However, given the data of the participants’ language use, some important findings need to be taken into account. Although, there were only 14 L1 English speakers in this study, 23 participants from the other two language groups reported to use English the most outside of the classroom. English was the predominate language reported to be used, outside of the classroom in high school, in college, and with friends. This signifies, that a more accurate representation of the English in the El Paso del Norte region needs to include these speakers, even though English was not their first language. The VOT values for this group were, 42 ms for /p/, 63 ms for /t/, and 60 ms for /k/. This shows that the English of the area, regardless of who speaks it, has shorter VOTs than the reported VOTs of monolingual English speakers of previous studies.

4.2 Future Research

A glimpse into the detailed variables of language background was given in this study. However, in order to accurately gauge the effect that language background and use has on VOT,
a study with a larger and more representative sample would need to be taken. This would allow
the complexities of bilinguals’ interaction with language to be analyzed for concrete effects on
production.

Past studies have been quick to separate participants by their first language, this study
shows that depending on what’s being studied, this approach may need another look. Moving
forward, it would be interesting to test a wider sample of participants from this region, across
varying age groups, but instead of being split by first language, to split them by the language
they use the most (still taking note of their first language). The results for the English VOTs in
this case, may be more representative of the English as it is spoken in a border region. The same
could also be done for Spanish in this region. The first language of a participant will always have
influence on the language being studied. Although, in areas of intense language contact, perhaps
first language is a periphery issue, with the current language makeup of the region, being of more
importance.


http://0.search.proquest.com/pqdtglobal/docview/305267021/citation/5EFFB07C8434FB3PQ/1.


https://doi.org/10.1080/00437956.1964.11659830.


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http://0.search.proquest.com/pqdtglobal/docview/1552723503/abstract/102CA1AE54AC40D2PQ/20.


APPENDIX

Appendix 1: IRB Approval Letter

THE UNIVERSITY OF TEXAS AT EL PASO
Office of the Vice President for Research and Sponsored Projects
Institutional Review Board
El Paso, Texas 79968-0587
phone: 915 747-8841  fax: 915 747-5931
FWA No. 00001224

DATE: December 6, 2017
TO: Kyla McMillan, BA English Literature
FROM: University of Texas at El Paso IRB
STUDY TITLE: [1147337-1] Voice Onset Time of Aspirated /p, t, k/ in the English of the El Paso Del Norte Region
IRB REFERENCE #: College of Liberal Arts
SUBMISSION TYPE: New Project
ACTION: APPROVED
APPROVAL DATE: December 6, 2017
EXPIRATION DATE: December 5, 2018
REVIEW TYPE: Expedited Review

Thank you for your submission of New Project materials for this research study. University of Texas at El Paso IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This study has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

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Appendix 2: Calvin and Hobbes Comics

**Calvin and Hobbes**

**by** Watterson

**Uh oh, I think I saw a tentacle under the bed!**

**Monsters!**

**Turn on the lights! That makes monsters shrivel up. Good idea.**

**Click! Ha ha. We got 'em!**

**Aarrghhh! Aieeee! Saaahhh! Gaack!**

**Just the ones under the bed, we'd better open up the drawers and closet too, and get some light in those places!**

**By golly, no monsters are going to get us tonight! Wither and die, bloodsucking freaks of nature!**

**Why is your light on? What in the world are you doing?!**

**Monsters, dad. They could be anywhere.**

**You're trashing your room at 1:00 in the morning, looking for monsters?! If you don't get in bed this instant, you'll have a lot more to worry about than stupid monsters!!**

**What we need is some way to shrivel him up.**
Well, if you didn't get in a fight at school, what on earth happened to you?


Let's just say sometimes I wish I had a gerbil.
WHAT'S THE SCORE?

TEN BILLION TO ONE, MY FAVOR.

IT IS NOT!

THEN KEEP TRACK YOURSELF.

HA! IT WENT STRAIGHT UP! EASY OUT! EASY OUT!

YOU'RE NOT EVEN GOING TO RUN, EH? I DON'T BLAME YOU. YOU'RE AS GOOD AS OUT.

BINE!

YOU CAN'T DO THAT!

THAT'S TWO HITS ON ONE PITCH! THIS RUN COUNTS DOUBLE!
CALVIN AND HOBBES

Here's "Hamster Huey and the Gooey Kablooge." You might like this story.

Yeah? How good can it be if it hasn't been made into an animated TV show?

I hope tonight's story isn't as boring as last night's was. It put me right to sleep.

Don't worry. This story will keep you up all night.

Really? What is it?

It's called "The Disembodied Hand That Strangled People."

Gosh, this is great! How creepy! I never get a scary story! A disembodied hand! Wow!

And you know what's really scary? They never found it! To this day, nobody knows where the hand is!

In fact, the hand could... Oh no! There it is!

It's g-got me!!

Gakk!!

Calvin? Calvin?

I should've thought of that years ago.
SLAM!
WHAT A CHUMP!

KNOCK KNOCK

FORGET IT, YOU MORON!
I'M NOT OPENING THE DOOR! YOU CAN JUST STAY OUT THERE ALL NIGHT!

I'M HOME!

OH, I CAN'T WAIT TO HEAR THIS ONE EXPLAINED.

YAHHAA!
Click

Uh oh...

The sky is a deep orange! Calvin's skin is a pale green! Yellow flowers are now blue!

Every color is the opposite of what it should be!

Calvin has been transferred to a color film negative!

His only hope is to be processed by a 1-hour photo finisher? developer? I need developer!

Doggone it, Calvin! That's another picture ruined! Can't you look pleasant for 1/500th of a second?
Appendix 3: Questions Used in Formal Individual Interviews

1. What is your major? *Why do you want to major in that? What is your favorite class this semester? What do you want to do when you graduate? Do you have a minor?*

2. What is your family like? *Who are you closest to in your family? Is your family close? What do you usually do together as a family? Do you have any pets?*

3. If you had a free day to do whatever you wanted, what would you do? *Would you stay here or go somewhere else? Would you rather do something new or something you know you love?*

4. (Back-up 1) What superpower would you like to have? Who is your favorite character in a book, movie, TV show, cartoon, or other?

5. (Back-up 2) Who is your favorite character in a book, movie, TV show, cartoon, or other?

6. (Back-up 3) Who is the person you are closest to? What are they like?
Appendix 4: List of Possible Famous People or Characters For Informal Game

Real People:

Characters:
Appendix 5: Questions Used for Informal Conversations Between Pairs

Slip 1:
1. If a crystal ball could tell you the truth about yourself, your life, the future, or anything else, what would you want to know?
2. When did you last sing to yourself? To someone else?

Slip 2:
1. Complete this sentence: “I wish I had someone with whom I could share…” Why is that important to you?
2. If you could be on any type of competition reality show, which would you have a chance of winning? (A cooking show, dating, dancing, singing, design, etc.)

Slip Back-up 1:
1. Would you rather travel back in time or to the future? When would you go and why?
2. What upcoming event that you have planned are you most excited for?

Slip Back-up 2:
1. Is there something that you’ve dreamed of doing for a long time? Why haven’t you done it?
2. If you could wake up tomorrow having gained one quality or ability, what would it be?
Appendix 6: Demographics and Language Survey Completed by Each Participant

A.
1. What is your number?
2. What is your gender?
3. How old are you?
4. What is your race/ethnicity?
5. In which city were you born?

B.
1. What was your first language(s)?
2. When did you first start learning English? (Answer with a guess of age or grade in school)
3. Which language do you speak at home?
4. Which high school did you go to?
5. During high school, which language did you speak the most outside of the classroom?
6. Here at UTEP, which language do you speak the most outside of the classroom?
7. Do you feel comfortable speaking English at school for class activities?
8. How often do you speak English with your friends?
9. Do you consider yourself bilingual?
VITA

Kyla McMillan is a linguistics graduate student and the Peace Corps Campus Recruiter at The University of Texas at El Paso. After completing her Bachelor's in English Literature at the University of North Texas, Kyla was accepted into Peace Corps and invited to serve as an English Education Secondary School teacher in Ukraine. While in Ukraine, Kyla learned both Russian and Ukrainian, though spent more time conversing in Russian due to her living location in the south. It was this exposure to two languages, which although very similar, were also very different that led her to pursue her Master’s in Linguistics. Kyla plans to either pursue her doctorate in Linguistics or follow a career of foreign service with the Department of State. For the time being, she has accepted a position to be an English Education Specialist with Peace Corps Response in the country of Georgia for six months.

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