ACQUIRING QUECHUA MID VOWELS: L1 ENGLISH-L2 SPANISH THIRD

LANGUAGE ACQUISITION IN A STUDY ABROAD CONTEXT

by

SARAH ELIZABETH HUBBEL

(Under the Direction of Chad Howe)

ABSTRACT

This study investigates vowel acquisition of L3 Quechua by L1 English-L2 Spanish speakers. Quechua has three vowel phonemes /i, a, u/ and two allophonic, low-mid variants of the high vowels in the context of uvular consonants, [ɛ] and [ɔ]. Spanish also contains five vowels, though the mid vowels are high-mids /e, o/. Most American English dialects contain eleven vowels including /ɛ, ɔ/. This study seeks to determine which language is the transfer source for participants acquiring Quechua. The participants completed two production and one perception task at the beginning and end of a study abroad program in Cusco, Peru. Some participants seem to transfer only from Spanish, while others combine English and Spanish in the production tasks at time 1. By time 2, Spanish seems to be the transfer source for most participants. However, the participants perceive many of the Quechua mid vowels as low-mid vowels, present only in English.

INDEX WORDS: third language acquisition, Quechua, Spanish, English, vowels, study

abroad

ACQUIRING QUECHUA MID VOWELS: L1 ENGLISH-L2 SPANISH THIRD

LANGUAGE ACQUISITION IN A STUDY ABROAD CONTEXT

by

SARAH ELIZABETH HUBBEL

BA, Calvin College, 2014

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment

of the Requirements for the Degree

MASTER OF ARTS

ATHENS, GEORGIA

2016

ACQUIRING QUECHUA MID VOWELS: L1 ENGLISH-L2 SPANISH THIRD

LANGUAGE ACQUISITION IN A STUDY ABROAD CONTEXT

by

SARAH ELIZABETH HUBBEL

Major Professor: Chad Howe
Committee: Timothy Gupton
                    Gary Baker

Electronic Version Approved:

Suzanne Barbour
Dean of the Graduate School
The University of Georgia
May 2016

ACKNOWLEDGEMENTS

I would like to acknowledge those without whom I would not have had sufficient support or resources to compose a Master's Thesis. First, I want to acknowledge the funding from FLAS (Foreign Language Area Studies) which provided the means to travel to Peru and collect data. I am also grateful for the cooperation of the administrators and instructors at Centro Tinku. I also want to thank my major professor, Dr. Howe, for being so available to his advisees and students, for offering considerable advice on my thesis and career path, and for his encouragement over the past two years. I am also greatly thankful for my committee members, Dr. Gupton and Dr. Baker, who contributed many meaningful comments, and inspired much of my discussion section. Lastly, I want to thank Dr. Cabrelli Amaro for meeting with me at the end of a busy semester to answer my questions on L3 acquisition, and to offer many great suggestions that informed the methodology and results section of my thesis.

To my friends and family, I first want to thank my fiancé, Justin Bigger, who has given up many weekends of rock climbing and hiking adventures to keep me company in my office. He and my enthusiastic best friend, Bethany Bateman, have offered continuous emotional support. I also acknowledge my family—Kyle, Melissa and Brooke Hubbel—who have pretended to be interested in my research, and have been in my fan club since day one. Lastly I want to thank the great people of the Romance Languages Department of the University of Georgia. Many stimulating conversations with these professors and students alike are what have propelled my academic growth and passion for Spanish linguistics.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 History of Quechua. Since the mid-16th century the Quechua and Spanish languages have been in contact. In the early fifteenth century, the Inca Empire began to flourish and quickly became a dominant presence in the Andean region of South America. Geographically, the Inca people occupied most of Peru, Ecuador, and Bolivia, and even inhabited a small portion of bordering countries—Colombia, Argentina and Chile. The Inca Empire, or *Tawantinsuyu*, 'four parts together', reflects the division of the empire into four regions—*Chinchaysuyu* 'the north quarter', *Antisuyu* 'the east quarter', *Qollasuyu* 'the south quarter' and *Kuntisuyu* 'the west quarter'. These four geographical regions largely reflect the four main dialects of Quechua—Quechua I and Quechua II, which is further divided into Northern, Southern and North Peruvian Quechua—and the four alliances that separated the Inca people from one another socially and culturally (Morris & Von Hagen 2011, Torero 1964). Mostly due to diseases and an already fragmented empire, the Spanish invasions, beginning in 1531, swiftly wiped out up to 90 percent of the Inca people (Hunefeldt 2004). Soon after the arrival of the Spanish conquistadors, the Incas began to employ Spanish in social situations and many were quick to replace their traditional, culture-rich language with the prestigious European counterpart. However, the use of Quechua on behalf of the Spanish administrators was instrumental in their ability to communicate with more isolated communities on the outskirts of the Inca Empire (Klee & Lynch 2006). Ultimately, since the arrival of the Spaniards, there has been some degree of contact between Spanish and Quechua.

The general coexistence of Quechua and Spanish throughout the past 500 years has persisted up until today; though, arguably, today's situation is more adequately described as diglossia rather than bilingualism (Klee & Lynch 2006). A prolonged coexistence of these two languages has instigated some bidirectional language change. Quechua has accepted many Spanish lexical items into its vocabulary for terms not relevant to a pre-colonial culture. Spanish has experienced phonological, morphosyntactic, semantic and lexical alterations, probably due to direct Quechua influence or its indirect influence of preserving a colonial Spanish (Klee & Lynch 2006). Among some of these phonological changes in Spanish are the confusion of high and mid vowels, conservation of /s/, assibilation of /r/, maintenance of the palatal lateral /ʎ/, and atonic vowel reduction (Klee & Lynch 2006:136). The most prominent morphosyntactic and semantic features resulting from Quechua contact are word order (i.e. a higher incidence of SOV) and the use of the past perfect verb paradigm to reflect the Quechua morpheme, *-sqa-*, which is utilized to mark the unexperienced past (Klee & Lynch 2006; Ocampo & Klee 1995). The present study focuses on phonetic phenomena, particularly the production of mid vowels in Quechua.

Understanding the history of contact between Spanish and Quechua is paramount to understanding the development of the Quechua vowel system spoken by Spanish-Quechua bilinguals at present (O'Rourke 2012). Quechua exhibits three vowel phonemes and two allophonic variants of the high vowels, /i/ and /u/ in the context of uvular consonants (Cerrón-Palomino 1994). However, due to influence of the five-vowel Spanish system, the realization of these vowels resembles low-mid vowels in bilingual speech[1], but backed variants of high vowels

---

[1] In section 2.3 I will provide data to support this statement.

in monolingual Quechua speech (Pasquale 2009). In other words, bilingual and monolingual speakers of Quechua have distinct vowel spaces, especially in regard to mid vowel production.

1.2. Present Study. The current study analyzes how L1 English-L2 Spanish bilinguals acquire Quechua vowels over a study abroad period. The four main research questions guiding the present study are: 1) *Is phonetic transfer in Quechua vowel production more likely to come from the L1 (English) or the L2 (Spanish) in the initial stages, when learners have had no contact with Quechua? After 7 weeks of Quechua input?* 2) *Do students tend to become more target-like in their pronunciation of Quechua vowels given increased exposure?* 3) *Is there a difference in the source of transfer between pronunciation and perception?* and 4) *What linguistic and extralinguistic factors condition the production of Quechua vowels?*

The study includes a control group comprised of five native bilingual Spanish-Quechua speakers, and an experimental group of six beginners and two intermediate Quechua learners. Each participant in the experimental group completes three tasks—a sociolinguistic interview, a reading task, and a perception task—at the beginning and end of the program, while the control group participants complete each task once. Moreover, each participant completes a series of documents in order to extract extralinguistic data that will be discussed later on. The dependent variables of the study are the first formant (F1) and second formant (F2) values of the Quechua mid vowels, which are measured and analyzed in light of several independent variables, both linguistic and extralinguistic (see Chapter 5). My general hypothesis is that participants will transfer the Spanish vocalic system directly to Quechua due to recency effects and psychotypological proximity.

In Chapter 2 of the thesis I discuss the three vowel systems relevant to the present study—English, Spanish and Quechua. The third chapter will deal with topics in third language

acquisition, specifically the difference between second and third language acquisition, approaches to L3/Ln acquisition, L3 phonetics and phonology, problems in L3 acquisition methodology, the context of acquisition, and perception versus production in language acquisition. This will be followed by a presentation of the methodology, data extraction, and data analysis in Chapter 4. The results will be presented in Chapter 5, beginning with the native control group, followed by a qualitative analysis of quantitative data from each experimental participant separately, and finally a statistical analysis of linguistic and extralinguistic predictors in relation to normalized formant values of the experimental participant group. Chapter 6 will conclude the thesis with a discussion of the results, comments on the limitations of the present study, and final remarks.

CHAPTER 2

VOWEL SYSTEMS

Because the present study investigates L3 acquisition of the Quechua vowel system by L1 English-L2 Spanish speakers, all three vowel systems must be analyzed in order to determine the source of transfer in the acquisition process.

2.1. English Vowel System. The English vocalic inventory has at least 11 vowels— /i, ɪ, e, ɛ, æ, ɑ, ʌ, ɔ, o, ʊ, u/ including both tense and lax vowels. In general, English vowels are pronounced as diphthongs more so than tense, 'pure' Spanish vowels— for example English /i, e, o, u/ are often times pronounced as [ij, ej, ow, ʉw] respectively, like in the words 'beat', 'day', 'grow', and 'shoe'(Whitley 2002). In unstressed position, many English vowels are reduced to schwa, /ə/, a centralized vowel, with respect to both F1 and F2 values, like in the last vowel of the word 'institution'. A visual representation of the English vowel space is presented in Figure 1. On the imaginary x-axis, the F2 values can be found, which increase from right to left. The y-axis represents the F1, which increases from top to bottom.
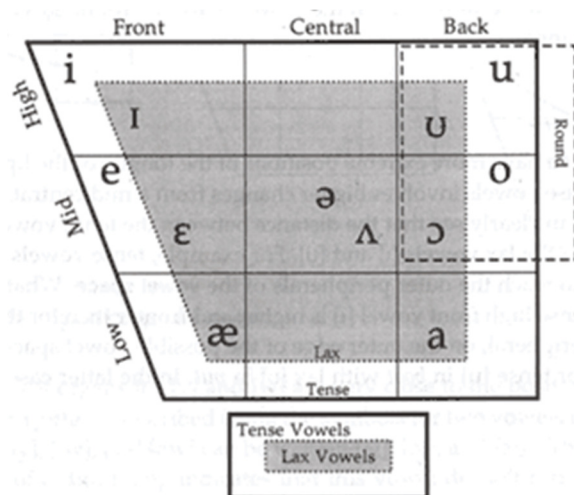
Figure 1. IPA English Vowel Chart (Language Samples Project 2001)

Figure 1 is supplemented with actual formant values in Table 1 and 2, which are replicated from a study conducted at Western Michigan University. The participants in the study are native English speakers primarily from the southeastern and southwestern region of Michigan's lower peninsula, but also include speakers from Illinois, Minnesota, Wisconsin, northern Ohio, and northern Indiana (Hillenbrand, Getty, Clark & Wheeler 1995). These speakers were chosen because of the "subjects' production of the /ɑ/-/ɔ/ distinction… not maintained by many [other] speakers of American English" (p. 3100). Table 1 lists the average F1 and F2 values for male speakers of Midwestern English and Table 2 lists the values for female speakers of Midwestern English.

Table 1. Formant Values for American English Vowels of Male Speaker											
	/i/	/ɪ/	/e/	/ɛ/	/ae/	/ɑ/	/ɔ/	/o/	/ʊ/	/u/	/ʌ/
F1	342	427	476	580	588	768	652	497	469	378	623
F2	2322	2034	2089	1799	1952	1333	997	910	1122	997	1200

Table 2. Formant Values for American English Vowels of Female Speaker											
	/i/	/ɪ/	/e/	/ɛ/	/ae/	/ɑ/	/ɔ/	/o/	/ʊ/	/u/	/ʌ/
F1	437	483	536	731	669	936	781	555	519	459	753
F2	2761	2365	2530	2058	2349	1551	1136	1035	1225	1005	1426

These vowels will be compared to the Spanish vowel formant values in the following section. Though the general vowel space is similar regardless of dialect, given that American English dialects vary greatly with regard to vowel production, and that the participants in this study reside in different regions, each participants' formant values will be analyzed separately in the present study. In other words, these participants will not be analyzed as a whole using average formant values across all participants to compare experimental and control groups, but rather as isolated cases, by comparing each set of formant values from each participant to the

normalized native group data separately.[2] This will prevent the foreseeable issue of overlooking any trends that may result from averaging formant values of speakers from different regions who pronounce and perceive each vowel differently. However, the above data are still useful in comparing overall English and Spanish vowel formants in order to find patterns in the data and make predictions as to what English and Spanish transfer might look like in the analysis of Quechua production. Because the native control group is comprised of only Cusco natives with similar vowel systems, this participant group will be analyzed as a whole.[3]

    2.2. Spanish Vowel System. The Spanish vowel system is much simpler in comparison to that of English as far as the number of vowels in the phonemic inventory is concerned. Whereas English has 11 vowels, Spanish contains only five— /i, e, a, o, u/. The overlapping English and Spanish vowels /i, e, o, u/ are similar, though not equivalent— the Spanish vowels are tenser, shorter, not diphthongized, and are characterized by different formant values. As seen in comparing formant values from Tables 1, 2 and 3, in English, the F1 and F2 values are slightly higher for the high vowels, /i u/, which means in English, these vowels are both more fronted and lower. Also, the F2 values are higher for /e/ in English, meaning this vowel is higher; and the F1 values are higher for /o/, meaning this is lower. However, the general vowel space that each of these four vowels occupies is about the same, meaning that these vowels are mostly equidistant from each other on a vowel chart in both English and Spanish. There is, however, no corresponding vowel sound for the Spanish low vowel, /a/ in English, though /ɑ/ may be considered the most similar phonetically (Whitley 2002). The *Nueva gramática de la lengua española: Fonética y fonología* published by the *Real Academia Española* (2011) provides a

---

[2] For the linguistic and extralinguistic analysis, however, the experimental group's formant values are normalized.
[3] These values are normalized as the native group contains both male and female participants belonging to different age groups.

table with approximate formant values for the five Spanish vowels, which is recreated in Table 3

below. The dialect from which these values are reported is not disclosed.

Table 3. Average Formant Values of Spanish Vowels					
	/i/	**/e/**	**/a/**	**/o/**	**/u/**
F1	298	465	753	455	283
F2	2188	1780	1260	910	865

Another way in which Spanish and English vowels differ is that they vary greatly

according not only to the quantity of vowels but also their length and "purity". English vowels

are usually longer, especially when they are stressed. English vowels are also considered less

tense and "pure," meaning many are actually realized as diphthongs (Whitley 2002). Also, unlike

English vowels, Spanish vowels are not as sensitive to dialectal variation (Morrison & Escudero

2007), though there are some exceptions to this generalization (Penny 2000). The most relevant

exception in regard to the present study is that found in O'Rourke (2010), which analyzes the

vowel space of monolingual Spanish speakers versus Spanish-Quechua bilinguals and will be

discussed in the following section.

2.3. Quechua Vowel System. The Cusqueño Quechua vowel system is highly debated by

linguists and other academics researching the language. Some contend that there are three vowels

/i, a, u/ while others argue that there are five vowels /i, e, a, o, u/ (O'Rourke 2010). Though the

three-versus-five-vowel debate is pertinent mostly in developing an orthographic system, most

scholars agree that Quechua has three vowel phonemes and two vowel allophones (O'Rourke

2012, Cerrón-Palomino 1994, Pasquale 2009). In Quechua the high vowels /i/ and /u/ become

mid vowels [ɛ] and [ɔ] respectively in the presence of a uvular consonant, whether it be ejective,

aspirated, plosive, or fricative (O'Rourke 2010, Cerrón-Palomino 1994). For example, in the

word *q'illu* 'yellow' despite the orthographic 'i', the pronunciation of the word is [q'ɛʎɔ] due to

the close proximity of the uvular ejective; however, *killa* 'moon', is realized [kiʎa] as the first

consonant is velar not uvular. For some words, the uvular consonant affects only the vowel that immediately precedes or immediately follows the uvular sound. In other cases, the uvular elicits vowel harmony that extends across the entire word, e.g. *qumir* 'green' [qɔmɛr].

Some researchers, however, have suggested that there are indeed minimal pairs that contrast mid from high vowels (Pasquale 2009). Take for example, the Cusqueño Quechua words *huk* 'one' and *hoq* 'other'. Both uvular and velar consonants become indistinguishable from each other in syllable-final position as they are both realized as a uvular fricative [χ]. Thus, *huk* is pronounced [huχ] and hoq is pronounced [hɔχ], and both words are distinctive from each other only because of the vowel. Because recognizing the mid vowels as phonemes or allophones does not affect acoustic analysis, which is the principle method of data analysis in the current study, my position on the three-versus-five vowel debate will remain agnostic.

Though most studies describe the allophonic variants as mid vowels without further explanation as to what the exact formant values classify these vowels as, the data for the current study suggest that these vowels are more like low-mid vowels than high-mid vowels.[4] Baker (p.c.) comments that the realization of a low-mid vowel in the presence of a uvular consonant is inevitable given lingual coupling triggered by tongue body lowering for the uvular production. However, in examining values extracted during his dissertation, Pasquale (2009) notes that in Cusco, monolingual Quechua and bilingual Quechua vocalic systems are quite different with regard to allophonic production of the high vowels. In addition to possessing a lower vowel space in general, monolingual Quechua speakers produce mid vowels that show much lower F2 values than the high vowels, but the F1 values are relatively equal. In other words, monolingual Quechua speakers produce 'mid vowels' that are backed allophonic variants of 'high vowels',

---

[4] See Table 5.

which end up resembling a slightly more fronted Spanish mid vowel because of the already low

vowel space—both Pasquale and Lipski (2015) agree that the Quechua high vowels are best

described as /ɪ/ and /ʊ/. A representation of the monolingual Quechua vowel space is in Figure 2

below—'iq' represents the allophonic variant of the high front vowel, and 'uq' the allophonic

variant of the high back vowel.
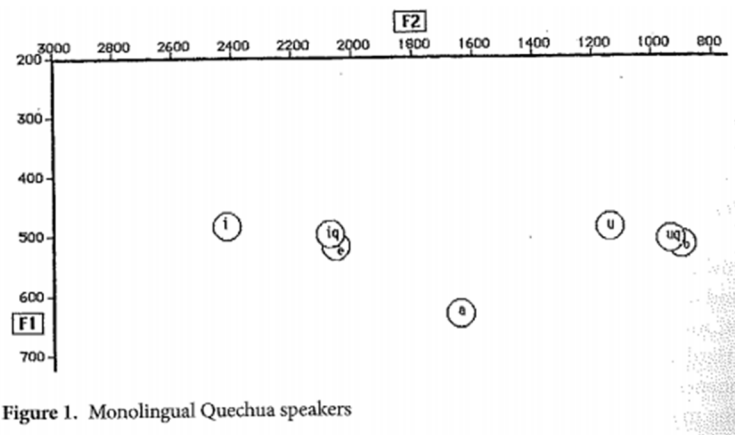
Figure 1. Monolingual Quechua speakers

Figure 2. Monolingual Quechua Speakers' Vowel Space

Pasquale notes that Spanish-dominant bilingual speakers do not realize the uvular

assimilation allophony as demonstrated in Figure 3. Quechua-dominant bilinguals on the other

hand produce allophonic mid vowels similar to corresponding Spanish mid vowels, with the

front-mid vowel being slightly higher and the low-mid vowel being slightly more backed than

Spanish high-mid vowels (Figure 4).
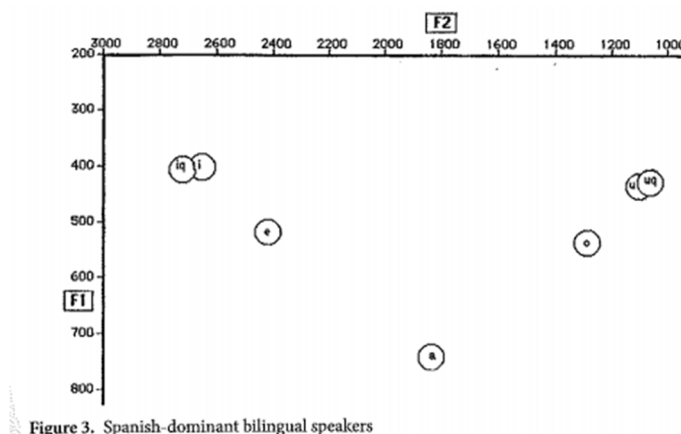
Figure 3. Spanish-dominant bilingual speakers

Figure 3. Spanish-dominant Bilinguals' Quechua Vowel Space
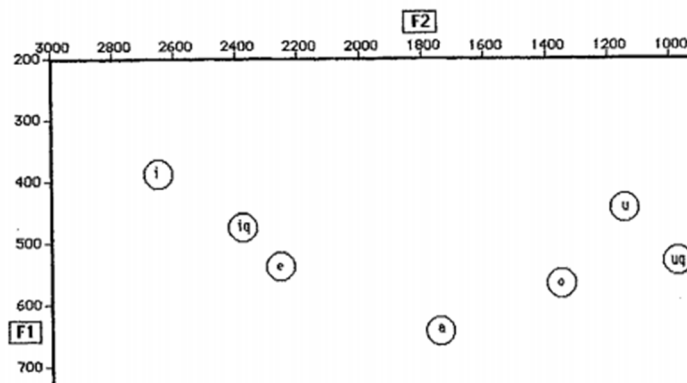
Figure 4. Quechua-dominant bilingual speakers

Figure 4. Quechua-dominant Bilinguals' Quechua Vowel Space

Because the values produced in the present study are from the control group that is comprised of instructors and host mothers with whom the experimental participants have the most amount of Quechua language contact, the allophonic variants of Quechua high vowels are assumed to be low-mid vowels in Cusqueño bilingual Quechua speech for the purpose of the present study.[5]

As seen in Table 4, the F1 and F2 of both the front and back mid vowels in Quechua are higher than the Spanish mid vowels and resemble the English low-mid vowels more than the Spanish high-mid vowels.[6] .This means that Quechua mid vowels are both lower and slightly more fronted than the Spanish mid vowels. Both Spanish and Quechua values are normalized formant values extracted from all participants from the first sociolinguistic task (see section 4.1, *Instruments*). English values are not present in the table below as the values in Tables 1 and 2 are not normalized like the Spanish and Quechua vowels. Normalization methods will be described in section 4.3.

---

[5] Based on the values presented in Table 4.
[6] A low F1 vowel indicates a higher vowel and a high F1 vowel indicates a lower vowel. Low-mid vowels have higher F1 values than high-mid vowels.

Table 4. Spanish/Quechua Mid Vowel Comparison				
	front mid vowel '/e/'		back mid vowel '/o/'	
	Spanish	Quechua	Spanish	Quechua
F1	506	616	585	644
F2	2314	2387	1315	1405

Though the qualities of Quechua vowels have been shaped by its contact with Spanish, O'Rourke (2012) finds that there may be some bidirectional influence in her investigation of the Spanish vowel space of four participant groups—Spanish-Quechua bilinguals, Quechua L2 speakers, Spanish monolinguals in Cusco and Spanish monolinguals in Lima, Peru. O'Rourke observed that, in considering F1 and F2 values of Spanish, "Cuzco speakers [of Spanish] generally [showed] a larger and more fronted vowel space than Lima speakers" and that L2 speakers of Quechua showed a larger overall Spanish vowel space while the bilingual group showed a somewhat smaller vowel space (2012:28). In the Spanish vowel space of both bilinguals and L2 speakers of Quechua, the mid vowels are slightly closer to high vowels. The L2 speakers showed the greatest amount of backness in the back vowels /o/ and /u/. The bilingual speakers produced front vowels /i/ and /e/ that were farther back than the other two Cuzco groups.

O'Rourke observes that there is less space between high and mid vowels for Quechua-Spanish bilinguals than Spanish monolinguals in light of 'motosidad', a term used to describe Quechua-accented Spanish speech in which the mid and high vowels distinction fades (Cerrón-Palomino 1994; Lipski 1994; Klee & Lynch 2006). This may result in the pronunciation of [pilu] for *pelo* 'hair', or [misa] for *mesa* 'table'. As seen in Figure 5, Lipski (2015) finds that Quechua-dominant bilingual speakers indicate "a tendency for the centroids of vocalic production to cluster in a pattern roughly corresponding to the three-vowel system in Quechua" (99). In other

words, these speakers collapse high and mid vowels. Because the bilingual Spanish-Quechua

speakers (both simultaneous and successive) produce high and mid vowels that are closer to each

other than the mid vowels produced by Lima speakers, which are equidistant from the high

vowels and mid vowel [a], it is possible that the mid vowels produced by these speakers are

misinterpreted as high vowels by non-Quechua speakers. The presence or absence of motosidad

in the speech of the control group participants should not have any bearing on Quechua mid

vowel production, the focus of the present study.
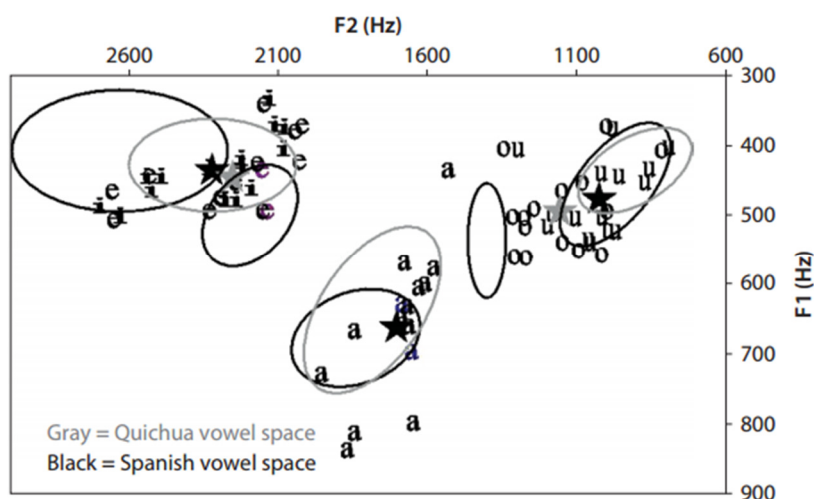
Figure 5. Quechua-dominant Speakers' Spanish Vowel Means (Lipski 2015:102)

The three vowel systems are summarized in Table 5 below.

Table 5. Mid Vowels in English, Spanish, and Quechua			
	ɛ	ɔ	**Allophones or phonemes?**
English	yes	yes	phonemes
Spanish	no	no	n/a
Quechua	yes	yes	allophones (of high vowels, found only in the context of a uvular consonant)

2.4. Predictions. In determining transfer source, if I were to find that Spanish is the

source of transfer, I would expect the F1 and F2 values of the Quechua front, low-mid vowels to

be 450Hz-550Hz for F1 and 1750Hz-2350Hz for F2. In regard to the back low-mid vowel, we

may expect 450Hz-550Hz for F1 and 900Hz-1350Hz for F2, using the values in Table 3.

However, if English transfer were the driving force, using the values in Tables 1 and 2 as a reference, we may expect the front low-mid vowel to have F1 values around 550Hz-750Hz and F2 values around 1750Hz-2100Hz. The back low-mid vowel may have F1 values around 650Hz-800Hz and F2 values between 950Hz and 1150Hz. In other words, if English transfer were to occur, the F1 values would be higher and the F2 values will be lower than those that would be expected if Spanish transfer were to occur. However, the importance of the F1 values far outweighs that of the F2 values in the present study because height of the vowel is what distinguishes a low-mid from a high-mid vowel (see Figure 1). These formant value predictions are based on Tables 1-3 and 5; however, the actual values for the participants of each case study may vary slightly depending on their English dialect and phonetic command of Spanish. We may assume that English is a more economic transfer source as Quechua mid vowels resemble English low-mid vowels more than Spanish high-mid vowels. However, a high level of Spanish proficiency along with recency and psychotypological effects allow Spanish to become the preferred source of transfer. Matters of L3 acquisition will be discussed in the next chapter.

CHAPTER 3

THIRD LANGUAGE ACQUISITION

In this chapter I will explore the importance of distinguishing L3 (third language) or Ln (n = variable of number after 3, i.e. L4, L5, etc.) acquisition from L2 (second language) acquisition, approaches to L3/Ln acquisition, phonological/phonetic L3 acquisition, and current issues in L3/Ln acquisition. I will also review second language acquisition themes like acquisition context and perception versus production.

3.1. Distinguishing L2 from L3/Ln. Though L2 and L3/Ln research may seem to fall under the same acquisition category, there are quite a few differences between L2 and L3/Ln acquisition that should distinguish them as separate areas of study. Despite the fact that the vast L2 acquisition literature has certainly informed work on L3 acquisition, the research conducted in L3 acquisition can possibly contribute more to our understanding of L2 acquisition than vice versa. First, according to Cenoz (2003), L3/Ln learners possess superior metalinguistic skills compared to bilinguals given that these learners have already acquired a second language, and now have the opportunity to use these skills in acquiring a third or 'n' language. Thus, these learners have access to more grammatical properties, and most likely have a wider phonemic and allophonic inventory to draw upon (Rothman, Cabrelli Amaro & Kees de Bot 2013). In his review of studies on the effect of bilingualism on L3 proficiency, Cenoz discusses a prior study on the acquisition of English in the Basque country in which one participant group speaks only Spanish, and the other participants are simultaneous bilingual speakers of Spanish and Basque. Cenoz finds that "bilingualism… [exerts] a significant [positive] influence on different measures

of English language proficiency such as listening, writing, speaking, reading, grammar and vocabulary" (2003:75). Though the direction of the present study is specifically geared toward acquisition of vowels, previous studies have shown that bilingual learners are more adept at learning a third language than monolinguals are at learning a second language. However, bilingualism may not be as important of a factor as general intelligence and motivation, the latter of which will be examined in the present study (Lafford 2006).

Not only is the actual acquisition process quite distinct in L2 and L3 acquisition (Rothman, Cabrelli Amaro & Kees de Bot 2013), there are also factors that can hinder or help a learner acquire a third language that are outside the scope of L2 acquisition. Recency, or how recently the participant interacted with her second language, is one of these factors. Participants who have had more recent contact with their L2 than others may expect the transfer source to be the L2, while those who have experienced a long gap since the last interaction with their L2 may use their L1 as a transfer source when acquiring an Ln (Barkley 2010). In light of the present study, recency is quite important given that the participants see Spanish and Quechua in close physical and cultural contact. (This will be discussed further in the Chapter 6.)

L2 proficiency is another one of these factors. Proponents of and even the authors of the L2 Status Factor (Bardel and Falk 2007; 2012) admit that L1 can trump L2 as the source of transfer if L2 proficiency is low, though how low L2 proficiency should be in order for that to happen is not predicted (Bardel and Falk 2007). Sagasta (2001) found that a higher level of bilingualism—that is, the more alike an L1 and L2 are according to proficiency—is associated with a higher L3 general fluency and specific written proficiency. Perceived typological and actual typological distance between the three or 'n' languages, or how similar or distant the languages are typologically, are also important factors in L3/Ln acquisition according to the

Typological Primacy Model (Rothman, Cabrelli Amaro, Kees de Bot 2013). For example, if a learner is an L1 Spanish-L2 English speaker learning L3 Italian, she may use her L1 as the source of transfer regardless of the 'foreign language effect' proposed by Bardel and Falk's L2 Status Factor model because the first and third languages are typologically related. Typology, psychotypology, recency, and proficiency are factors that influence L3/Ln acquisition in morpho-syntactic transfer; however, Cabrelli Amaro (2014) argues that these factors have not been applied to phonological/phonetic processes. The present study, however, will discuss the results in light of these variables.

3.2. Approaches to L3/Ln Acquisition. There are three main approaches to L3 Acquisition—Sociolinguistic approaches, Multicompetence approaches and Generative approaches. The Generative approach offers four models that make predictions about the initial and developmental stages of L3 acquisition.

Sociolinguistic approaches. While the Multilinguistic and Generative approaches analyze L3 acquisition data with a strategy quite different from how they may respectively analyze L2 acquisition data, the basic sociolinguistic questions frame both L2 and L3/Ln acquisition studies. The objective of a sociolinguistic framework is to determine what role linguistic and extralinguistic factors—age, gender, socioeconomic status, academic background, etc.—play in the acquisition process, and if the factors that condition native production are the same factors that condition learners' production. However, in approaching L3/Ln acquisition studies from a sociolinguistic framework, the number of sociolinguistic variables increase, given a more complex linguistic and social context that accompanies L3/Ln acquisition (Rothman, Cabrelli Amaro, de Bot 2013). Language status, or the social status of a language, is one of these factors. In L2 acquisition studies the L1 and L2 can be either in an equal bilingual relationship or a

hierarchical diglossic relationship (Penny 2000). However, with three or more languages, the relationship is usually more complex. Another factor considered in L3 acquisition is language command—that is whether the participant is a successive or simultaneous bilingual. The latter factor and more classically sociolinguistic variables will be analyzed as extralinguistic predictors in the present study.

Multicompetence approaches. In multicompetence approaches, "languages are not seen as separate entities but part of a larger system" (Rothman, Cabrelli Amaro, de Bot 2013:379). Several languages form a language supersystem in a multicompetence framework. The most important notion borne of a multicompetence approach is that language change and influence is multidirectional, meaning, for example, that a person proficient in two languages does not necessarily transfer from L1 to L2—the influence may be bidirectional, or multidirectional if the person stores more than two languages. In other words, "languages in multilinguals are connected in a larger system whereby changes in one language may have an impact on the other languages" (Rothman, Cabrelli Amaro, de Bot 2013:380). The idea that languages are malleable and interconnected has inspired regressive transfer research and possibly even the Phonological Permeability Hypothesis, which will be examined in section 3.4.

Generative approaches. The generative approach is one that has put forth specific models by which current morphosyntactic L3 research has been analyzed. These models make certain predictions according to each of the three phases of language acquisition—the initial state, interlanguage development, and ultimate attainment. Because L3 is a relatively new area of research, there are no available studies that have produced concrete conclusions for the ultimate attainment state. The principal models of the generative framework make predictions only for the initial state and have been applied exclusively to morphosyntactic phenomena (García Mayo and

Rothman 2013). However, the basic concepts of each of these models can be applied to phonetic research, as the models that inform this area of research are limited to those on regressive transfer (i.e. Phonological Permeability Hypothesis). The four models detailed in the following sub-sections are Absolute L1 Transfer, the L2 Status Factor, the Cumulative Enhancement Model and the Typological or Pyschotypological Primacy Model.

Absolute L1 Transfer: Though according to García Mayo and Rothman (2013) this model "has never been systematically advanced within the generative paradigm", absolute L1 transfer suggests that "the L1 acts as a filter of sorts, impeding access to acquired L2 properties" (2013:16). Judging by the scarcity of research that cites absolute L1 transfer, this model is neither well supported nor well investigated. The advantage of this model is the predictions are clear in the initial state—the anticipated transfer source is always the L1. However, when the results of a study point to the L1 as the source of transfer, this does not necessarily exclusively support absolute L1 transfer, as the predictions put forth by both the Cumulative Enhancement Model and Typological Primacy Model could allow for L1 transfer. Competing models in determining transfer source are another reason why consistent methodology across L3 acquisition studies is paramount in L3 acquisition studies (see section 3.5).

L2 Status Factor: The L2 Status Factor rigidly predicts that the L2 is always the source of transfer of morphosyntactic structures. This model is more colloquially titled the 'foreign language effect', which assumes that foreign (i.e. acquired) languages are stored and processed in the same regions of the brain and separately from the native language. After learning a second language, the learner is now familiar with learning a non-native language and will likely use the same strategies and transfer the same morphosyntactic structures of the L2 in the initial stages of acquiring a third or 'n' language. In this model, the "L2 acts as a filter of sorts to the L1

grammar" (García Mayo and Rothman, 2013:17). L2 Status Factor has been supported by several studies (Bardel & Falk 2007; Falk & Bardel 2011; Kulundary & Gabriele 2012); however, the same results can be explained by either the Cumulative Enhancement Model or the Typological Primacy Model.

The Cumulative Enhancement Model (CEM): The first of two models that does not privilege the L1 or L2 as the transfer source, the Cumulative Enhancement Model predicts combined transfer for the developmental stages and ultimate attainment. In reviewing Flynn's model (2004), Cabrelli Amaro notes the following:

> The CEM "states that existing language systems can facilitate acquisition in an additional language or remain neutral, and that developmental patterns are not redundant. Given that this model takes into account the economy of language, non-facilitative transfer is predicted to never occur because it would not be economical" (45).

In other words, under the CEM, there is no possibility of negative transfer. Though some studies support these predictions (see Tremblay 2007), others find evidence contrary to outcomes predicted according to the CEM (Gut 2010; Carvalho and Bacelar da Silva 2006).

(Psycho)typological Primacy Model (TPM): The TPM shares with the CEM the allowance of either the L1 or the L2 as the source of transfer; however, this transfer is selective and can be non-facilitative as well as facilitative (Cabrelli Amaro, Flynn and Rothman 2013). The selective transfer depends on the typological relationship between languages or the psychotypological—i.e., the perceived typological—distance. A language that is typologically proximate to the target language is predicted to be the source of transfer. This model is supported through findings of Carvalho and Bacelar da Silva's (2006) research on Spanish-English bilinguals acquiring Portuguese. Using mirror-imaging methodology, Carvalho and Bacelar da

Silva analyze L1 English-L2 Spanish and L1 Spanish—L2 English participants' results on two tasks analyzing their ability to produce and understand present subjunctive and future subjunctive Portuguese verb conjugations. They find that both groups perform extraordinarily well on both tasks due to their increased metalinguistic awareness as bilinguals and, more importantly, that both groups transfer from Spanish regardless of its status as the L1 or L2. They argue that "[the] linguistic similarity between the languages overrides order of acquisition, since participants in both groups transferred mostly from Spanish" (198). Additionally, Cabrelli Amaro et al. (2013) find that in acquiring Portuguese, Spanish is the source of transfer even when disadvantageous, which clearly supports the TPM not the CEM. In the present study, it may be argued that although Quechua and Spanish are not typologically similar, these two languages may be perceived as being related because of the great number of Spanish loanwords found in both the monolingual and bilingual Quechua lexicon and a shared five vowel inventory. In Rothman's hierarchical model of what classifies languages as typologically proximate, lexicon is at the top of the list (2015). Quechua and Spanish may also appear to be culturally linked in Cusco, Peru, where the presence of both languages is quite apparent. According to the learner, Spanish and Quechua may be psychotypologically more proximate than English and Quechua, even though overall, Spanish and English are equally typologically distant from Quechua.

   3.3. L3 Phonetics and Phonology. Within the domain of third language acquisition, phonetic and phonology research is greatly underrepresented. The research that does exist in this body of literature mostly focuses on regressive transfer in which the L2 system is altered as a result of the acquisition of later-acquired language systems. Cabrelli Amaro and Rothman's Phonological Permeability Hypothesis (PPH) postulates that non-native systems are "distinct from native systems in its underlying mental representation" (2010:277) and that because these

later acquired systems are distinct, they are more malleable and subject to influence from an L3 or Ln. This model predicts that if L1 and Ln systems are indeed "constructed in a different manner… then the successive system will undergo much more rapid and pervasive cross-linguistic interference from the L3 on the L2 as proficiency in the L3 increases" (2010:278). Their research that supports this hypothesis comes from Spanish-English bilinguals acquiring Brazilian Portuguese (BP) as a third language via testing of segmental phenomena like nasality, spirantization, vowel neutralization, and the treatment of codas (2010). Cabrelli Amaro and Rothman (2010) find that their predictions based on the PPH were corroborated in the results of their pilot study—successive bilinguals learning BP as an L3 in an immersion environment first transfer Spanish values to BP but then begin to transfer BP phonological features to Spanish after a short period of time. Their pilot study also depicts a sound methodology that Cabrelli Amaro (2013) considers quite important in accurately determining transfer source. Issues in L3 methodology will be discussed in the next section.

3.4. Issues in L3 Acquisition Methodology. Because L3 acquisition is a new area of research, its corresponding methodology is not as developed and fine-tuned as that of L2 acquisition. Cabrelli Amaro (2013) puts forth methodological suggestions for participant groups, assessing proficiency, testing paradigms and data analysis.

First, she advises that there should be more than one experimental group, and, in particular, that the experimental groups should be 'mirror images' of each other, meaning the L1 of the experimental group is the L2 of the mirror-image group and the L2 of the mirror-image group is the L1 of the experimental group. Without a mirror-image group, transfer source is difficult to determine. She adds that these groups act as their own control, and that monolingual groups are not appropriate control groups because their metalinguistic awareness and processing

is not as advanced as third language learners. Given the difficulty of finding a homogeneous group of participants, the present study's experimental group does not have a mirror-image group, rather a Spanish-Quechua bilingual control group.

L2 proficiency is a variable in L3 studies that can either be consistent across all experimental participants or vary as part of an extralinguistic independent variable examined in data analysis. Either way, proficiency reports should be accurate and involve some pronunciation component for L3 phonetic and phonological studies. Cabrelli Amaro (2013) suggests using both subjective self-reports and objective measurements. The present study includes a self-report of Spanish proficiency, a written grammatical proficiency measurement, and a native-speaker rating of pronunciation and overall oral proficiency.

In order to assess proficiency and baselines for each language, it is important to design tasks for all three languages involved. The experimental participants in the present study completed the first task, a sociolinguistic interview, in Spanish, English, and Quechua in order to obtain measurements of their vowel formants in all three languages. These participants also read a list of English words that each contained a different English vowel three times so that participants could be more easily compared to each other. The control group participants completed the sociolinguistic interview in Spanish and Quechua.

Lastly, in analyzing the data, like rating proficiency, Cabrelli Amaro (2013) suggests using both acoustic measurements and native raters to have an objective, quantifiable measurement along with a more subjective measurement that is sensitive to phonological proficiency, not just phonetic measures. Unfortunately, there was no access to Quechua-speaking native raters so the data analysis is based mostly on F1 and F2 measurements and limited impressionistic commentary.

One problem that Cabrelli Amaro (2013) does not mention in her commentary on methodology is determining the criteria that classify a language as a second language. Because it is possible that later learned languages may be distinctly represented mentally (Cabrelli Amaro & Rothman 2010), it is important to decide whether a language learned in childhood simultaneously with another language should be considered an L1 or an L2 (Rothman, Cabrelli Amaro & de Bot 2013). One of the participants in the present study is a simultaneous English-Spanish bilingual while the rest are successive bilinguals. However, because all participants are analyzed as separate case studies, her results can be analyzed in light of her specific language background.

3.5. Acquisition Context. The present study takes place in a study abroad context. This means that the learner may be subject to different amounts and types of input than an in-class learner might receive. According to previous research, there are mixed outcomes when comparing language development of a Study Abroad (SA) learner to an At-Home (AH) learner. Segalowitz et. al (2004) compared a AH intermediate group of English L1—Spanish L2 learners spending 3-5 hours per week in class for one semester, with SA intermediate learners spending roughly 17 hours per week over the same time frame in Alicante, Spain. The learners were rated on oral fluency, oral proficiency, communication strategies, pronunciation and vocabulary, and grammatical skills. The study found that the SA learners showed gains in oral proficiency and oral fluency that were not found among AH students. However, AH students improved in their grammatical abilities and vocabulary while the SA learners did not show any gains in this area. Both AH and SA improved in some areas of pronunciation but not in others, an effect also observed by Díaz-Campos (2004), discussed below. In regard to communication strategies, the AH group was able to incorporate the use of far more communication strategies over the course

of the semester than the SA group. Concluding, SA learners showed superior improvements in oral proficiency, AH learners were superior in improving their grammatical abilities, vocabulary and communication strategies and both improved in pronunciation equally.

Using the same group of participants, Díaz-Campos (2004) provides further insight as to how SA and AH learners develop pronunciation skills over the course of a semester. In analyzing four phonological and phonetic phenomena—word-initial voiceless stops, voiced fricatives in intervocalic position, word final [l], and palatal nasals—Díaz-Campos found inconsistent results across phenomena. In both the SA and AH groups aspirated voiceless stops were still predominant in speech at the end of the semester, but regardless, both learner groups favored non-aspirated variants at the end of the program. SA and AH learners alike did not improve in their ability to use a voiced fricative in intervocalic position but did improve in using an alveolar liquid word-finally, especially the AH learners. Both groups of learners had already acquired the palatal nasal before the treatment period. Díaz-Campos comments that "[t]hese results are slightly puzzling in that they do not reveal striking differences between SA and AH students" (2004:270). He further comments that a SA environment perhaps does facilitate improvement of other segmental characteristics of Spanish, or suprasegmental characteristics, and that future studies should address these aspects of Spanish language acquisition.

Because the present study is situated in a short study abroad context, namely one that lasts only seven weeks, of great importance is Llanes and Muñoz's (2009) study that investigates whether short study abroad stays can also facilitate acquisition. They find that their participants, Catalan/Spanish L1 students learning English as a L2, improve in all areas—listening comprehension, oral fluency, errors per clause, ratio of error free clauses per clause, ratio of morphological, syntactic and lexical errors—except for ratio of covered errors. Because the

research applied a sociolinguistic approach, Llanes and Muñoz also found that proficiency level, age, length of present stay abroad, and length of previous stays abroad were significant independent variables. In regard to proficiency level, those who started at a lower English proficiency level were the participants who improved the most. With regard to L2 use over the study abroad period, those who spent more time listening to the target language improved more in the ratio of error free clauses than those who spent less time listening. Those who spent more time writing decreased with respect to the ratio of covered errors. Though Quechua listening, writing, reading, and conversation contact hours were reported by the participants of the present study, these variables are not analyzed in the present study at this time.

In analyzing the perception of phonemic contrasts in English L2 by Spanish/Catalan L1 advanced learners, Mora (2005) finds that the participants improve in their ability to distinguish six of the nine phonemic contrasts investigated— /i:/-/ɪ/, /æ/-/ʌ/, /ɪ/-/ə/, /e/-/eə/, /t/-/d/, /s/-/z/— more so during the formal instruction period (FI) than during the subsequent SA period. Though the authors were puzzled as to how the SA period did not produce significant improvements in phoneme distinction and cite the 'short' three-month abroad period as the root of this lack of improvement, the reason that these already advanced learners of English failed to improve their perception skills was likely due to the structure of the experiment. All of the students were enrolled in an advanced English course at Universitat Pompeu Fabra in Barcelona and experienced a FI period of 100 contact hours over two to three months and then studied in an English-speaking country for the same amount of time. Time 1 (T1) to time 2 (T2) was the FI period and T2 to time 3 (T3) was the SA period. Because advanced students had already spent 100 contact hours of FI before studying abroad, there was most likely not much improvement to be made. At this stage in language development, the learners had probably fossilized in their

English language abilities or had performed so well on the auditory discrimination task at T2 that there was no possibility of significant improvement at T3. This study, though important in the discussion of literature addressing perceptual acquisition, should not be taken as evidence to determine the role that context plays in acquisition, and, more specifically, does not confirm that SA programs do not lead to significant perceptual gains in language acquisition.

In reviewing previous linguistic L2 study abroad research, Lafford (2006) hypothesizes that "it is not the context of learning alone, but rather individual learner perceptions of specific characteristics of the contexts that interact with cognitive factors to account for differences in linguistic performance among L2 learners in classroom and study abroad contexts" (18). Thus perhaps the improvement, or lack thereof, hinges on internal factors rather than context. In the present study, each participant's motivation—academic, social, or external—is determined based on their responses to the ranking of motivators for studying abroad (see Appendix A). The findings of the reviewed study abroad literature is summarized in Table 6.

Table 6. Summary of Study Abroad SLA Literature (adapted from Lafford 2006:13)			
Authors	**Duration**	**Assessment Categories**	**Results**
Segalowitz et. al (2004)	One semester, 12 weeks	oral fluency oral proficiency communication strategies pronunciation vocabulary and grammar	SA > AH SA > AH SA < AH SA = AH SA < AH
Díaz-Campos (2004)	One semester, 12 weeks	word-initial voiceless stops intervocalic voiced fricatives word final [l] palatal nasals	SA = AH in all categories
Llanes & Muñoz (2009)	3-4 weeks	listening comprehension, oral fluency, errors per clause, ratio of error free clauses per clause, ratio of morphological, syntactic and lexical errors, covered errors	No SA/AH comparison, SA improvement in all categories except covered errors
Mora (2005)	2-3 months	Perception of English minimal pairs— /iː/-/ɪ/, /æ/-/ʌ/, /æ/-/ɑː/ /ɪ/-/ə/, /e/-/eə/, /t/-/d/, /s/-/z/, /tʃ/-/dʒ/, /d/-/ð/	PI > AH /iː/-/ɪ/, /ɪ/-/ə/, /e/-/eə/, /t/-/d/, /s/-/z/ PI = AH /æ/-/ɑː/

3.6. Perception versus Production. As mentioned in the previous section on the context of learning, Mora (2005) presents research that is useful in perception research. Like the present study, the participant groups had to distinguish vowels though an auditory discrimination task using minimal pairs. The advanced Spanish/Catalan bilingual L2 English learners were able to significantly improve in their perception of six of the nine phonemic contrasts in English at T2 and one of these six at T3. Even though the minimal pairs do not exist in Spanish or Catalan, "[the] advanced learners' ability to auditorily discriminate between English contrastive sound units seem to improve over time" (2005:9).

Patihis et al. (2015), on the other hand, found that only bilingual individuals whose native language contained the tested phonemic distinction in the target language were able to improve in perception. Four separate groups of participants—monolingual English, bilingual English-Spanish, bilingual Armenian-English and trilinguals—were tested in accordance to ability to discriminate stop distinctions in Ln Korean which are threefold—lenis, tense and aspirated. The three-way distinction is not present in English or Spanish but is present in Armenian. The results showed that participants belonging to any of the groups that did not possess knowledge of a language that makes this distinction—Spanish-English bilinguals, English monolinguals and trilinguals (no Armenian)—performed the same in an ABX phoneme discrimination task; however, the Armenian-English group, as well as one participant proficient in Thai, did perform better than the other participant groups. The general conclusion is that simply being bilingual is not necessarily an advantage, at least phonologically; however, narrow transfer can be facilitated by proficiency in a language with the same feature as the chosen feature of the target language. In the present study, experimental participants are all English L1 speakers, which has low-mid vowels like the target language, but in English these vocalic distinctions are phonemic, whereas

in Quechua they are allophonic. It is difficult to hypothesize how this will affect learners' perception of these vowels, though my conjecture is that English learners could not distinguish aspirated from tense pronunciations of stops in Korean, because both exist as allophones of voiceless stops in English. Therefore, perception of these vowels might cause problems if Quechua speakers were asked to identify English vowels, but not vice versa. This is because low-mid vowels are allophonic contrasts in Quechua, but phonemic in English.

Lastly, in analyzing L1 Italian speakers' perception of English vowels, Flege et al. (1999) conclude that L2 production is limited by L2 perception and, therefore, cannot precede perception. Evidence for this supposition originates from the tendency of subjects with higher /a/-/ʌ/ discrimination scores from the categorical discrimination test to be better at producing these vowels in the production task. For the present study, these findings suggest that the participants may be adept at perceiving Quechua vowels before acquiring native-like pronunciation.

CHAPTER 4

THE PRESENT STUDY

Chapter 4 explores the present study in light of the research questions, participants, study design, instruments, variables, data extraction and data analysis. The research questions of the present study are as stated below:

1. Is phonetic transfer in Quechua vowel production more likely to come from the L1 English or the L2 Spanish in the initial stages, when learners have had no contact with Quechua? After 7 weeks of Quechua input?

2. Do students tend to become more target-like in their pronunciation of Quechua vowels given increased exposure to the language?

3. Is there a difference in the source of transfer between production and perception?

4. What linguistic and extralinguistic factors condition the production of Quechua vowels?

My corresponding hypotheses are stated below:

1. Based on previous research, the source of phonetic transfer in the initial stages is expected to be the L1, English. However, in the developmental stages, the L2, Spanish, may be a more likely source of transfer, due to a social environment in which Spanish and Quechua are linked, and a high level of Spanish proficiency among the experimental group.

2. The participant is more likely to lose their foreign accent over time; however, a language's phonetic intricacies are difficult to acquire in a short period of time, especially in adulthood, so this improvement may not be seen over a seven-week study abroad

period, despite research that suggests 3-4 weeks of study abroad is enough for significant improvement (Pennington 1998; Llanes and Muñoz 2009). A more native-like production of Quechua mid vowels would be indicated by high F1 values and a more backed back vowel (low F2 value).

3. Though either Spanish or English are both likely sources of transfer in regard to production of Quechua vowels, English is expected to transfer in the perception task. Due to recency effects, fluency level, and psychotypology (i.e. speakers have maintained an active level of Spanish during the 7-week stay), my prediction is that Spanish mid vowel formant values are more likely to be present in speech; however, because perception may develop before production, participants may draw on English in perceiving vowels (Mora 2005).

4. The linguistic factors that may condition the pronunciation of Quechua mid vowels are position of the uvular consonant (i.e. before or after), syllable type (i.e. closed or open), uvular articulation (i.e. plosive, ejective, aspirated), and stress (i.e. tonic or atonic). However, these are not expected to condition pronunciation in the same way that they condition native speech, because many participants will only have seven weeks of Quechua contact by the end of the study abroad period. The extralinguistic factors that are likely to condition Quechua pronunciation are time, gender, Spanish oral proficiency, Quechua proficiency, academic status, motivation, metalinguistic competence, Quechua language contact, English language contact, and Spanish language contact.

4.1. Methodology

Participants. There were three main participant groups in the study, two of these groups were experimental, and one was a control group.

Experimental groups. Both experimental groups were English L1—Spanish L2 learners of Quechua, the first being beginner learners of Quechua and the second being intermediate learners. Each group was comprised of students in a seven-week Quechua language study abroad program administered through the University of Michigan in Cusco, Peru at a language school and cultural center, Centro Tinku. Classes were held four hours a day, five consecutive days a week with an optional two-hour conversation session in the afternoon three days a week. There were two main classes: one for beginners and one for both intermediate and advanced students. All participants in the experimental groups were either undergraduate students, graduate students, or former students that had recently graduated from a higher education institution. All were required to have at least an intermediate oral command of Spanish; however, they were still required to a take written Spanish proficiency test and participate in a spoken Spanish interview which was rated by several university Spanish professors and instructors who judged each participants' overall fluency as well as pronunciation. The criteria for this evaluation replicate a previous study on foreign accentedness by Wrembel (2012). Each judge rated the "overall degree of foreign accent", intelligibility of the speaker, "degree of certainty of their foreign accent judgement", and "how irritating/acceptable the speaker sounds" on a six-point scale (2012:291). In Wrembel's study the judges are asked to identify the speaker's L1, though this was not necessary for the current study, as all of the speakers share the same L1, and the foreign accent ratings are based on the interaction of two, not three languages. In the subsequent data analysis each participant is treated as a separate case, though trends separated by Quechua proficiency are also analyzed. The beginner group consisted of six participants, one male and five females. The intermediate group consisted of only one female participant.

Control group. The control group consisted of five bilingual speakers of Quechua and Spanish from Cusco, Peru or the surrounding areas. Although all speakers were self-reportedly fluent in each language, their frequency of use of each language varied depending on the social context. This will be discussed in section 4.1. Two of the participants were instructors of the Quechua program, one was an administrator, and two were host mothers of the program. All had spoken Quechua since childhood, with one participants listing Quechua as a first language and all considering themselves to be bilingual speakers.

Design. The present study follows a pretest-posttest design in regard to the experimental group. The testing items varied depending on the participant group. During the pretest, all participants in the experimental group filled out a Background Questionnaire and a written Spanish Proficiency Test in addition to the three main testing instruments described in the following section. Native Spanish speakers also evaluated participants' L2 fluency and pronunciation, as the Spanish Proficiency Test did not assess pronunciation. During the posttest, all participants completed the same three tasks a second time along with a Language Contact Survey measuring the approximate amount of time each participant spent speaking, writing, reading and listening to English, Spanish, and Quechua on a weekly basis during the program. See Appendix A for the Background Questionnaire, Appendix B for the Spanish Proficiency Test, Appendix C for the Native Speaker Judgment Rubric and Appendix D for the Language Contact Survey.

The control group participated in the experiment only once. Just like the pretest for the experimental group, the control group filled out a Background Questionnaire, a Spanish Proficiency Test as a point of comparison for the experimental group participants, and completed the three tasks.

Instruments.

Task 1: Sociolinguistic Interview. The participants in both the experimental and control groups were asked the same ten questions in Quechua. Participants in the control group were additional questions according to their responses in order to lengthen the interview and record more natural data. The control group was asked the same ten questions in Spanish just before answering the questions in Quechua in order to extract Spanish vowels to use as a point of comparison for the experimental group, and to compare mid vowels in Spanish and Quechua. At the pretest, the experimental group was asked the same questions in Spanish directly before the Quechua interview. Although each participant read a list of English words as a part of the Background Questionnaire in order to obtain English formant values, during the post-test, the experimental group also answered the same ten questions in English to elicit more natural speech for vowel formant measurements. However, in data analysis only the list of words read were measured. See Appendix E for Task 1 materials.

Task 2: Reading. Each participant in both the experimental and control groups was asked to read three short stories in Quechua. Each story was about 150 words long and took about two minutes to read. The participants read the stories one right after the other. The stories were presented in the same order each time. The experimental group was asked to read the stories during the pre- and post-test, and the control group only once. Though many speakers in the control group could read Quechua, all of the control group speakers sounded unnatural and Spanish-like during this task. Perhaps this is because many speakers of Quechua do not have many years of experience with a written Quechua system, given that this system is relatively new (Howard 2013). The formant values extracted from the native speakers come only from the first task in the following section, which reported more natural data. Each of these stories—

Alqochamanta Willakuy, Tarukakunamanta Willakuy and *Atoqmanta Willakuy*—contained

several words with uvular consonants and neighboring allophonic mid vowels. See Appendix F

for Task 2 materials.

Alqochamanta Willakuy. The first story, 'The Story about the Little Dog', consists of

fourteen words with orthographically written mid vowels, three of which contain two vowels,

and seven words with contexts that should elicit mid vowels but are spelled with a high vowel /i/

or /u/. Because the point of this task was not to evaluate the participants' ability to use the

phonetic context to inform pronunciation instead of orthography, tokens of the seven latter words

were not analyzed. Of the 17 mid vowels present in *Alqochamanta Willakuy*, 14 were allophonic

variants of the high back vowel and the remaining three of the high front vowel. Of the 14 back

mid vowels, two came before /o/ and twelve came after the uvular consonant. All three of the

front mid vowels came after the uvular consonant.

Tarukakunamanta Willakuy. The second story, 'The Story about the Deer', contains five

words with orthographic mid vowels and three with written high-vowels in the context of a

uvular consonant. Two of the five latter type of words contain two mid vowels. Of the seven mid

vowels, five are the front mid vowel /ɛ/, and two are the back mid vowel /ɔ/. Four of the five

front mid vowels fall before the uvular consonant and both of the back mid vowels come after

the uvular consonant.

Atoqmanta Willakuy. The last story, 'The Story about a Fox", contains 12 words with mid

vowels and 1 with an orthographic high vowel neighboring a uvular consonant. Nine of the 12

vowels were back mid vowels, of which seven came before a uvular sound, and the remaining

three were front mid vowels of which only one came before a uvular sound. In all, there were 36

mid vowels across all three stories that were uttered by all of the participants of the experimental

group at T1 and T2.[7]

Among the three stories, there were at least 72 tokens for each participant, a few more if

the participant had repeated the target word. There were 11 instances of /ɛ/ at each time of the

experiment, 8 of which came after a uvular consonant and 25 instances of /ɔ/, 16 of which came

after a uvular consonant. Of the 36 vowels across the three stories, 23 mid vowels are found next

to a plosive consonant, nine next to a fricative uvular, and four next to an ejective uvular

consonant. The distribution of the Task 2 mid vowels is found in Table 7 below.

Table 7. Distribution of Task 2 Mid Vowels							
	Alqochamanta		*Tarukakunamanta*		*Atoqmanta*		**Total**
	before /q/	after /q/	before /q/	after /q/	before /q/	after /q/	
/ɛ/	0	3	2	3	1	2	11
/ɔ/	2	12	0	2	7	2	25
Total	2	15	2	5	8	4	36

Task 3: Perception. The experimental group was presented with a recording of a native

Quechua speaker reading a list of 36 words, each of which was repeated three times. The

participants were asked to listen closely to the first vowel in the first syllable, the tonic vowel, in

each of the two-syllable words. Twelve of the 36 words were distractors that contained no uvular

consonants or mid vowels; the remaining 24 words were target words. Target words were chosen

particularly to manipulate the linguistic variables mid vowel ([ɛ] or [ɔ]), type of uvular and

uvular consonant position. All of the target vowels were in open syllables. Twelve of the 24

words contained the front mid vowel [ɛ] and 12 contain the back mid vowel [ɔ], half of each of

these vowels are positioned before the uvular consonant and half following the consonant. Eight

---

[7] Except for the delayed-posttest participant, Participant 8, who read these two stories only once.

of the uvular consonants are ejectives /q'/, 13 are plosives /q/ and three are aspirated /qh/. For

examples of these words, refer to Table 8.

Table 8. Task 3 Quechua Word List Examples		
	before uvular consonant	**after uvular consonant**
[ɛ]	*meq'ey, seqay, cheqaq*	*q'ello, q'epe, qhepa*
[ɔ]	*hoq'o, soqo, poqoy*	*qhoya, q'omer, qhosi*

The participants were instructed to listen to the vowel in the first syllable of each

Quechua word, and decide which English vowel most resembled the target Quechua vowel. Each

vowel sound had five word options that were closest to its actual formant values. For example, if

the native speaker uttered the word *kusa* 'okay' which contains the vowel /u/, the English word

options for that vowel sound were 'boot', 'foot', 'caught', 'clock', and 'bat'. Any Quechua word

that contained the front low-mid vowel presented the English options 'beat', 'bit', 'bait', 'bet',

and 'bat', corresponding to the vowels /i/, /ɪ/, /e/, /ɛ/, /æ/ and the Quechua words that contained

the back low-mid vowel presented the English word options 'boot', 'foot', 'boat', 'bought', and

'but', corresponding to /u/, /ʊ/, /o/, /ɔ/, /ʌ/, to choose from. This task was completed pre- and

post-program. The native participants also completed this task; however, the word options were

in Spanish. This task was carried out on the control group to ensure that native speakers hear

five, not three, different sounds in their native language. However the results for the native

speakers were the same for each participant, so the results will not be analyzed in Chapter 5. See

Appendix G for Task 3 Materials.

In designing this task, a native Quechua speaker, an instructor of the program in Cusco,

was asked to repeat each of the 36 words along with five 'warm-up' words three times. I then

selected one utterance of the three that was most easily segmented using Praat and copied it

thrice a sound file so the participants heard the same word three times. This ensured that the

formant values of each repetition were not different enough to be considered different vowels to

native English speakers, who phonemically distinguish high and low vowels. The formant values of each of these utterances was extracted at 20%, 50%, 80%, and the average of the three points of the vowel to explain why the participants, who each have different vowel spaces themselves, select the option that they did. This method of extraction and analysis is adapted from Di Paolo and Yaeger-Dror (2011).

	/ɛ/				/ɔ/			
Table 9. Task 3 Mid Vowels								
	20%	50%	80%	Average	20%	50%	80%	Average
F1	600	606	607	603	638	657	612	635
F2	2425	2455	2482	2448	1176	1164	1292	1207

In review English and Spanish vowels in Tables 1, 2 and 3, the values reported above are much like the English low-mid vowels. Both the front and back mid vowels are more open, and though it may not seem like 465Hz, the average F1 value of a Spanish speaker's mid vowel is much different than 620Hz, the average F1 value of a low-mid vowel in Quechua, a mid-western male English speaker distinguishes the high-mid vowel /e/ from the low-mid vowel /ɛ/ by less than 100Hz in regard to the F1, 476Hz and 580Hz respectively. Sometimes these vowels even overlap as seen in Figure 8 in the next section.

What is noteworthy about the values extracted from the bilingual Quechua speaker is that the F2 value of the front low-mid vowel is quite high considering the average Spanish speakers F2 value for a high-mid vowel is 1780Hz, which is generally more fronted than the low-mid vowel. Nevertheless, O'Rourke found that "Cuzco speakers generally [showed] a larger and more fronted vowel space than Lima speakers" (2012:28), meaning that Spanish mid vowel values from the native participants may show higher F2 values that allow Quechua low-mid vowels to be more fronted than the normal high-mid vowel in a dialect of Spanish not in contact with a language like Quechua, which has a distinct vowel space.

Other Instruments: The other materials— Background Questionnaire, Spanish Proficiency Test, Language Contact Survey, and Native Speaker Judgment Rubric—were adapted from prior studies, except the Background Questionnaire, which I created based on typical factors examined in sociolinguistic studies. A Spanish Proficiency Test was also used, developed in consultation with Melissa Whatley (p.c.). The Language Contact Survey was adapted from Freed et al. (2004). Finally, as previously mentioned, the Native Speaker Judgment Rubric was adapted from Wrembel (2012). All four instruments served in collecting extralinguistic information about the participants for sociolinguistic analysis.

Variables.

Dependent Variable. The dependent variable for the first two tasks are F1 and F2 values of the front and back mid vowels of Quechua—[ɛ] and [ɔ]. The dependent variable for the third perception task is the particular English (or Spanish) vowel sound chosen by each participant.

Independent Variables. There are two main groups of independent variables. The first are linguistic variables and the second are extralinguistic variables. The linguistic variables of this experiment are, position of the uvular consonant—before or after the low-mid vowel—, type of uvular— aspirated, ejective, plosive—, stress—tonic or atonic—, and syllable type—open or closed. The extralinguistic variables are measured from answers given in the Background Questionnaire and Language Contact Survey at the end of the program. These are age, gender, metalinguistic knowledge, motivation, academic status, Spanish proficiency, Quechua contact hours, English contact hours, and Spanish contact hours.

4.2. Data Extraction. The first step in extracting the vowel formants from all target words was to chunk those words as separate sound files from the overall sound file. These sound files were then uploaded into Praat, version 6.0.17 (Boersma 2001) and were displayed with a text

grid. Using the text grid, I aligned each segmented vowel by hand and used a Praat script that

read each pair of sound files and text grids and extracted the vowels at the 20%, 50%, and 80%

point. These values were exported into a spreadsheet where the average of all three points was

taken for F1 and F2 (Di Paolo and Yaeger-Dror 2011). The average values are used in the

majority of the analyses, including the linguistic and extralinguistic analysis. For the native

control group and the linguistic and extralinguistic variables of the experimental group, the data

were normalized using the NORM v. 1.1 website sponsored by the University of Oregon using

the Labov, NORM v.0.9, using Telsur G normalization method (Thomas and Kendall 2007).

      4.3. Data Analysis. In analyzing the results of the values extracted using Praat, the second

phase of data analysis involved statistical analysis using R. R was used to find the average

formant values for the vowel systems of all three languages from both the experimental and

control group, analyze linguistic and extralinguistic predictors, run statistical tests—t tests and

one-way ANOVA tests—, and plot vowel spaces.

CHAPTER 5

RESULTS

In this chapter, the results of the present study will be presented first for the native

control group and then for the experimental group on a case-to-case basis. The third section will

present the results for the linguistic variables, and the forth the results for the extralinguistic

variables.

5.1. Native Control Group. Among the five participants that comprise the native control

group, two of them are instructors at Centro Tinku, one is an administrator at the institution and

two are host mothers contracted through the program. Though all of the participants are now

Spanish-dominant bilinguals, one of the host mothers spoke only Quechua for several years in

her childhood before learning to speak Spanish. All participants indicated that they use Spanish

more overall in their daily lives, but Spanish is more frequently used outside of the home, and

Quechua is often used in close-knit social situations like conversing with friends or family in the

home, or with acquaintances in the marketplace. This is consistent with the idea that in a

diglossic situation, language A, the superior language, is more frequently used in politics, the

economy, academics, and career, but the language B is used mostly in social contexts like

conversations in the home with family and close friends, and gatherings in churches and other

social institutions (Penny 2000).

In order to establish a point of comparison between experimental participants and control

group the normalized Spanish and Quechua vowel formant values are found respectively in

Table 10 and 11 below. These values are averages of the 20%, 50%, and 80% points of each

vowel, first normalized then averaged over the entire control group. For the Spanish values, there were 241 vowels analyzed—/i/=53, /e/=50, /a/=57, /a/=47, and /u/=34– while there were only 119 Quechua vowels analyzed—/e/=27 and /o/=92—because the phonetic environments that elicit mid vowels in Quechua are less frequent than those that elicit high vowels. There are quite a few more back mid vowels because of the high incidence of first person singular and plural subject pronouns *noqa* 'I' and *noqayku* 'we' (exclusive), as well as variations of these words including different suffixes. A comparison between Spanish and Quechua mid vowels show that Quechua mid vowels are in fact higher according to F1 values, meaning they take a lowered tongue position, much like the low-mid vowel in English.

Table 10. Normalized Spanish Formant Values of Native Control					
	/i/	**/e/**	**/a/**	**/o/**	**/u/**
F1	401	505	742	585	436
F2	2717	2314	1823	1315	1308

Table 11. Normalized Quechua Formant Values of Native Control		
	[ɛ]	**[ɔ]**
F1	616	644
F2	2387	1405

In Figures 6 and 7, these vowel spaces are detailed using vowel plots in which each point is represented by the respective vowel. For both the Spanish and Quechua vowel space, there is a clear cluster for each vowel; however, especially in the Spanish vowel space, there is some overlap. In Figure 4, though there are fewer front mid vowels, they are more closely clustered than the back mid vowels. Though this paper assumes that the Quechua mid vowels are low-mids [ɛ] and [ɔ], they are represented by 'e' and 'o' in the vowel plots.
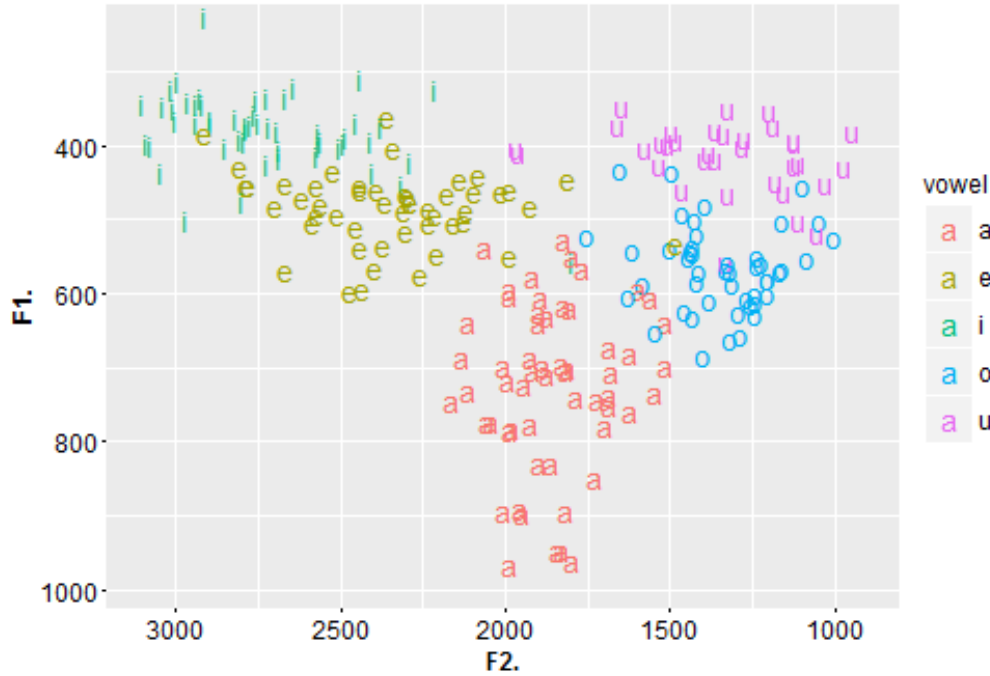
Figure 6. Control Group Spanish Formant Values
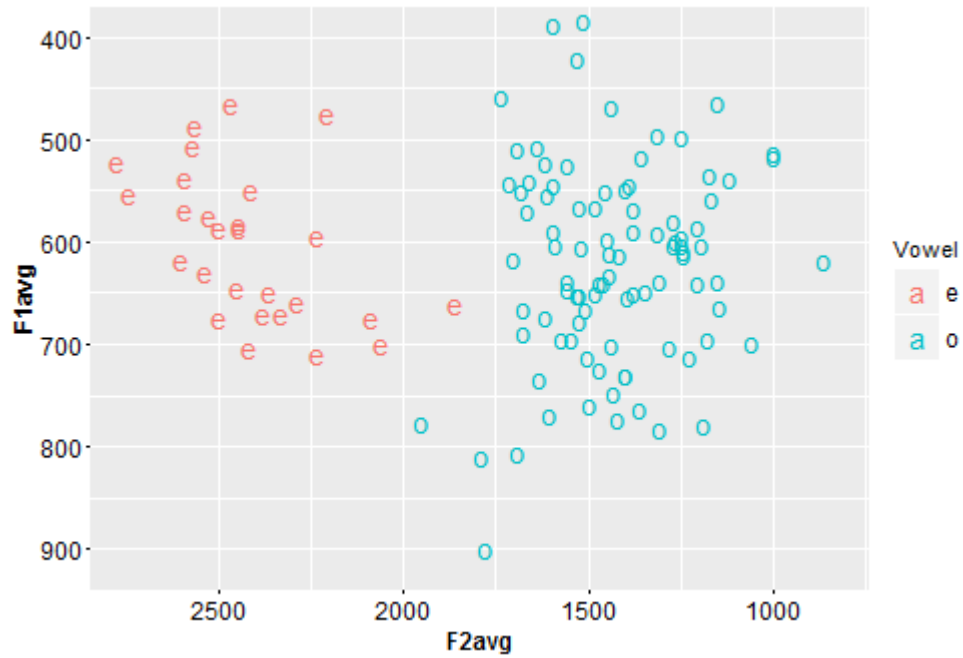
Figure 7. Control Group Quechua Formant Values

The control group's mid vowels extracted in the sociolinguistic interview are further divided by uvular articulation, position with respect to the uvular consonant, the type of syllable, and syllable stress. Understanding how these linguistic predictors are correlated with mid vowel

formant values for the native group reveal whether the experimental participants have acquired the sociolinguistic nuances that accompany Quechua language production. If the same linguistic predictors are significant in the same way for both groups, this would indicate that the experimental participants have indeed learned the idiosyncrasies of the language. However, because the participants are only beginner or intermediate learners of Quechua, it is not expected that they have reached this advanced level of proficiency. For the native control group uvular articulation and stress were significant while syllable and position were not found to be significant. The former two variables will be discussed in the following two sections.

Uvular articulation. Though there are three main uvular phonemes, plosive /q/, ejective /q'/ and aspirated /qh/, there is also a fricative allophone of the plosive phoneme in syllable final position. For example, in the word *sonqon* 'heart' [sɔn.qɔn], the uvular consonant is realized as a plosive consonant because it begins the syllable. In the word *soqta* 'six' [sɔχ.ta] the uvular consonant is fricative because it is in syllable-final position. According to a one-way ANOVA test for each vowel—[ɛ] and [ɔ]— and formant—F1 or F2—uvular articulation is significant only for F2 of both the front and back mid vowel, F = .04 and F = .002 respectively.[8] From the values provided in Table 12 it is clear that an ejective consonant elicits a vowel that is the most fronted for the front mid vowel and the most backed for the back mid vowel. With regard to [ɛ], an aspirated uvular produced the most backed version of the front vowel, while the uvular fricative is correlated with a fronted [ɔ].

Table 12. Native Quechua Mid Vowels across Uvular Articulations							
	[ɛ]				[ɔ]			
	/q/	/q'/	/qh/	[χ]	/q/	/q'/	/qh/	[χ]
F1	684	598	643	611	618	666	649	631
F2	2304	2459	2131	2432	1400	1018	1336	1430

[8] The highlighted cells indicate a significant p (t-test) or T (ANOVA) value.

A visual representation of this data is found below in Figure 8.
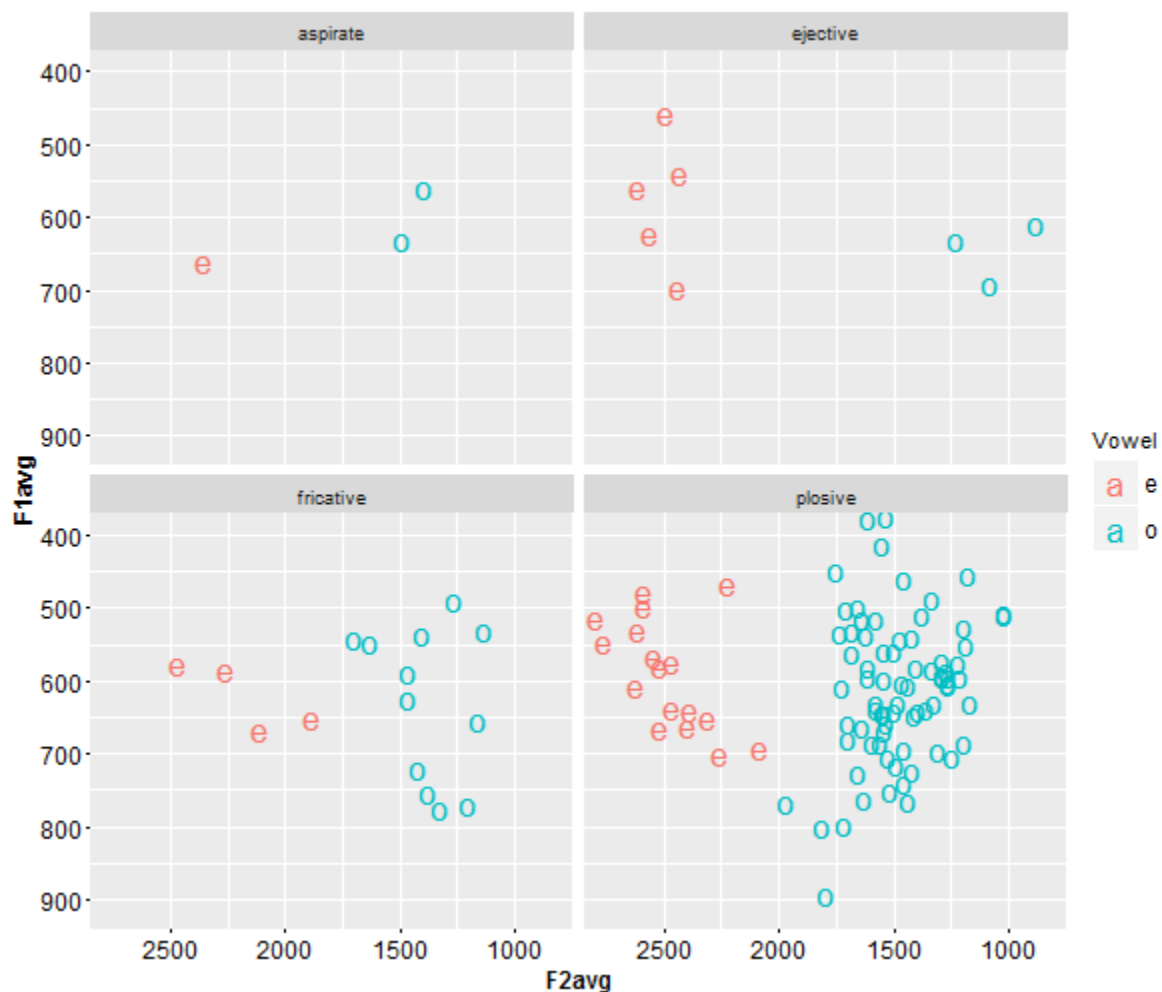
Figure 8. Native Quechua Mid Vowels across Uvular Articulation

Stress. The predictor stress was significant but only for the F1 and F2 of the front vowel, [ɛ] according to a t-test (p = 0.04, p = 7.3 x 10⁻⁴). The front mid vowel is lower when atonic than it is when tonic, as seen in Table 13, which may be because tonic vowels are usually tenser due to a shorter duration and a change in tone (Guitart 2004). In other words, a tense, stressed vowel is more like a high-mid vowel than a more lax, atonic vowel. It is not clear why the same trend is not present for [ɔ].

Table 13. Native Quechua Mid Vowels across Stress				
	[ɛ]		[ɔ]	
	tonic	**atonic**	**tonic**	**atonic**
F1	594	655	638	627
F2	2496	2203	1387	1440

The data are represented visually using a vowel plot in Figure 9. The linguistic predictors of the experimental group are presented in section 5.3.

Figure 9. Native Quechua Mid Vowels across Stress

Because this is native production, it is not surprising to see in the plot that tonic variants better occupy and exploit the acoustic space. That is, the tonic variant of the front vowel is more fronted, the tonic of the back is more backed (Baker p.c.). Separate case studies of the experimental participant group follow.

5.2. Experimental Group Case Studies. Because each of the participants is from a different region of the United States, each of their English vowel spaces are quite distinct, which may also affect their Spanish and Quechua formant values. These kinds of nuances are not visible without a more qualitative description of the data for each participant. This section analyzes the English and Spanish vowel systems of each participant individually and presents his or her results for each of the three tasks. In Figure 10 we see the individual vowel spaces of each participant. In the English vowel plot, 'I' represents /ɪ/, 'E' represents /ɛ/, 'U' represents /ʊ/, 'v'

represents /ʌ/, and 'a' represents /ɑ/. The plot reveals how distinct each participants' vowel space

truly is. Even when two participants are from the same region, some participants tend to have a

more closely clustered vowel space with distinct divisions between vowels, while others have

dispersed vowel spaces with some vowels that overlap. Participant 6 for example has a tightly

clustered vowel space with clear distinctions between vowels, while Participant 1's vowels

overlap, especially the front vowels. We can also determine from this plot that Participants 1, 2,

4 and 5 have overlapping /ɑ/ and /ɔ/ which means that their speech is subject to the *caught-cot*

merger. Each participants' vowel space for each of the three languages will be discussed in the

following sub-sections.

Figure 10. English Vowel Spaces of Experimental Participants

However, before discussing each participant separately, Task 1 will be presented for all

participants overall. Because Task 1 was a sociolinguistic interview that allowed participants to

speak freely in Quechua, many of the beginner participants were limited in their general oral expression of Quechua, and some failed to produce any words with mid vowels at all. Others only uttered one or two words with mid vowels at T1 and T2, so statistical comparisons between T1 and T2 would not be accurate. Additionally, in general, vowels are clustered in a similar vowel space but when compared individually they may be statistically different. For example, in Figure 10, Participant 4 utters one /i/ with an F2 value of about 2600Hz but two others with an F2 value of about 2200Hz. In Table 13 above, a difference in formant values of less than 100Hz produces a significant p-value, so we can expect that a difference of 400Hz in the F2 values of these two /i/s are statically different, even though they are both the same vowel. Thus, in order to compare formant values at T1 and T2, we should compare an average of many formant values, which describes Task 2 in which participants utter at least 36 mid vowels at T1 and T2.

Table 14 presents a summary of the number of mid vowels each participant uttered at T1 and T2. Some participants, like Participant 1, 3 and 6 do not have any values to be compared to each other over time. Participant 1 does utter a single subject pronoun containing [ɔ] at T1 but none at T2, so there is no comparison to be made. Similarly Participant 6 produced only two words with [ɔ] at T2 but none at T1. Other participants like Participant 2, 4 and 5 produced words with [ɔ] at T1 and T2, but with [ɛ] only at T2 or not at all. Though the values for [ɔ] could be compared impressionistically, a statistical test should not be employed due to the small number of tokens. The only participant who utters a substantial number of tokens is Participant 7. Her formant values will be discussed in the individual case studies that follow.

Table 14. Summary of Distribution of Mid Vowels in Task 1				
	T1		T2	
	[ɛ]	[ɔ]	[ɛ]	[ɔ]
Participant 1	0	1	0	0
Participant 2	0	3	1	3
Participant 3	0	0	0	0
Participant 4	0	1	0	8
Participant 5	0	1	2	1
Participant 6	0	0	0	2
Participant 7	2	9	4	23
Participant 8	--	--	--	3

The succeeding case studies all follow the same pattern. First, there is a general introduction for each participant that reveals pertinent extralinguistic information like their gender, academic status, motivation, and Spanish proficiency level. Participants 1-6 are all beginner learners of Quechua and Participants 7-8 are intermediate learners of Quechua. The introduction also includes the average English vowel formant values for each participant. This is followed by a subsection presenting the average Spanish vowel formant values. Then the results of Task 2 and Task 3 will be discussed for each participant in separate subsections. Each of the three subsections after the introduction—Spanish vowel formant values, Task 2 and Task 3— will present a table that allows readers to better understand the impressionistic comparisons between vowels systems made by the author. The only exceptions of this pattern are 1) the addition of a subsection discussing the results of Task 1 for Participant 7, which falls between the discussion of her Spanish vowels and Task 2 results, and 2) a separate section on English Formant Values for Participant 1 after her introduction in order to revisit the methodology accompanying the extraction of the English vowel formant values.

Participant 1. The first participant is a recent graduate with a Bachelor's degree in history. Apart from possessing a self-reported intermediate level spoken proficiency in Spanish, she also considers herself as a low-intermediate speaker of Italian and Latin. Mainly academic,

cultural, and career interests are what motivated her to study, while monetary compensation,

course credit, and visiting friends and family were motivators that did not apply to her. Because

the participant originates from California, the formant values of /ɑ/ in *clock* and /ɔ/ in *bought*

hardly differ. In other words, she is an example of an English speaker with the *cot-caught*

merger.

English Formant Values. Extraction of the formant values for English vowels was

conducted in the same manner for each participant. Upon completing the Background

Questionnaire, the participants were required to read each of the following words three times:

beat, bit, bait, bet, bat, but, boot, foot, boat, bought and *clock.* These monomorphemic words

correspond to the eleven vowels in the English language: /i/, /ɪ/, /e/, /ɛ/, /æ/, /ʌ/, /u/, /ʊ/, /o/, /ɔ/,

and /ɑ/ respectively. The formant values reported below are an average of a measurement of each

repetition of the vowel at 20%, 50%, and 80% of the vowel duration. As already mentioned,

reporting separate formant values for each participant is important in light of the vowel space

variation that relates to regional dialects in the United States. By analyzing these participants

separately, we uncover what is occurring in the phonetic acquisition process. The formant values

for Participant 1 are listed in Table 15 below. The mid vowel values are highlighted.

Table 15. Participant 1 English Formant Values										
	/i/	/ɪ/	/e/	/ɛ/	/ae/	/ɑ/	/ʌ/	/ɔ/	/o/	/ʊ/	/u/
F1	298	506	453	664	788	716	616	768	489	511	308
F2	2258	1783	2082	1770	1720	1134	1347	1216	1156	1250	1183

The most important formant values in the table above are those belonging to the high-mid

and low-mid vowels /e/, /o/, /ɛ/, and /ɔ/ because the former two may show some comparisons

between her Spanish values, and all four may show some comparison to the Quechua values. The

values above will be compared to the participant's Spanish vowel space, and then both will be

compared to the Quechua formant values in order to determine the source of transfer at both T1

and T2. Both the English and Spanish values were only measured once throughout the study, as

the participant's command of these languages was not expected to change over a seven-week

program.

      Spanish Formant Values. The Spanish values were extracted from the participant's

sociolinguistic interview at T1 during which the participant was asked to answer the interview

questions in both Spanish and Quechua. Three to five of each vowel were analyzed for each

participant. Because there was no systematic list for the participants to read, the Spanish vowels

were extracted from the oral interview, mostly from the response to the last questions, which

allowed the participant to speak more freely due to the open-ended nature of the question— i.e.

Tell me about a particularly memorable event that happened to you in the recent or far-off past.

The words that contained the vowel in the stressed, open syllable surrounded by fricative or

plosive consonants were the first choice, as the boundaries are most easily defined for vowels in

that category; however, most of the vowels were not in this environment, especially for

Participant 1 who spoke for only 36 seconds in response to the last question with several

hesitations. In other words, the vowels extracted for this participant were in both open and closed

syllables, stressed and non-stressed positions surrounded by plosive, fricative, affricate, lateral

and nasal consonants. However, because the Quechua mid vowels are so scarce in comparison to

the Quechua peripheral vowels, most of the Quechua vowels extracted from both the

sociolinguistic interview and the reading task were in both open and closed syllables, in stressed

and unstressed positions, and neighbored a plosive, fricative, nasal or lateral consonant. This

means that Spanish formant values for Participant 1 in Table 16 below can be used as

comparison values between the participants' second and third languages. Table 16 contains both

the Spanish formant values and the corresponding English formant values for side-by-side

comparison. The English vowel /ɑ/ is used as the comparison value to the Spanish central low

vowel because American English does not contain /a/.

Table 16. Participant 1 English and Spanish Formant Value Comparison										
	/i/		/e/		/a/		/o/		/u/	
	Eng	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**
F1	298	384	453	486	716	677	489	448	308	455
F2	2258	2368	2082	2114	1134	1621	1156	1278	1183	1680

For three of the five vowels, /i/, /e/ and /u/, both F1 and F2 Spanish values are slightly

higher, meaning these values are more fronted and open than the corresponding English vowels.

The back mid vowel /o/, however, is more fronted and slightly less open in her Spanish

pronunciation than in English. In regard to the central low vowels in both English and Spanish,

the F1 values are very similar between the two languages, but the F2 is much higher in Spanish,

meaning the vowel is more fronted. This could mean that the speaker has a good understanding

of Spanish vocalic pronunciation because the difference between these two central vowels is that

/a/ is central and /ɑ/ is backed (Whitley 2007) as seen toward the bottom of Figure 11.
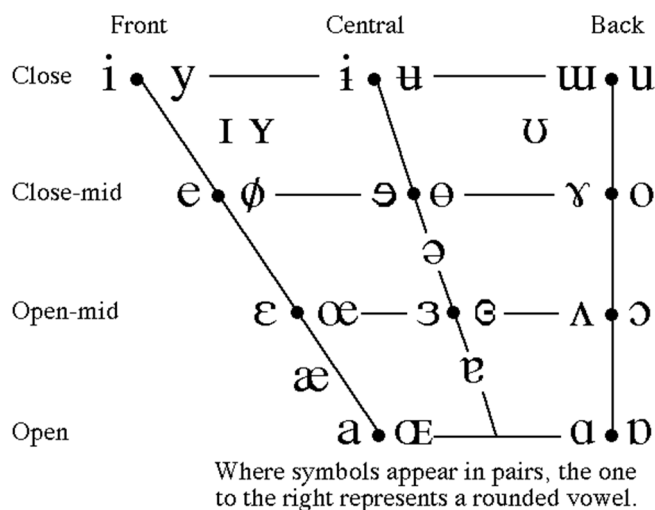
Figure 11. IPA Vowel Chart (Ladefoged 2007)

Task 2. In completing the second task of the experiment, participants were to read three

short stories in Quechua that were provided by an American professor of a beginner Quechua

class. The table below shows the average values of both the front and back mid vowels at T1 and T2 of the experiment.

Table 17. Participant 1 Task 2 Quechua Formant Values				
	Time 1		Time 2	
	[ɛ]	[ɔ]	[ɛ]	[ɔ]
F1	547	507	469	445
F2	2071	1161	2185	894

According to the results in Table 17, Participant 1 has a Quechua mid vowel pronunciation very similar to her pronunciation of the Spanish mid vowels and English high-mid vowels. At T1, the F1 values for both mid vowels are slightly higher than at T2 and fall between the F1 values of her English pronunciation of the two mid vowels /e/ and /ɛ/. The F2 values of the front mid vowel is very similar to the second formant value of her English high-midvowel /e/. The second formant value of the Quechua mid vowel is quite similar to the English high-mid vowel value at T1, but at T2 the F2 value is much lower, which means that her pronunciation of /o/ has become more Quechua-like over time when considering that O'Rourke reports that successive Quechua-Spanish bilinguals "show the greatest amounts of backness in /o/ and /u/" (2012:28). This also aligns with Pasquale (2009) who argues that the allophonic variants of the high vowels are both more open and more back. This may also be because Participant 1's Spanish pronunciation has improved over time, especially when considering that she was rated by the native speaker judges as having a less native-like pronunciation than most of the other participants at T1 and was the only participant to consider herself an intermediate speaker of Spanish. Participant 1 may have improved in this area due to extended exposure to Spanish during the seven-week period. Though the change is not great, there is a decrease in the first formant values for both mid vowels from T1 to T2, which suggests that though Participant 1's pronunciation may have been more English-like at T1, it resembles her Spanish system and

becomes more Quechua-like over time. However, at both T1 and T2 the formant values resemble more closely the high-mid vowels /e/ and /o/ in both English and Spanish than the low-mid vowels in English. The shift in [ɛ]'s F1 value and [ɔ]'s F1 and F2 values is significant according to several t-tests (p = 0.039, 5.03×10^{-4} and 1.59×10^{-6} respectively). Though it may have been more economical for Participant 1 to use English as the primary transfer source in the production of Quechua low-mid vowels because the English vocalic inventory contains this vowel while the Spanish vocalic inventory does not, that data suggests that her second language overrides her first as the primary source of transfer, which is an outcome certainly predicted by the L2 Status Factor and possibly by the Pyschotypological Primacy Model.

Task 3. As summarized in section 2, prior research has found that the perception of sounds is likely developed in a language learner before production of these sounds (Flege et al. 1999). In order to test this claim with third language learners of Quechua, participants were asked to listen to words in Quechua and to indicate which English vowel sound most resembled the first vowel sound they heard. If perception is more developed than production then we may expect the participants to indicate hearing a low-mid vowel even if they are producing something else. At T1, Participant 1 indicates hearing a low-mid vowel for 14 of the 24 target words, high-mid vowels for eight of the 24 target words and neither a high nor a low-mid vowel for two of the 24 target words. At T2 Participant 1 selects a low-mid vowel for 18 of the 24 target words and high-mid vowels for four of the 24 target words and neither a high nor a low-mid vowel for two of the 24 target words. However, a Fisher's Exact Test does not produce a significant *p*-value with regard to this change (*p* = 0.277). When separating the two mid vowel results, there is an even more drastic change for the back mid vowel allophone. At T1, Participant 1 hears the high-mid vowel in eight of the 12 target words and the low-mid vowel in only three of the 12

target words. However, at T2, these figures reverse, resulting in indicating the high-mid vowel

for three of the 12 target words and the low-mid vowel for eight of the 12 target words.

However, this swap does not reach significance according to Fisher's Exact Test ($p = 0.140$).

When separating the front low-mid vowel, however, we find that at T1, Participant 1 selects the

low-mid vowel for 11 of 12 target vowels, but only 10 of the 12 target vowels at Time 2. This

change does not approach significance, in fact, a Pearson's Exact Test generates a *p*-value of 1,

meaning that there is virtually no change. I conclude that Participant 1 is able to use known

English vowel sounds to perceive mid vowels in Quechua and has adept perception skills at T2

and even more so at T2. For Participant 1, perception is more consistent than production given

that she perceives most vowel as low-mid vowels at T1 and T2, but produces mid vowels that are

more like a combination of an English low-mid and a Spanish high-mid vowel at T1 and more

like a Spanish high-mid vowel at T2. This information is summarized in the table below.

Table 18. Participant 1 Perception of Mid Vowels				
	[ɛ]		[ɔ]	
	before	**after**	**before**	**after**
low-mid	11	10	3	8
high-mid	0	1	8	3
others	1	1	1	1

Participant 2. As a student seeking a Ph.D., the second participant came to the summer

program not only because of academic interests pertaining to Quechua, but also due to other

research interests aligning with his Political Science major. Participant 2 was not motivated to

study in Cusco because of monetary compensation or course credit. Being half Peruvian,

Participant 2 also indicated visiting friends and family a strong motivator for studying in Cusco.

Though in the Background Questionnaire and Sociolinguistic Interview, Participant 2 did not

classify himself as a heritage speaker, he did admit to having visited Peru many times since birth.

Because his self-reported spoken proficiency was five out of seven, he does not consider himself

a simultaneous bilingual like Participant 4, who reports a perfect seven for spoken proficiency.

Participant 2 is the only male participant classified as a beginner learner of Quechua. Participant

2 studies at a university in Wisconsin, and apart from several trips to Peru, his home base has

always been in the Twin Cities. Due to his geographical roots, the formant values in Table 19 are

quite similar to the values of Midwestern male participants reported in Hillenbrand et al.'s

(1995) study (see Table 1).

Table 19. Participant 2 English Formant Values											
	/i/	/ɪ/	/e/	/ɛ/	/ae/	/ɑ/	/ʌ/	/ɔ/	/o/	/ʊ/	/u/
F1	325	461	398	640	846	749	717	700	428	479	336
F2	2525	2279	2455	2029	1831	1652	1715	1179	1080	1358	1193

Spanish Formant Values. Judging by the Spanish formant values below, Participant 2's

vowel space differs from his first to second language. His production of the Spanish front high

vowel /i/ is considerably backed as evidenced by the low F2 value. The front mid vowel exhibits

the same tendency. This may be because often times an orthographic 'e' in English is realized as

the low-mid vowel [ɛ] like in the word 'bet' or 'letter' which has higher F1 values and generally

lower F2 values than /e/. We may conclude from the formant value comparison that perhaps

Participant 2 does not have a native-like Spanish vowel system, which corresponds with the

judges' average rating of four out of six for overall degree of foreign accent, one being very

foreign and six being native-like.

Table 20. Participant 2 English and Spanish Formant Value Comparison										
	/i/		/e/		/a/		/o/		/u/	
	Eng	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**
F1	325	347	398	458	749	501	428	474	336	361
F2	2525	1971	2455	1835	1652	1486	1080	1197	1193	1241

Task 2. The average F1 value of Participant 2's production of [ɛ] greatly resembles his

production of the Spanish mid vowel at both T1 and T2, though the F2 value resembles a

combination of an English low-mid vowel and a Spanish high-mid vowel. The F1 value of [ɔ] is

quite similar to a high-mid Spanish /o/, though it is more backed in regard to the F2. In this case, it is difficult to conclude that the transfer source is either his first or second language given that his L2 Spanish vowel production may not be fully developed yet, or has perhaps already fossilized. Nevertheless, due to the fact the both the first and second formant values coincide with his Spanish production, it seems more logical to assume that Spanish is the source of transfer here. We also notice in Table 21 that his Quechua mid vowels are quite stable over the course of the program. That is, he begins and ends the course transferring from Spanish. The only change is that [ɛ] becomes slightly less fronted, which is usually characteristic of a low-mid vowel (see Figure 1). However neither changes in F1 nor F2 produced a significant *p*-value.

Table 21. Participant 2 Task 2 Quechua Formant Values				
	Time 1		Time 2	
	[ɛ]	[ɔ]	[ɛ]	[ɔ]
F1	450	441	431	437
F2	1961	1010	1881	1000

Task 3. Though his production of the Quechua [ɛ] may be quite Spanish-like, he still perceives this vowel as a low-mid vowel at both T1 and T2. Though he perceives the native production as a low-mid vowel more at T1 than at T2, there is no significant change according to a Fisher's Exact Test ($p = 1$). The back mid vowel, however is perceived as a low-mid for only one of the 12 words at both T1 and T2. Curiously, the native [ɔ] production is strikingly similar to Participant 2's native English production of /ɔ/ with respect to the F1 and F2 values, even more so than [ɛ]. It is not clear what is driving this participant to perceive only the front mid vowel as a low-mid variant but not the back mid vowel. We find the same tendency occurring for participant 7, who is also a Midwesterner.

Table 22. Participant 2 Perception of Mid Vowels				
	[ɛ]		[ɔ]	
	before	**after**	**before**	**after**
low-mid	11	9	1	1
high-mid	0	0	8	11
others	1	3	3	0

Participant 3. Although Participant 3 is originally from the east coast of the US, she is currently enrolled at southern university as a first-year Ph.D. student studying Anthropology and Gender Studies. Much like Participant 2, she enrolled in the Quechua program not only to learn the regional indigenous language, but also to begin to shape her dissertation project by travelling to small communities and speaking with indigenous women during the few vacations included in the 7-week program. She rates developing a new perspective as well as academic interests as first and second on the list of motivators, while visiting friends and family is not applicable, and course credit is ranked last. Apart from ranking herself between a five and six for spoken proficiency in Spanish, she reports having a beginner-level proficiency in both French and Italian. For Participant 3, Quechua may more adequately be described as an Ln instead of L3. The F1 values and some F2 values of the New England speaker are quite a bit higher than the rest of the participants, meaning her tongue positioning is generally lower and more fronted. This generalization does not apply to the high vowels /i/ and /u/.

Table 23. Participant 3 English Formant Values											
	/i/	**/ɪ/**	**/e/**	**/ɛ/**	**/ae/**	**/ɑ/**	**/ʌ/**	**/ɔ/**	**/o/**	**/ʊ/**	**/u/**
F1	324	580	433	852	970	902	830	827	593	618	389
F2	2728	2188	2721	2201	2088	1344	1567	1190	1171	1304	1063

Spanish Formant Values. In general, Participant 3's Spanish vowel space is smaller than her English vowel space as evidenced by less fronted and higher front vowels, and more fronted back vowels. However her Spanish vowels seem to be more or less consistent with native values, besides the slightly less rounded /o/, more backed /u/, and higher /e/. This is probably due to

English transfer, though mirror-image studies would be needed to corroborate this hypothesis. Native speakers rate her overall foreign accent as a five on a scale of six, meaning her accent is almost native-like. The possible English influence in her Spanish vowel space is not enough for her to exhibit a noticeable foreign accent.

Table 24. Participant 3 English and Spanish Formant Value Comparison										
	/i/		/e/		/a/		/o/		/u/	
	Eng	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**
F1	324	426	433	585	902	739	593	557	389	379
F2	2728	2338	2721	2122	1344	1730	1171	1426	1063	1154

Task 2. Like Participant 2, at both T1 and T2 both the front and back low-mid vowels closely resemble her Spanish high-mid vowels. Given the similarities between the Quechua and Spanish mid vowels, it seems her L2 is the source of transfer. As seen in Table 25, though [ɛ] becomes slightly more fronted, typical of a native bilingual speaker, this change is not significant ($p = 0.30$) (O'Rourke 2012). The change in F1 values of [ɔ], however, is significant ($p = 7.6\text{x}10^{-4}$). From T1 to T2 her back mid vowel becomes slightly lowered, though overall both the F1 of [ɔ] at T1 and T2 resemble Participant 3's high-mid vowel values more than her low-mid vowel values.

Table 25. Participant 3 Task 2 Quechua Formant Values				
	Time 1		Time 2	
	[ɛ]	[ɔ]	[ɛ]	[ɔ]
F1	552	558	576	609
F2	2158	1234	2274	1311

Task 3. Though she produces the Quechua vowels as if they were Spanish mid vowels, she perceives many of them as low-mid vowels instead. At T1, Participant 3 perceives seven of the 24 target vowels as low-mid vowels, but at T2 this number rises to eight. Though overall this change is not significant, the change over time for perceiving [ɔ] approaches significance ($p = 0.15$) as she perceives none of the target back vowels as low-mid vowels and most as high-mid

vowels at T1, but perceives three of the 12 target vowels as low-mid vowels and only seven as high-mid vowels at T2. The change over time for the perception of [ɛ] is not significant ($p =$ 0.86). Though she perceives more low-mid vowels at T2 than at T1, this is not necessarily counter-evidence to the conclusion that perception precedes production because the change is not significant and at T2 she is still producing high-mid vowels in Quechua. It is curious that she classifies any of the target vowels as low-mid vowels given that her English F1 values for low-mid vowels fall between 825-855Hz, while the F1 values for the Quechua low-mid vowels are between 590-610Hz, much like her Spanish high-mid vowels.

Table 26. Participant 3 Perception of Mid Vowels				
	[ɛ]		[ɔ]	
	before	after	before	after
low-mid	7	5	0	3
high-mid	4	4	11	7
others	1	3	1	2

Participant 4. Participant 4 ranks academic interests, developing a new perspective, career, visiting friends and family and travel experience as the top motivators for participating in the program. Monetary compensation and course credit are both ranked as motivators that are least important to her. Though she currently attends a Midwestern university studying Psychology and Pre-Health with a Latin American Studies minor, she is a New York City native. Most importantly, she is the only simultaneous bilingual in the participant group. The other participants are all successive English L1 Spanish-L2 bilinguals. Because L3 acquisition, especially L3 phonetic acquisition, is a relatively new area of study, there are many methodological questions that have yet to find concrete answers. One of those issues is how to treat successive bilinguals versus simultaneous bilinguals acquiring a L3. Are both considered L3 learners? Do native speakers of two languages have two first languages or a dominant first language and a secondary second language? (See section 3.4.) Instead of offering my own

opinion regarding what qualifies a learner as a third language acquirer, the data collected from

Participant 4's involvement will be analyzed like any other participant keeping in mind that if

her results seem different than the others, it could be because of her status as a simultaneous

bilingual. Table 27 displays Participant 4's English F1 and F2 values. We see that Participant 4

seems to not distinguish between /ɔ/ and /ɑ/; like Participant 1 (see Figure 10). Though this

merger is not characteristic of New York speech (*North American English Dialects, Based on*

Pronunciation Patterns), there is evidence of the *cot-caught* merger in eastern Pennsylvania

which is geographically quite close to New York City (Herold 1997). Recognizing this pattern in

Participant 4's speech is important because in the perception task, selecting both *caught* and

clock indicate that she hears a low-mid vowel, not a distinct low-mid and low-central vowel.

Table 27. Participant 4 English Formant Values											
	/i/	/ɪ/	/e/	/ɛ/	/ae/	/ɑ/	/ʌ/	/ɔ/	/o/	/ʊ/	/u/
F1	284	496	437	755	944	829	788	843	568	636	390
F2	2318	2125	2311	1909	1697	1302	1529	1267	1345	1600	1166

Spanish Formant Values. Because Participant 4 is a true bilingual speaker, her Spanish

and English vowel spaces are very different, especially in regard to the front vowels. Her front

vowels are lower and more distant from each other in regard to F2. The Spanish vowels are

proximate to the English vowel in regard to the F1 but not in regard to the F2, given the

frontedness of the two high vowels. In determining perception transfer source in Task 3, if

Participant 4 selects a high-mid vowel, it may be difficult to prove that Spanish is the transfer

source given that the F1 and F2 value of /e/ in Spanish and /ɛ/ in English are quite similar.

Table 28. Participant 4 English and Spanish Formant Value Comparison										
	/i/		/e/		/a/		/o/		/u/	
	Eng	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**
F1	284	352	437	620	829	648	568	569	390	455
F2	2318	2627	2311	1794	1302	1698	1345	1407	1166	1484

Task 2. The formant values of the mid vowels produced by Participant 4 in the reading task change very little from T1 to T2. In fact, there is no significant change over time. At both T1 and T2 her F1 Quechua mid vowel values closely resemble her English and Spanish high-mid vowels, but the F2 values closely resemble the F2 values of only the English high-midvowels. (As seen above in Table 28, there is a substantial difference between her English and Spanish mid vowel F2 values.) However, F1 is the most important formant value in determining mid vowel transfer as the F1 value is what distinguishes high and low-mid vowels from each other. Nevertheless, the average F1 value of the Quechua mid vowels is more like a high-mid vowel, which would usually point to Spanish transfer, but the Spanish front mid vowel is more similar to an English /ɛ/ than /e/. However, her Quechua [ɔ] is similar to both an English and Spanish /o/. It is difficult to determine transfer source for Participant 4.

Table 29. Participant 4 Task 2 Quechua Formant Values				
	Time 1		**Time 2**	
	[ɛ]	**[ɔ]**	**/ɛ/**	**/ɔ/**
F1	476	496	502	529
F2	2255	1197	2326	1243

Task 3. Perhaps because of the equal status of both languages, Participant 4 was the only one to perceive something other than a high-mid or low-mid vowel for more than a third of the target words. Participant 4 actually perceives fewer target vowels as low-mid vowels at T1 and more as high-mid vowels at T2. However, if Participant 4 selects a high number of vowels other than high or low-mid as what she perceives, then perhaps she did not understand the task, or she possesses a mental representation of the vowels that is different than the other participants. If the latter is true, she may be confusing her Spanish and English vowels, in which case it would make sense that she selects the high-mid vowels more at T1 than at T2, because her /e/ and /o/ Spanish

vowels are very similar to the mid vowels in Quechua, even if her English high-mid vowels are not.

Table 30. Participant 4 Perception of Mid Vowels				
	[ɛ]		[ɔ]	
	before	**after**	**before**	**after**
low-mid	8	6	2	2
high-mid	0	2	4	5
others	4	4	6	5

Participant 5. Participant 5 is a Master's student at a southern university studying Spanish literature. Among the top three motivators are travel experience, developing a new perspective, and career. Participant 5 rates herself as a six out of seven for Spanish on the spoken proficiency scale and lists no other languages. Participant 5 is learning Quechua as a true third language. Since birth she has lived in the south, mostly in Georgia, though the vowel quality analysis would not lead one to conclude that her vowel space belongs to a southern dialect. There is also no evidence of the pin/pen merger, or the "raising and fronting of the two lax vowels /ɪ/ and /ɛ/" or the "switch in position of the tense and lax vowels" or "dipthongization in both tense and lax vowels." (Fridland 2012:183). In fact, her vowel space is remarkably similar to that of Participant 3, a New Englander, with the exception of the back vowels, which are more fronted for Participant 5. Like Participant 1 and 4, Participant 5 has also merged /ɔ/ and /ɑ/ into one single vowel. The *cot-caught* merger is not typical of Georgia speech, however Participant 5 does not appear to have vowel patterns typical of southern speech (*North American English Dialects, Based on Pronunciation Patterns*).

Table 31. Participant 5 English Formant Values											
	/i/	**/ɪ/**	**/e/**	**/ɛ/**	**/ae/**	**/ɑ/**	**/ʌ/**	**/ɔ/**	**/o/**	**/ʊ/**	**/u/**
F1	340	609	487	885	1113	937	870	946	618	638	429
F2	2820	2205	2473	2117	2070	1242	1729	1255	1390	1791	1456

Spanish Formant Values. Participant 5 is rated somewhere between a three and a four for overall degree of foreign accent by native judges, which is lower than any of the other participants. However, the vowel formants reported from her Spanish sociolinguistic interview are remarkably similar to those reported for the native control group. They are however, quite fronted and lowered in comparison to the average formant values for Spanish vowels reported in Table 3, which may be more characteristic of the native speaker judges; or perhaps the foreign accent criteria was based on other phonetic flaws like a plosive pronunciation of an allophonic voiced approximant, or collapsing the trill and tap rhotics into a single rhotic. In comparison to the corresponding English values, her Spanish front vowels are more backed and her back vowels, especially /u/, are more fronted. The F1 values are not much different across English and Spanish vowels.

Table 32. Participant 5 English and Spanish Formant Value Comparison										
	/i/		/e/		/a/		/o/		/u/	
	Eng	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**
F1	340	405	487	511	937	790	618	551	429	462
F2	2820	2639	2473	2152	1240	1727	1390	1391	1456	1662

Task 2. In the second task [ɔ] is slightly more backed than other participants, as evidenced by low F2 values, which are, in fact, more Quechua-like. The front mid vowel's formant values fall between a Spanish /e/ and an English /ɛ/ both at T1 and T2, though at T2 [ɛ] may be considered even more like a low-mid vowel because it is slightly more backed, though this difference is not significant ($p = 0.13$). On the other hand, [ɔ] greatly resembles Participant 5's English /o/, comparable to a Spanish /o/, though it is slightly more backed, and thus, more Quechua-like. There is very little change over time, corroborated by non-significant p-values from all four t-tests with respect to both vowels across both formant values at T1 and T2. Because both the front mid and back mid Quechua vowels resemble a high-mid vowel more than

a low-mid vowel at both T1 and T2, we can conclude that the transfer source in both the

beginning and end of the experiment is more Spanish-dominant, though the formant values point

to combined English and Spanish transfer.

Table 33. Participant 5 Task 2 Quechua Formant Values				
	Time 1		**Time 2**	
	[ɛ]	**[ɔ]**	**[ɛ]**	**[ɔ]**
F1	624	615	631	621
F2	2323	1159	2176	1192

Task 3. In the third task, Participant 5 generally classifies the front mid vowels as low-

mid and the back mid vowels as high-mid. Though according to Figure 1, the F1 values for the

high and low-mid vowels should be equivalent, Participant 5's F1 values for /o/ are much higher

than /e/. This same tendency extends to her English low-mid vowels, meaning that her English

/ɛ/ is similar to a native Quechua [ɛ], but the native Quechua [ɔ] resembles the English /o/ much

more than an English /ɔ/. This may explain why she classifies at least two thirds of the target

Quechua front mid vowels as a low-mid vowels at both T1 and T2 but classifies zero of the

target back mid vowels as low-mid vowels and more than three-fourths as high-mid vowels.

Table 34. Participant 5 Perception of Mid Vowels				
	[ɛ]		**[ɔ]**	
	before	**after**	**before**	**after**
low-mid	10	8	0	0
high-mid	1	3	11	9
others	1	1	1	3

Participant 6. Participant 6 is a female graduate student seeking a Ph.D. in Latin

American Literature and Culture in the Midwest, where she resides. Though she is a beginner

student of Quechua, she did admit to knowing a few words from the Ayacucho variety of

Quechua, but she had never before taken a Cusqueño Quechua course. We can assume that

Participant 1 was measured producing Quechua at her initial state at T1. She ranks her spoken

proficiency of Spanish as a five out of seven and lists no other languages, meaning that Quechua

is her true L3, similar to Participant 2, 4 and 5. Like the majority of the beginner students, she

lists academic interests and career as her two main motivators, with visiting friends and family

and independence as irrelevant motivators. Like Participant 2, her Midwestern vowel space is

strikingly similar to those found in Table 2, though her front vowels are less fronted and her back

vowels are more fronted than the Midwestern averages found in Hillenbrand et al. (1995).

Because her F1 values for both the high and low-mid vowels are quite a bit lower than other

participants, namely Participants 3, 4 and 5, she may perceive the target vowels in Task 3 as low-

mid vowels more often than her aforementioned classmates.

Table 35. Participant 6 English Formant Values

	/i/	/ɪ/	/e/	/ɛ/	/ae/	/ɑ/	/ʌ/	/ɔ/	/o/	/ʊ/	/u/
F1	348	521	478	659	780	800	670	752	588	568	426
F2	2420	1947	2267	1782	1840	1388	1533	1291	1223	1528	1503

Spanish Formant Values. Though not obvious from the reported Spanish formant values

in Table 36, Participant 6 is rated between three and four on a six-point scale of overall foreign

accent, just like Participant 5. Though her Spanish front vowels are generally a bit lower and

more backed than the corresponding English vowels, in comparison to the formant values

reported in Table 13, her first formant values are almost exactly those of the native bilingual

speakers. Her second formant values for the front vowels /i/ and /e/ are slightly lower, meaning

they are more backed in her Spanish vowel space than a native cusqueño bilingual.

Table 36. Participant 6 English and Spanish Formant Value Comparison

	/i/		/e/		/a/		/o/		/u/	
	Eng	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**
F1	348	437	478	535	800	607	588	565	426	433
F2	2420	2265	2267	1926	1388	1651	1223	1392	1503	1338

Task 2. From T1 to T2 there is not much change in Participant 6's formant values for

either [ɛ] or [ɔ], and this slight change is not significant according to several t-tests for either

vowel or formant value. What we notice about her formant values at T1 and T2 is that they are

almost exactly the same as her Spanish formant vowels. In fact, there is no significant difference between her Spanish mid vowel formants and her Quechua mid vowel formants. Spanish is the mostly likely source of transfer for both T1 and T2.

Table 37. Participant 6 Task 2 Quechua Formant Values				
	Time 1		**Time 2**	
	[ɛ]	**[ɔ]**	**/ɛ/**	**/ɔ/**
F1	553	580	534	566
F2	1917	1307	1989	1313

Task 3. Though it was hypothesized that Participant 6 may perceive a low-mid vowel more often than her classmates because her English low-mid formant values closely resemble those of the Quechua native speakers, she actually perceives a low-mid vowel less than any of her fellow classmates at T1 and T2. Perhaps because she produces her Quechua vowels almost exactly like the Spanish variants, she attempts to choose the answer that most accurately describes her idea of what the Quechua vowel system should sound like, a five vowel system closely resembling her second language.

Table 38. Participant 6 Perception of Mid Vowels				
	[ɛ]		**[ɔ]**	
	before	**after**	**before**	**after**
low-mid	8	6	1	2
high-mid	4	6	10	10
others	0	0	1	0

Participant 7. Participant 7 was the only intermediate student enrolled in the Quechua program with English as her first language and Spanish as her second. Like most of the beginner participants, she is learning Quechua as a true L3 and ranks her spoken Spanish proficiency as a five out of seven. Academic interests and monetary compensation rank among her top two motivators, and visiting friends and family and gaining course credit rank the lowest. At the time of the program she was seeking a Master's degree but was soon after enrolled in a southern university to pursue a Ph.D. in Spanish Linguistics. Though she calls Ohio home, she has resided

in many states across the continental United States. She describes herself as having a neutral

accent with some pronunciation idiosyncrasies from each of the regions she has lived in. Her

vowel space is quite similar to the Midwestern Participant 6, though Participant 6's back-mid

vowels are more fronted, as is evident in the formant values found in Table 39 below.

Table 39. Participant 7 English Formant Values											
	/i/	/ɪ/	/e/	/ɛ/	/ae/	/ɑ/	/ʌ/	/ɔ/	/o/	/ʊ/	/u/
F1	292	521	437	635	822	841	729	768	521	602	375
F2	2672	2092	2308	2001	1813	1372	1615	1231	1016	1556	1200

Spanish Formant Values. Participant 7 was ranked just as native-like as the only

simultaneous bilingual in the group, receiving a six from all of the judges for overall accent. One

judge even commented that she was a typical sevillana, even though she is indeed a native,

American-born English speaker. The values in Table 40 suggest that her Spanish front vowels

are slightly less fronted than the corresponding English vowels, just like the native speakers in

Table 3, and her back vowels are more fronted than her English vowels, unlike the average

formant values for Spanish vowels presented in Table 3, but much more like the normalized

Spanish values of the native control group presented in Table 13. These slight differences in F2

values seem to not affect her native-like Spanish accent. Just like Participant 6, Participant 7's

Spanish front-mid vowel has a slightly higher F1 value than her English high-mid vowel.

Table 40. Participant 7 English and Spanish Formant Value Comparison										
	/i/		/e/		/a/		/o/		/u/	
	Eng	Span	Eng	Span	Eng	Span	Eng	Span	Eng	Span
F1	292	263	437	546	841	665	521	534	375	372
F2	2672	2316	2308	1931	1372	1580	1016	1355	1200	1632

Task 1. In the sociolinguistic interview, Participant 7 produced 11 mid vowels at T1—

two [ɛ] and nine [ɔ]—and 27 at T2—four [ɛ] and 23 [ɔ]. Most of back mid vowels were subject

pronouns like *noqa* 'I'*, noqanchis* 'we'*, noqayku* 'we'*, noqawan* 'with me'*,* etc. At T1 we notice

that her production of [ɛ] falls between her English /e/ and /ɛ/ with respect to both F1 and F2

values, and is slightly higher and more fronted than her Spanish /e/ according to the F1. At T2,

however, her front mid vowel becomes more backed and higher, and becomes more like her

Spanish /e/, though she overshoots both the F1 and F2 values and produces a vowel that is both

higher and more backed than her Spanish /e/. According to t-tests, the change in F2 is significant,

$p = 0.005$, but not the change of F2 over time. The same tendency occurs with [ɔ]: though her

starting F1 value resembles an English or Spanish /o/, the F2 value is more reminiscent of an

English /ɔ/. At T2, her Quechua [ɔ] becomes higher and more backed just like the Spanish /o/.

This change in F1 is significant according to a t-test, $p = 9.7 \times 10^{-4}$, but the change in F1 over time

is not significant. We might concede that at T1, Participant 7 may be transferring from a

combined Spanish and English value. At T2 her Quechua back vowel becomes more Spanish-

like, as it heads in the direction of a Spanish /o/, even though she overshoots the F1 target like

she does for [ɛ].

Table 41. Participant 7 Quechua Values Task 1				
	T1		**T2**	
	[ɛ]	**[ɔ]**	**[ɛ]**	**[ɔ]**
F1	571	574	426	466
F2	2149	1259	1748	1196

Task 2. In the second task, we see the same general trend as the first task. The front mid

vowel [ɛ] and back mid vowel [ɔ] becomes higher and less fronted. Though the F1 and F2 values

are even lower than the reported Spanish values, her vowels become more Spanish-like over

time. The back mid vowel becomes more backed, which is like the Quechua vowel, and thus her

speech becomes more Quechua-like in one respect. The change from T1 to T2 is significant for

the F1 value of [ɛ], $p = 0.014$, and the F2 value of [ɔ], $p = 0.015$.

Table 42. Participant 7 Task 2 Quechua Formant Values				
	Time 1		**Time 2**	
	[ɛ]	**[ɔ]**	**[ɛ]**	**[ɔ]**
F1	483	462	381	425
F2	2078	1253	2000	1132

Task 3. In the third task, Participant 7 classifies the front mid vowels as a low-mid vowel for more than two-thirds of the target words at both T1 and T2, but classifies all target back mid vowels as low-mid vowels at both T1 and T2. This may be because the native F1 value for the back mid vowel [ɔ] is more similar to her Spanish /o/ F1 value than her English /ɔ/, though the latter vowel's F2 value is more similar to the Quechua mid vowel. Though the contrast is stark for Participant 7, classifying more front than back mid vowels as low-mids is a trend that applies to all participants.

Table 43. Participant 7 Perception of Mid Vowels				
	[ɛ]		**[ɔ]**	
	before	**after**	**before**	**after**
low-mid	10	8	0	0
high-mid	0	2	12	12
others	2	0	0	0

Participant 8. The final participant was not a student studying at Centro Tinku, rather a student who was conducting research in Cusco during a time overlapping the seven-week program for his dissertation in Hispanic Linguistics. He had been a Quechua student at the same institute the summer before as an intermediate student and two summers before as a beginner student. The purpose of including him in the study is to see if participants use the same transfer source to inform L3 vowel pronunciation after an extended period of little or no contact with the L3. Because Participant 8 participated in the program as one case of a delayed posttest, he has no pretest to compare his results to. However his Quechua vowel system can still be evaluated in the interlanguage stage. Participant 8 admitted that he had spoken very little Quechua in the academic year following his studies in Cusco and that he had probably suffered at least some

language attrition. Besides marking himself as completely orally proficient in Spanish, he reported intermediate-high oral proficiency in Portuguese and low proficiency in French and Russian. Contact with these six languages as well as his academic pursuits in linguists means that his metalinguistic awareness is quite high, especially in comparison with someone like Participant 4, who speaks only two languages and studies Psychology and Pre-medicine. Though he was not studying Quechua at the time of the study, his main motivations to study Quechua in the past were academic interests, career, and developing a new perspective. The least important motivators were visiting friends and family and course credit. Though he is originally from Colorado, he is currently studying at a university in the Midwestern US. His formant values are in line with the three other Midwestern participants. The difference, which may be seen in both the production and perception tasks is that his low-mid vowels have higher F1 values than the other Midwestern participants (Participants 2, 6 and 7).

Table 44. Participant 8 English Formant Values											
	/i/	/ɪ/	/e/	/ɛ/	/ae/	/ɑ/	/ʌ/	/ɔ/	/o/	/ʊ/	/u/
F1	230	520	399	776	729	842	729	852	619	581	372
F2	2202	1816	2158	1561	1490	1186	1490	1388	1090	1575	1197

Spanish Formant Values. Participant 8 was one of two non-native Spanish speakers to be rated a six out of six with respect to foreign accent, meaning his accent is native-like. Two of the three judges even asked if he was a native speaker. His Spanish values resemble the native Spanish values in Table 3 even though they may not be just like the English values. The stark difference is in his back vowel F2 values, especially for /u/, which is almost as fronted as /e/. This is because this vowel in particular was difficult to find in tonic position and with a long enough duration to produce clear vowel formant 'bars' on the spectrogram. Though these values are inaccurate, this should not affect the comparisons between each language's mid vowels.

Table 45. Participant 8 English and Spanish Formant Value Comparison										
	/i/		/e/		/a/		/o/		/u/	
	Eng	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**	**Eng**	**Span**
F1	230	365	399	406	842	714	619	490	372	428
F2	2202	2135	2158	1878	1186	1650	1090	1266	1197	1716

Task 2. In the interlanguage stage of Participant 8's Ln Quechua, the source of transfer may be slightly different for each vowel. The front mid vowel [ɛ] resembles a vowel in between an English /e/ and /ɛ/ in regard to both F1 and F2 values, and one that is lower than the Spanish mid vowel /e/. Perhaps this participant believes that the Quechua front mid vowel is more like an English low-mid vowel, but his knowledge that the Quechua system contains only five vowels like Spanish leads him to produce a vowel that represents a combined high and low-mid vowel. The F1 value of the back vowel [ɔ], however, does not exceed the F1 value of his English /o/, but is slightly higher than his Spanish /o/ F1 value. His Quechua back mid vowel resembles a high-midvowel. This trend of producing a front mid vowel between a high /e/ and low /ɛ/, but a back mid vowel reminiscent of a pure high vowel /o/ holds true for Participants 1, 3, 4, 5, and 6 as well and will be discussed in Chapter 6.

Table 46. Participant 8 Task 2 Quechua Formant Values		
	[ɛ]	[ɔ]
F1	500	567
F2	1830	1141

Task 3. On par with Participant 1, at T2, Participant 8 perceived 18 of the 24 target words with mid vowels as low-mid vowels. He perceived all 12 of the front mid vowels as low-mids, half of the back mid vowels as low-mids, and the other half as high mids. This is not surprising, given that his English low-mid vowel F1 value is similar to the Quechua-Spanish bilingual native production of [ɛ] (see Table 9), but his Quechua [ɔ] resembles a Spanish or English high-mid/o/. Perceiving more of the front mid vowels as low-mids than back mid vowels is also a trend that is true for every participant, and will be discussed in Chapter 6.

Table 47. Participant 8 Perception of Mid Vowels		
	[ɛ]	**[ɔ]**
low-mid	12	6
high-mid	0	6
others	0	0

Table 48 is a summary of all of the results for all eight participants in the experimental

group. The first and second task display the transfer source at T1 and T2 and the third task shows

how many of the target vowels were perceived as low-mid vowels. Because Task 1 is analyzed

only for Participant 7, only these results are summarized in the table below. This table indicates

that most participants seem to transfer from Spanish for both the sociolinguistic and reading task.

Task 3 results indicate that participants are quite consistent in their perception of mid vowels at

T1 and T2, with the most drastic change being only four target vowels. Six participants actually

perceive fewer mid vowels at T2 but these changes are not significant. Each cell marked with a

(*) means there was a significant difference between either F1 or F2 values for either vowel from

T1 to T2.

Table 48. Summary of Transfer Source	Task 1		Task 2		Task 3	
	T1	**T2**	**T1**	**T2**	**T1**	**T2**
Participant 1	--	--	Spanish/ English*	Spanish*	14/24	18/24
Participant 2	--	--	Spanish	Spanish	12/24	10/24
Participant 3	--	--	Spanish	Spanish	7/24	8/24
Participant 4	--	--	Spanish	Spanish	10/24	8/24
Participant 5	--	--	Spanish	Spanish	10/24	8/24
Participant 6	--	--	Spanish	Spanish	9/24	8/24
Participant 7	Spanish/ English*	Spanish*	Spanish*	Spanish*	10/24	8/24
Participant 8	--	--	--	English/ Spanish	--	18/24

Figure 12 provides a summary of the Quechua vowel space for each of the eight

participants. Like the vowel plot displaying the participants' English vowel spaces, some

participants produced more tightly clustered Quechua vowel spaces, like Participant 6, while

others, e.g. Participant 7, produce a wide range of F1 and F2 values that coincide with the low-mid vowels [ɛ] and [ɔ].
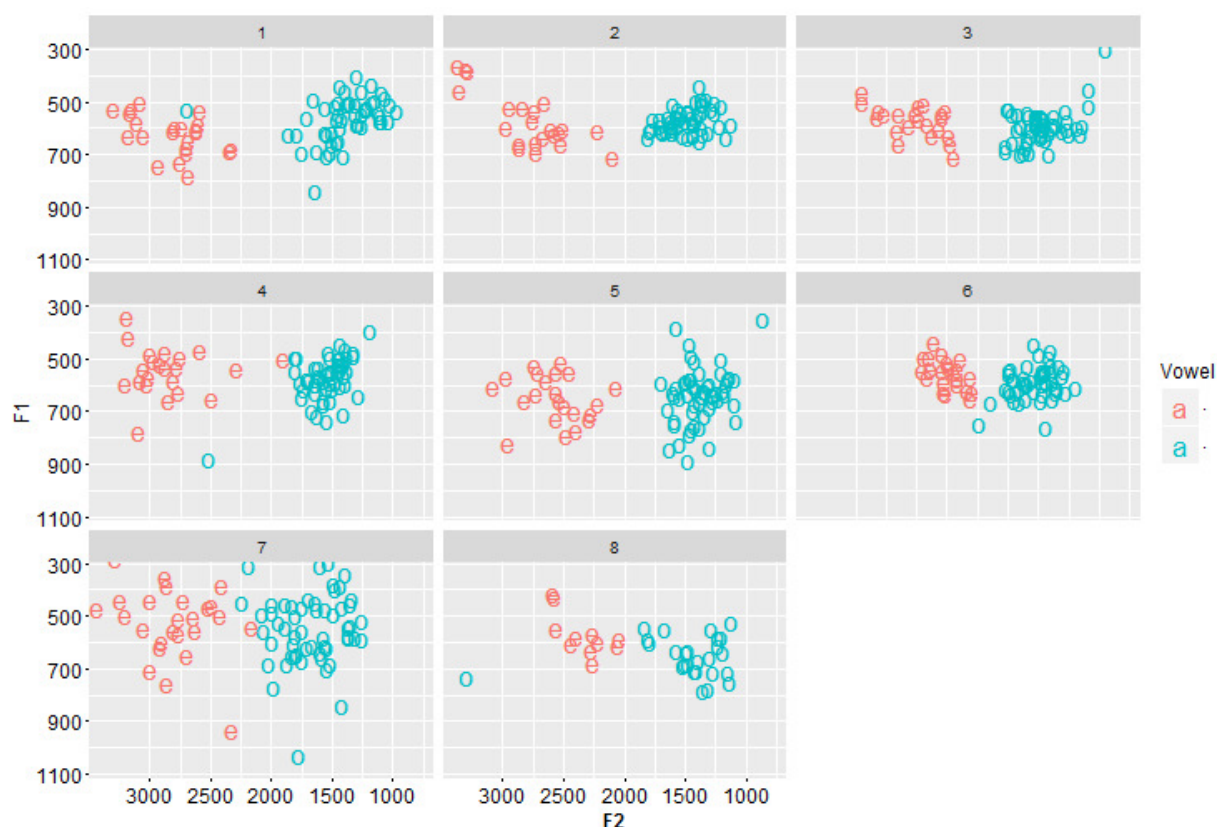

Figure 12. Experimental Group Quechua Mid Vowel Space

5.3. Linguistic Predictors. In order to determine which linguistic predictors influence the vowel formant values produced, all of the participants will be analyzed as one whole experimental group. Using the same program as the control group, the experimental Quechua values from Task 2 were normalized. Though most of the participants seem to use their L2 Spanish as the source of transfer, an analysis of the linguistic variables may reveal patterns that correspond with uvular consonant articulation, position of the uvular consonant, syllable type, and syllable stress. Perhaps these linguistic predictors may not vary in transfer source, but by comparing them to native values we can see if these linguistic predictors are 1) significant and 2) reveal if participants have the ability to exhibit the nuances of native speech. The linguistic

predictors are analyzed for all combined T1 and T2 tokens as very few of the formant-vowel combinations changed significantly over time for each participant individually. Recall that the native Quechua-Spanish bilinguals' data selected only the F2 value for both mid vowels of uvular articulation and both the F1 and F2 of the front mid vowel for stress as significant linguistic predictors. All four predictors are significant for either [ɛ] or [ɔ] across either F1 or F2.

Uvular type. In determining whether the uvular consonant type has an effect on the vowel production, all four modes, including the allophonic fricative production, will be considered. The aspirate uvular articulation, however, was not present in any of the three stories. According to a one-way ANOVA statistical test conducted for each formant value of each vowel, uvular type is significant. Though it is difficult to ascertain the differences between the three articulations based on the visual representation provided in Figure 13, the average values in Table 49 reveal that an ejective produces the highest F1 value for [ɛ] and the fricative produces the highest F1 value for [ɔ]. Thus, [ɛ] is most like a low-mid vowel when next to a ejective uvular and [ɔ] is most like a low-mid vowel when next to a fricative uvular. With regard to F2 values, [ɛ] is the most fronted with the plosive articulation and [ɔ] is the most backed with the ejective articulation. Like the native group, the experimental group's ejective uvular produces the highest F2 values for [ɛ]. Unlike the native group, the F1 and F2 values were significant for both vowels and the most backed F2 values for [ɔ] are those positioned next to an ejective uvular.
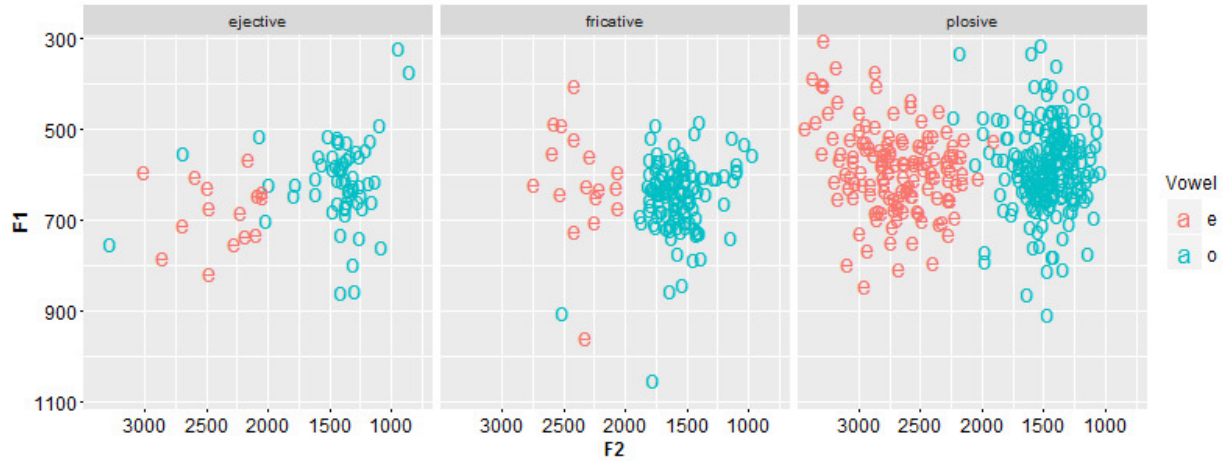
Figure 13. Experimental Mid Vowels across Uvular Articulation

	[ɛ]			[ɔ]		
Table 49. Mid Vowel Formant Values across Uvular Type						
	plosive	**ejective**	**fricative**	**plosive**	**ejective**	**fricative**
F1	613	707	642	612	640	673
F2	2622	2313	2282	1399	1375	1496

Position with respect to uvular consonant. The position with respect to the uvular

consonant is either before or after. The word *orqokuna* 'mountains' provides an example of mid

vowels that come both before and after the uvular consonant. For words like *qoq* 'gave

(habitually)', the mid vowel was considered as following the uvular consonant, which in this

case, is plosive. The native Quechua-Spanish bilinguals' mid vowel formant values did not

display significant differences according to for uvular position.

Of the 569 tokens collected in Task 2, 264 of the words contained a mid vowel before the

uvular consonant and 305 after the uvular consonant. For the front mid vowel, there were 168

tokens, 79 of which came before the uvular consonant and 89 of which came after. For the back

mid vowel, there were 401 tokens, which were positioned before the uvular consonant in 185 of

the tokens and after the uvular in the remaining 216. For each mid vowel separately and both

combined vowels, there are slightly fewer vowels overall that come before a uvular consonant,

but the proportions are about equal. This information is summarized in Table 56.

Table 50. Mid Vowel Distribution across Uvular Position		
	[ɛ]	**[ɔ]**
Before Uvular	79 (47%)	185 (46%)
After Uvular	89 (53%)	216 (54%)
Total	168	401

As represented in Table 51, both mid vowels are slightly higher when they come after the uvular consonant. Position of the mid vowel with respect to the uvular consonant is significant only for the F1 and F2 values of the back vowel ($p = 0.0018$ and $p = 7.8$ x 10^{-6} respectively). Figure 14 indeed depicts a more lowered and backed mid vowel when it follows the uvular consonant. The front mid vowel is lower when positioned before a uvular consonant, which is opposite of what Cerrón-Palomino suggests might be occurring with the allophonic mid vowels, namely, that before a uvular the allophone is a high-mid vowel and after uvular the allophone is more open more similar to a low-mid vowel (2015).

Table 51. Mid Vowel Formant Values across Uvular Position				
	[ɛ]		**[ɔ]**	
	before	**after**	**before**	**after**
F1	637	611	641	627
F2	2538	2586	1445	1400

Figure 14. Experimental Mid Vowels across Position of Uvular Consonant

Syllable. The mid vowel of the syllable could either be open or closed. The word *noqayku* 'we' is an example of a mid vowel, [ɔ], in an open syllable and *reqsini* 'I know' is an example of a mid vowel, [ɛ], in a closed syllable. Though not selected as significant for the native control group, the experimental group's results were significant for the F1 and F2 values of [ɔ]. When the vowel was in an open syllable, the tendency was for the vowel to be higher and more backed than when in a closed syllable. Figure 15 shows a cluster of back mid vowels that have a lower F1 value and thus a higher tongue position, and a lower F2 value with a correspondingly more backed tongue position in an open syllable. The reverse is true of a closed syllable.

	[ɛ]		[ɔ]	
	open	**closed**	**open**	**closed**
F1	627	622	611	662
F2	2566	2556	1395	1459

Table 52. Mid Vowel Formant Values across Syllable

Figure 15. Experimental Mid Vowels across Syllable

Stress. This predictor accounted for whether the mid vowel was tonic or atonic. The three Quechua stories did not contain any tonic front mid vowels. A t-test produced a significant *p*-value for this predictor only for the first formant value of [ɔ] ($p = 1.6 \times 10^{-4}$). Tonic vowels are less fronted than atonic vowels, which means that the tonic vowels are slightly more rounded. Stress was significant for the control group, however only for [ɛ]s F1 and F2 values. The

discrepancies between the control group and participant group according to the linguistic

predictors will be discussed in greater detail in the following chapter. There is no vowel plot of

these data given that there are no tonic front mid vowels.

	[ɛ]		[ɔ]	
	tonic	atonic	tonic	atonic
F1	--	624	654	620
F2	--	2560	1411	1434

Table 53. Mid Vowel Formant Values across Stress

5.4. Extralinguistic Predictors. There were several extralinguistic predictors extracted

using both the Background Questionnaire and the Language Contact Survey. The only variable

not extracted using either of these two instruments is time—before the intensive Quechua course,

T1, and after, T2. The Background Questionnaire revealed the gender, academic status,

motivation and other languages spoken by the participants. The language contact survey revealed

how many contact hours each participant had per week with Quechua, English and Spanish.

Time. Previous studies are divided on whether or not students improve during a study

abroad period in regard to phonetic and phonologic phenomena (Segalowitz et. al 2004, Díaz-

Campos 2004, Llanes & Muñoz 2009, Mora 2005). Llanes & Muñoz (2009), however, found

that participants improved over just a three to four week stay, which means there is a possibility

that students will become more native-like from T1 to T2 in the present study. This, however, is

not the case. There is no significant difference between the formant values produced for either

the front or back mid vowel at T1 and T2. However, when analyzing the case studies separately

in the previous section, three of the participants did change significantly over time in at least one

of the vowel-formant value combinations.

Gender. The participant pool is unbalanced in regard to gender—there are six female

participants and two males. In the beginner group, these numbers are even more offset with one

male participant and five female participants. Probably due to normalization of the data, there is no significant difference between male and female participants. If the data were not normalized, we could expect that male and female participants would produce significantly different vowel spaces given that female speech is usually lower and more fronted (Hillenbrand, Getty, Clark & Wheeler 1995, see Tables 1 and 2). This is yet further justification for analyzing each participant separately in section 5.2.

  Spanish Oral Proficiency. According to third language acquisition researchers Bardel & Falk (2007) who proposed the L2 Status Factor, proficiency level may cause the L2 to be overridden by the L1 in the selection of the transfer source. If this is true, Spanish should be the likely transfer source for participants that have a higher level of Spanish proficiency, while those that have a low level of Spanish proficiency should be more likely to use English as a source of transfer. At the institution in which the present study was conducted, all participants were required to have at least an intermediate proficiency level in Spanish. In the native speaker judgments of the overall degree of foreign accent, intelligibility of the speaker, acceptability of accent, degree of certainty of foreign accent judgment, and spoken Spanish proficiency on a scale of 1 (lowest) to 6 (highest) the majority of scores given were 4, 5 and 6. The only exceptions were ratings from Judge 1, who rated Participant 2 and Participant 5 as a '3' on overall degree of foreign accent. However, in order to analyze the data, the speakers were categorized as either low, intermediate or high in Spanish pronunciation proficiency. This was done by averaging all three judges' scores for all questions, except 'degree of certainty of foreign accent judgment', and taking the lowest average, subtracting it from the highest and creating three groups—'low', 'medium' and 'high'. This methodology is described in greater detail in the subsection *Quechua Language Contact* on page 88. The labels 'low, 'medium' and 'high' are

used with respect to one another as all participants are at least intermediate high in their pronunciation of Spanish.

There are three speakers considered 'high' in Spanish pronunciation proficiency—including, Participant 4, the simultaneous bilingual—one considered 'medium' and four considered 'low'. All formant vowel combinations were considered significant by a one-way ANOVA test except F1 of [ɔ] given there is not much difference across Spanish proficiency. In Figure 16, notice that for the 'high' participants, [ɛ] is clustered higher on the vowel plot, meaning it is a higher mid vowel with respect to 'low' and 'medium' participants. This vowel is also clustered further to the left for both [ɛ] and [ɔ], meaning these vowels are more fronted. A higher and more fronted mid vowel is indicative of Spanish transfer, given that the mid vowel in Spanish is both higher and more fronted than Quechua's mid vowel. The 'low' participants have the highest F1 value for [ɛ], which may indicate English transfer of the low-mid vowels given an English mid vowel has a higher F1 value than an English or Spanish high-mid vowel. This coincides with Bardel & Falk's (2007) hypothesis that L1 transfer may override the L2 when participants' proficiency level in L2 is low.

Figure 16. Experimental Mid Vowels across Spanish Pronunciation Proficiency

Table 54. Mid Vowel Formant Values across Spanish Pronunciation Proficiency						
	[ɛ]			[ɔ]		
	low	**medium**	**high**	**low**	**medium**	**high**
F1	648	622	590	638	642	626
F2	2527	2440	2656	1375	1401	1514

Quechua Proficiency. In the intensive Quechua program the participants were broken up into two groups—beginner and intermediate learners. Because Participant 8 had already completed the beginner and intermediate program, he was considered an intermediate participant, along with Participant 7. One may speculate that an intermediate participant would produce higher F1 values and lower F2 values than the beginner group, given that Quechua's mid vowels are of the low-mid variety. However, according to the values presented in Table 63, the opposite is true. Though t-tests show that only the F1 value of [ɛ] and F2 value of [ɔ] are significant for Quechua proficiency ($p = 0.04$ and $p = 0.0003$ respectively), the overall trend is that intermediate participants have a higher and more fronted mid vowel space than do the beginner participants. This may be because the intermediate participants are also the two participants with the highest-rated Spanish pronunciation, meaning that the L2 is more likely to be the source of transfer, which means their F1 values are lower.

Figure 17. Experimental Mid Vowels across Quechua Proficiency

Table 55. Mid Vowel Formant Values across Quechua Proficiency				
	[ɛ]		[ɔ]	
	beginner	**intermediate**	**beginner**	**intermediate**
F1	634	588	636	629
F2	2554	2583	1396	1538

Academic Status. Though all participants were enrolled in the program due to their status as students of higher education, some students were enrolled in an undergraduate program, some were in the process of completing a Master's degree, and others were enrolled in a Ph.D. program. These three groups are 'bachelors', 'masters' and 'phd' in Figure 18 and 'BA', 'MA' and 'Ph.D.' in Table 62 respectively. Two of the participants belonged to the Bachelor's group, one to the Master's group and five to the Ph.D. group. According to several one-way ANOVA tests, academic status is significant for both F1 and F2 for both vowels (F1 [ɛ], T = 2.8x10^{-4}; F2 [ɛ], T = 2.6x10^{-5}; F1 [ɔ], T = 1.5x10^{-5}; F2 [ɔ], T = 2.9x10^{-5}). According to the values presented in Table 56, for the front mid vowel, the Ph.D. group has the highest and most fronted production, meaning that this vowel is more Spanish-like. The Ph.D. group produces a F1 value for the back mid vowel that is between the other two groups but the most fronted as seen by the high F2 value. The only Master's student participant produces mid vowels that are lower than the other two groups, and thus more Quechua-like. However, because this is the only participant in this group, she may just have a lower vowel space overall, which she, in fact, does. If there were more participants in each group, academic status may not be a significant predictor, as academic status does not describe the data consistently across both vowels.

Figure 18. Experimental Mid Vowels across Academic Status

Table 56. Mid Vowel Formant Values across Academic Status					
	[ɛ]			[ɔ]		
	BA	**MA**	**Ph.D.**	**BA**	**MA**	**Ph.D.**
F1	632	696	606	616	685	631
F2	2757	2494	2490	1400	1303	1462

Motivation. Motivation of the participant was extracted from the Background

Questionnaire in which the participants revealed what motivated them to study Quechua (see

Appendix A, question 5). Though motivation is often cited in second language acquisition

literature as something that may affect a learner's acquisition process even more than context,

this is usually an explanation that researchers fall back on when other predictors are not

significant. Motivation, it is not often tested statistically as a separate predictor (Lafford 2006).

The Background Questionnaire included motivators that are typical of study abroad students, and

were composed by personally asking students who had previously studied abroad what had

motivated them to do so.

Those motivators considered 'academic' are 'course credit' and 'academic interests'.

Motivators considered 'social' are 'develop a new perspective', 'travel experience', and 'visit

friends/family'. The category 'external' includes 'monetary compensation', 'resume/career', and

'independence' (see Appendix A). Each participant was asked to rank the motivators, from one,

the most important motivator, to eight, the least important motivator. To separate the participants into meaningful groups, each participant was given a score for each category, which was the average of the motivators that comprised that group. The lowest score was considered the most important category of motivators. For example, if a participant ranked the motivators in the following way—4-travel experience, 5-monetary compensation, 2-academic interests, 8-course credit, 7-visit friends and family, 1-resume/career, 3-develop new perspective, and 6-independence they would be given a 5 for academic ((2+8)/2=5), 4 for external ((5+1+6)/3=4) and 4.7 for social ((4+7+3)/3=4.7). This means they would be considered a participant driven by external motivators.

According to several one-way ANOVAs motivation is significant for both formant values of both mid vowels (F1 [ɛ], $p = 0.02$; F2 [ɛ], $p = 2.5 \times 10^{-6}$; F1 [ɔ], $p = 0.002$; F2 [ɔ], $p = 2.8 \times 10^{-8}$). Like academic status, the significance of this variable may be attributed to the small number of participants in the current study. However, the F1 and F2 values according to different motivation categories are consistent for both mid vowels. Those motivated by academic and social reasons were those who showed a higher F1 and lower F2 value for both mid vowels, meaning both were more backed and lower, and thus resemble a Quechua low-mid vowel. Those who were motivated by external interests, on the other hand, produced F1 and F2 values for both vowels that resemble a standard Spanish high-mid vowel. These conclusions are drawn from observing the values presented in Table 57. From the visual representation in Figure 19 the overall trend is not as clear because the external data is made up of one participant who produced mid vowels that are not closely clustered. These results we be discussed further in the next chapter.
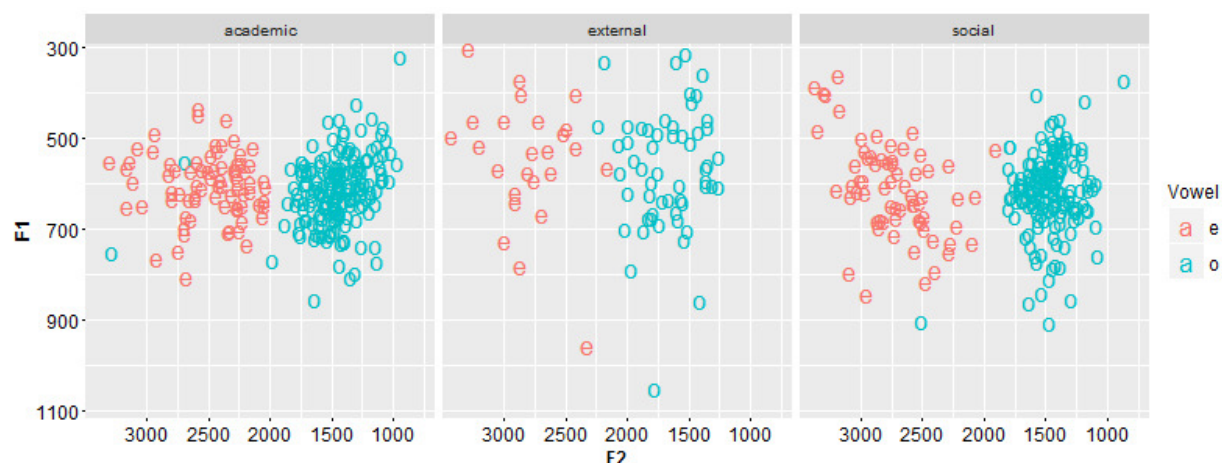
Figure 19. Experimental Mid Vowels across Motivation

	[ɛ]			[ɔ]		
Table 57. Mid Vowel Formant Values across Motivation						
	academic	social	external	academic	social	external
F1	630	636	575	640	641	595
F2	2423	2658	2726	1396	1398	1599

Metalinguistic Competence. Principle researchers in the area of third language acquisition have suggested that learning more languages makes a learner more competent metalinguistically (Rothman, Cabrelli Amaro, de Bot. 2013). That is, the more languages a learner knows, the more adept they are at learning new languages. The participants in the current study were to indicate in which languages they possessed spoken proficiency, and three of the five participants were at least somewhat proficient in multiple languages, while five of the participants were proficient only in Spanish, English, and Quechua. For example Participant 8 speaks Portuguese, French, and Russian in addition to English, Spanish, and Quechua. Regardless of the level of their self-reported proficiency, any prior knowledge of other languages was considered as knowledge of additional languages. The languages in which the participants with higher metalinguistic competence were proficient included Italian, French, Russian, Portuguese, and Latin. In Figure 20, the label 'multiple' and 'none' refers to the number of other languages known.

Though this variable was expected to be significant, t-tests reveal that only the F2 value of [ɔ] is significant for this predictor ($p = 0.005$). That is, those participants with more metalinguistic competence produced a lower F2 value for the back mid vowel than were those with knowledge of only English and Spanish. This value would indicate that the participants produced a more Quechua-like back mid vowel than did those with a smaller metalinguistic competence. A more backed back mid vowel is more native-like, especially when considering that monolingual Quechua speakers produce allophonic variants of high vowels that are only more backed, not backed and lowered like the allophones of bilingual Spanish-Quechua speakers. Given the emphasis placed on metalinguistic competence in third language acquisition literature, one would expect this variable to be significant for F1 and F2 of both [ɛ] and [ɔ]. It is surprising that only one of the formant values for one of the mid vowels is significant.

Figure 20. Experimental Mid Vowels across Metalinguistic Competence

Table 58. Mid Vowel Formant Values across Multilinguistic Competence				
	[ɛ]		[ɔ]	
	multiple	none	multiple	none
F1	641	617	641	631
F2	2523	2578	1372	1450

Quechua Language Contact. The last three predictors examine how much contact each of the participants had with all three languages on a weekly basis. In second and third language

acquisition studies, it is contested that perhaps learners with more contact with the target language and less contact with the L1, and the L2 by extension, may have a more native-like pronunciation (Mora 2005). Because the amount of contact hours was evaluated at the end of the program, and this amount refers to how the participants spent their time during the program, only the values at T2 are evaluated with respect to the predictors Quechua, English and Spanish language contact hours.

In order to divide the participant group into 'high', 'medium' and 'low' groups, I added all of the contact hours for each language separately according to the corresponding questions, and calculated a total for each participant. The lowest value of these totals was subtracted from the highest value and divided by three. The resulting number was added to the lowest value to create the range of values for the 'low' category. To create a range of values for the 'medium' category, the same number was added to the highest value of the 'low' category. The same method was used to generate the range of values for the 'high' category. For example, the lowest total for the number of Quechua contact hours overall was 19 and the highest was 67. With 48 points separating the high and low values, to arrive at three groups, I divided 48 by three, netting 16-point intervals between groups. The 'low' category contained any participant in contact with Quechua 19-35 hours per week. The 'medium' contact group was those in contact with Quechua 36-51 hours per week and the 'high' contact category 52-67 hours per week. Participant 3 did not complete the Language Background Questionnaire and Participant 8 was not given this questionnaire because he did not participate in the program and his reported contact hours from the summer prior would have likely been inaccurate. Thus, data is available only for six of the eight participants.

Three of the participants were in contact with Quechua a low amount, one a medium amount, and two a high amount. The only formant vowel combination not significant according to the Quechua Language Contact predictor is F1 of [ɛ] (T = 0.087), but the other three, F2 [ɛ], F1 and, F2 [ɔ], are significant. According to the vowel plot in Figure 21[9] and the values in Table 59, those with high Quechua contact produce mid vowels that are both lowered and more backed, just like native Quechua-Spanish bilinguals. Those with low contact produce the most Spanish-like mid vowels with low F1 values and slightly higher F2 values, meaning the mid vowels are both higher and more fronted. Those with medium contact fall in between the other two groups with respect to F1 but have the most fronted F2 values. Though I am not certain of how to analyze the F2 patterns, F1 values are far more valuable in analyzing high versus low-mid vowels, given that the F1 value is typically what separates a high-mid vowel from a low-mid vowel. It is interesting to note that the highest F1 values, and therefore, lowest mid vowels, are those participants in frequent, or 'high', contact with Quechua. The opposite is true for those in 'low' contact with Quechua throughout the program.
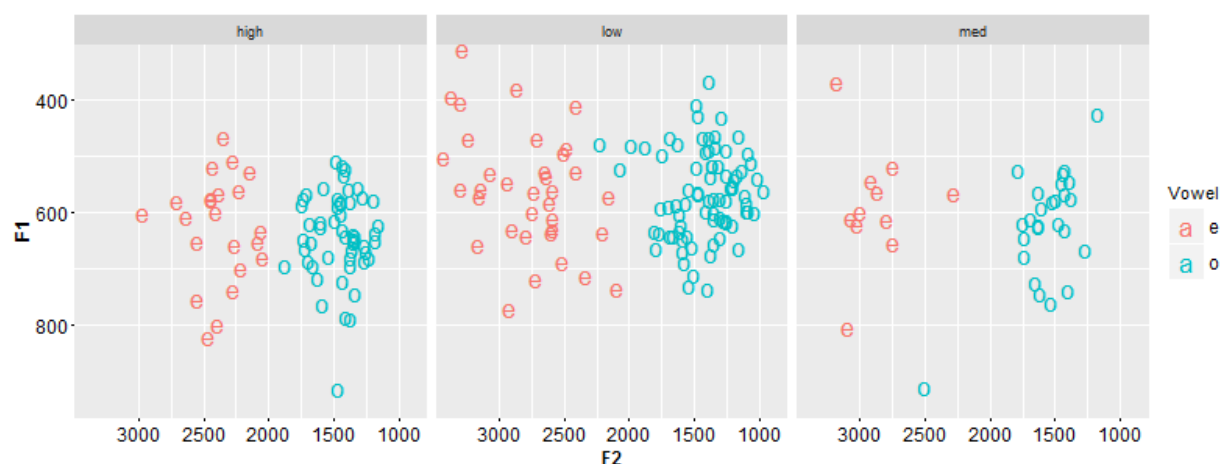

Figure 21. Experimental Mid Vowels across Quechua Contact

---

[9] Notice that 'high' Quechua Contact is on the left, 'low' is in the middle, and 'medium' is on the right.

Table 59. Mid Vowel Formant Values across Quechua Language Contact						
	[ɛ]			[ɔ]		
	low	**medium**	**high**	**low**	**medium**	**high**
F1	581	608	650	585	640	660
F2	2710	2818	2313	1358	1505	1390

English Language Contact. The same method described in the previous sub-section was used in distinguishing 'high', 'medium', and 'low' categories for English and Spanish contact. Distribution of the English contact hours was even across the participant group—two were in contact with English a low amount, two a medium amount, and two a high amount. All four of the formant-vowel combinations were significant across English contact according to one-way ANOVA tests (F1 [ɛ], T = 9.5×10^{-3}; F2 [ɛ], T = 1.1×10^{-5}; F1 [ɔ], T = 0.002; F1 [ɔ], T = 2.7×10^{-6}; F2 [ɔ], T = 7.6×10^{-8}). For [ɔ], the results of the English contact predictor are the same as those found in amount of Quechua contact, though the actual values are slightly different, with the addition of F1 of [ɛ] being significant for English contact. The 'medium' participants have a lower F1 value for [ɛ] than the 'low' participants. Though we would expect those participants that have more contact with Quechua to produce more Quechua-like vowels, we would suspect that the opposite would be true of those participants with high English contact. I will explore this idea in Chapter 6.

Figure 22. Experimental Mid Vowels across English Contact

Table 60. Mid Vowel Formant Values across English Language Contact						
	[ɛ]			[ɔ]		
	low	**medium**	**high**	**low**	**medium**	**high**
F1	623	555	647	594	605	660
F2	2730	2741	2313	1282	1510	1390

Spanish Language Contact. There is, however, a different pattern that emerges according to Spanish language contact. Though the F1 value of [ɛ] is not significant across Spanish contact ($p = 0.057$) the remaining three—F2 [ɛ], F1 [ɔ], F2 [ɔ]—are significant ($p = 1.6 \times 10^{-4}$, $p = 1.8 \times 10^{-8}$ and $p = 0.044$ respectively). The three 'low' participants have the highest F1 values for [ɔ] and lowest F2 values for [ɔ], meaning their production of [ɔ] is more Quechua-like than those who report a high or medium amount of contact with Spanish throughout the program. Those participants that are in contact with Spanish a 'high' amount produce the lowest F2 value for [ɛ], and those in contact a medium amount produce the highest F2 value.

Figure 23. Experimental Mid Vowels across Spanish Contact

Table 61. Mid Vowel Formant Values across Spanish Language Contact						
	[ɛ]			[ɔ]		
	low	**medium**	**high**	**low**	**medium**	**high**
F1	638	569	594	648	603	630
F2	2626	2738	2212	1411	1465	1460

Though the results for [ɔ] match what one would hypothesize, i.e. low contact with Spanish correlated with a more Quechua-like production, it is unclear why the same pattern does not

follow for [ɛ]. All results will be discussed in light of the research questions in the chapter that

follows.

CHAPTER 6

CONCLUSIONS AND DISCUSSION

In this chapter I will first discuss the results from the previous chapter, followed by the limitations of the study, and will then conclude with final remarks.

6.1. Discussion of Results. The discussion of results will be organized according to the research questions presented in Chapter 4.

1. Is phonetic transfer in Quechua vowel production more likely to come from the L1 English or the L2 Spanish in the initial stages, when learners have had no contact with Quechua? After 7 weeks of Quechua input?

For all of the participants, at both the initial stages and interlanguage stages, the L2 Spanish seems to be the source of transfer. My hypothesis was that at the initial stages, English will transfer but Spanish will transfer in the developmental states. This is somewhat corroborated given that all but one participant became more Spanish-like in their production of mid vowels over the seven week period and some participants, namely Participant 1, started out with mid vowel formants that resembled a mixture of English low-mid vowels and Spanish high-mid vowels that changed to become reflective of a Spanish high-mid vowel at T2.

There may be an orthography effect at play in the results. The Task 2 materials employed the five-vowel written system, which may have primed Spanish when learners read these passages out loud. In Spanish, each of the five vowels represents a distinct and consistent sound. In English this is not the case. For example, an orthographic 'o' in English can be realized as /o, ɔ, ə/, while in Spanish it is realized only as /o/. Learners may be associating the same Spanish

vowel one-to-one production-orthography relationship with Quechua, especially given that the beginner participants had been given resources in their class which contained only the three phonemic vowels, and may not have recognized the five-vowel distinction present in the study materials. Nevertheless, even after seven weeks of intensive Quechua, it is unlikely that learners will be aware of the phonetic intricacies that accompany mid vowel production linked with a uvular consonant. In fact, perhaps the learners are failing to produce the uvular consonant with native-like accuracy, which could be coarticulatorily related to mid vowel production. This will be discussed in greater detail in responding to research question 4.

The generative L3 acquisition model that fits these results is ambiguous due to the lack of a mirror-image group. However the Absolute L1 Transfer model and Cumulative Enhancement Model (CEM) are two that definitely do not fit the data. The former because the source of transfer seems to be the L2 and the latter because there is negative transfer in the data, i.e. vowel formant values that resemble high-mid vowels more than low-mid vowels. The L2 Status Factor and Pyschotypological Proximity Model both fit the data. The L2, also the language most likely to be psychotypologically related to the L3, seems to be the preferred transfer source. My prediction is that the data from a hypothetical mirror-image study would find that Spanish is the source of transfer for L1 Spanish-L2 English speakers as well due to recency and social environment. Both recency and environment are inextricably linked in the context of the present study. Spanish is the most recent language for all participants because of the social environment of Cusco, Peru. Half of all participants lived with a host family with whom the participants indubitably spoke mostly Spanish. Gupton (p.c.) suggests that, for participants, it may subconsciously seem like transferring from English in an environment dominated by Spanish and Quechua clashes with their natural inclination to use the language that seems most facilitative of

the communicative context. I agree that the Psychotypological Primacy Model not only offers a more nuanced response to the results of the present study but also fits the data in light of the social context that surrounded all participants during the course of the study abroad program. Again, no single model can be said to describe the data without results from a mirror-image participant group.

2. Do students tend to become more target-like in their pronunciation of Quechua vowels given increased exposure to the language?

Most participants became more Quechua-like according to the F2; mid vowels were more backed at T2 than at T1, especially [ɔ]. However, most all became more Spanish-like according to the height of the vowel, that is, the formant values resembled a Spanish high-mid vowel more at the end than at the beginning. In the initial state and interlanguage stages, Spanish seems to be the source of transfer, though it becomes even more preferred over time. This makes one wonder if perhaps a study abroad context in which two languages with greatly different origins are seen as culturally, and maybe even politically, linked may not be the environment most advantageous to forming native-like Quechua pronunciation.

My hypothesis was that participants are more likely to lose their foreign accent over time; however, phonologic intricacies are a difficult component of language to acquire, especially in adults, so this improvement may not be seen over a seven-week study abroad period (Baker et al. 2008). The results suggest that overcoming the 'foreign language effect' is difficult to surmount even when the L1 is the more economic source. A curiosity of the results is that, the participants that do produce vowels with an F1 value that seem to be a combination of both an English low-mid vowel and a Spanish high-mid vowel, and thus more Quechua-like, only do so for the front mid vowel, [ɛ]. This may be because in English orthography, the letter 'e' is pronounced /ɛ/ more

often than /e/, and the letter 'o' is mostly pronounced /o/ instead of /ɔ/. For example the first 'e' in 'bet', 'letter', and the second 'e' in 'perception' are all pronounced /ɛ/, while the tonic vowel in 'bait' and 'gate' is /e/. The tonic 'o' in 'over', 'produce', and 'low' are all pronounced /o/, while the tonic vowel in 'caught' and 'bought' are pronounced /ɔ/. In other words, an orthographic 'e' corresponds with /ɛ/ while an orthographic 'o' corresponds with /o/. Perhaps the orthographic association with a certain pronunciation in the mind of an English speaker is at the root of the difference in production and perception of the Quechua front and back mid vowels.

3. Is there a difference in the source of transfer between pronunciation and perception?

Because there is literature that suggests that perception often precedes production, my hypothesis was that the participants perceive most vowels as low-mid vowels, even if their production resembles high-mid vowels. However, the majority of the participants selected the low-mid vowel for less than half of the target vowels at T1 and even less so at T2. However, there was not a significant difference between perception at T1 and T2, which may indicate that perception is not subject to change. Overall, participants selected the low-mid vowel for 43% of the target vowels at T1 and 45% at T2. For [ɛ], participants selected the low-mid vowel for 77% of the target vowels at T1 and 67% at T2; and for [ɔ] only 8% at T1 and 23% at T2. Most participants were more likely to perceive the front mid vowel as a low-mid vowel. This may be because an English /ɔ/ usually has a higher F1 value than an English /ɛ/, the Quechua mid vowel values for the third task often fall between an English speakers' high and low-mid vowel for the Quechua back mid vowel, [ɔ], but are similar to an English low-mid vowel for the Quechua front mid vowel, [ɛ].

4. What linguistic and extralinguistic variables condition the production of Quechua vowels?

The significant linguistic variables for the experimental group are uvular type, position with respect to the uvular consonant, stress, and syllable type. The only factors significant for the control group were uvular type, for which only the F2 values of each vowel were significant, and stress, for which only F1 and F2 of [ɛ] was significant. In regard to uvular type, for the back mid vowel of the control group, the ejective uvular was correlated the most backed vowel and the aspirate mode correlated with the most backed front mid vowel. The experimental groups' F1 and F2 values for both vowels was significant for uvular type. Like the native group, the ejective consonant was correlated with the most backed [ɔ], but the most backed front vowel was correlated with a fricative uvular.[10] Stress was significant in the control group only for [ɛ]—a tonic vowel was more fronted and higher. As mentioned earlier, this may be because tonic vowels are usually tenser due to a shorter duration and a change in tone (Guitart 2004). In the Task 2 readings, there were no tonic [ɛ] vowels, so there is no comparison to be made between the two groups. Though the linguistic predictors stress and uvular type are significant for the participant group, predictors are not correlated with the mid vowel formant values in the same way for the learners as they are for native Quechua-Spanish bilinguals. This may suggest that at the initial state and development stages, participants are not attuned to the linguistic intricacies correlated with Quechua mid vowel production. However, Baker (p.c.) suggests that speakers' production of Quechua mid vowels in light of the aforementioned linguistic predictors is not consciously controlled, rather that mid vowel production is a matter of coarticulation. That is, Quechua acquirers may become more native-like in the production of these vowels over time according to the significant predictors of the control group, but this change will not be deliberate, rather an articulatorily natural process. This means that same linguistic trends that the control

---

[10] There were no aspirated uvulars in Task 2.

group exhibit in their speech will not apply to Quechua learners until they have reached a native-like pronunciation proficiency level, which is not expected of the participants after seven-weeks of Quechua instruction, especially because most are beginners.

Regarding the extralinguistic variables, eight of the ten predictors analyzed—academic status, motivation, multilinguistic competence, Spanish pronunciation, Quechua proficiency Quechua language contact, English language contact, and Spanish language contact—were significant for at least one formant value-mid vowel combination. Though the overall data suggest that Spanish is the main source of transfer, the data also suggest that some predictors are correlated with a more Quechua-like vowel, that is, a low-mid vowel, while others are correlated with a Spanish-like vowel, or a high-mid vowel. Academic status, may have been significant due to the low number of participants given that there is no pattern consistent across both vowels in the data according to whether the participant was at the Bachelor, Masters or Ph.D level. Motivation, on the other hand, did produce a clear pattern— those who were motivated by external factors produced mid vowels with a lower F1 and higher F2 mid vowel than those motivated by academic or social reasons. In other words, externally motivated participants produce more Spanish-like mid vowels. Perhaps those who are not motivated to learn the language for more internal reasons are less interested in perfecting certain components of the language, namely pronunciation. Those who are motivated by social communication and/or receiving a high mark may be more likely to evaluate the phonetic nuances of the language and apply them to their own speech than one who seeks to add Quechua proficiency to a résumé or is funded by a government stipend. Regardless of the reason why a difference exists between internal and external motivation, there is a significant difference that hinges on motivation, which is stated, but not statistically analyzed in past studies (Lafford 2006). In analyzing L2

proficiency, we find that suppositions by Bardel & Falk (2007) are corroborated. That is, when

L2 proficiency is low, the L1 may override the L2 in transfer, which is seen in the high F1 values

of [ɛ] for those whose pronunciation of Spanish falls in the relative 'low' category. In the results,

Spanish pronunciation is significant—those who have not yet developed a native-like Spanish

pronunciation are more likely to produce a more English-like low-mid vowel than a Spanish-like

high-mid vowel. The level of Quechua proficiency produces results opposite of what is

hypothesized—intermediate participants produce more Spanish-like mid vowels than beginner

participants. However, this may be because the intermediate participants are also the two

participants with the highest Spanish pronunciation proficiency rating, meaning that the L2 is

more likely to be the source of transfer, in line with the fact that Spanish mid vowels are higher

and more fronted than those of Quechua. Metalinguistic competence, also cited in L3 acquisition

studies as a predictor that distinguishes L3 acquisition from L2 acquisition, (García and Rothman

2012) is significant only for the F2 value of [ɔ], which is more backed for those with competence

in multiple languages besides English, Spanish and Quechua. However, with a larger participant

group, it is likely that metalinguistic competence would not be significant at all, given that it is

only significant for one of the four mid vowel/formant value combinations. This is surprising

given that some researchers argue that L2 acquisition and L3/Ln acquisition should be

considered separate areas of research given L3/Ln learners, citing a higher level of metalinguistic

competence among the participants as a main reason for this division (Cabrelli Amaro et al.

2013). Language contact with the three languages spoken by the participants were only analyzed

at T2, since analysis of this variable depended on how much contact the participant had with

each language over the course of the program. English and Quechua showed similar trends,

which may be attributed to some participants naturally being more conversational overall than

others. This would explain why the Quechua language contact and English language contact results are nearly identical—that is, the same participants that indicate being in contact with Quechua a 'high' amount during the program also indicate 'high' contact with English. Though the Spanish results are more in line with what was expected—those with 'low' Spanish contact produce vowels more like low-mid vowels, possibly because they are investing their time in writing, reading, listening to, and speaking Quechua, instead of Spanish. Because so many of the extralinguistic predictors are significant, we can assume that what occurs in Quechua mid vowel acquisition is much more complex than simply determining the source of transfer.

6.2. *Limitations.* As with all third language acquisition studies, one limitation of the current study is participant group size. There are very few native English speakers who are learning Quechua given that many universities and colleges in the U.S. do not offer this language. Those institutions that do offer Quechua suffer from low enrollment rates, as students are more interested in Commonly Taught Languages that may be more useful for popular majors like business or economics. Thus, in order to find a sample big enough to analyze, travel may be required, and researchers often do not have the resources required to travel to far away locations like Peru or Ecuador.

Another limitation of this study is that there is no mirror-image group, that is, no Spanish L1-English L2 participants learning Quechua as a L3. The lack of a mirror-image group means I am not able to make meaningful conclusions about the transfer source. Though the case study results point to Spanish, the L2 may be privileged in this study for a couple of reasons. First, the L2 status factor may apply to matters of phonetics and phonology, meaning there is indeed a foreign language effect at the initial state regardless of recency, proficiency, typology or psychotypology. Second, the participants may perceive a smaller distance between Spanish and

Quechua possibly due to the large number of borrowed Spanish words in Quechua, similar vocalic inventories that each contain five vowels, or the Quechua-Spanish environment of Cusco, Peru. If the hypothetical mirror-image group did indeed transfer from Spanish, we would conclude that the participants view Quechua as typologically more distant from English than Spanish. However, if the transfer source of the mirror-image group were clearly English, we would conclude that the L2 Status Factor does apply to pronunciation. It would also be interesting to compare the study abroad participant group with an at-home participant group to determine if the presence of both Spanish and Quechua in the study abroad environment is what facilitates Spanish transfer. An at-home group of L1 English would not be exposed to the same surroundings as those in the study abroad group, e.g. marketplaces in which both Spanish and Quechua are used interchangeably. Students in an at-home group may not associate Spanish and Quechua like the study abroad learners may be doing.

Another limitation of the study is that the participants are enrolled in the Quechua program for only seven weeks and very few of them change much in their vowel production over the course of the program. Perhaps if these students were given more explicit pronunciation instruction, there might be more difference between T1 and T2, which was not selected as a significant predictor according to t-tests. But, as a student of the program myself, I can attest to a program focused heavily on vocabulary, communication, and comprehension, with the heaviest focus on grammar. Morin (2007) describes pronunciation instruction as a 'neglected' topic in foreign language learning, which Pennington (1998) attributes to an attitude that instructors cannot effectively change pronunciation, thinking that attempting to sound native is somehow offensive to the native speakers and, the trend toward a more communicative approach.

6.3. Final Remarks. In conclusion, though Spanish seems to be the main source of transfer for both the initial stages and the interlanguage stages, the linguistic and extralinguistic predictors analyzed indicate that some factor levels are correlated with a vowel resembling a low-mid vowel while others are correlated with a more high-mid-like vowel. Future studies in L3 phonetics and phonlogy are required to expand the current small body of literature and determine if it behaves the same way as morphosyntactic phenomena. Because there are very few studies about Quechua phonetics and phonology, more L3 Quechua acquisition studies using a native control group can also contribute to the few articles dedicated to acoustically describing the segmental and suprasegmental features of Quechua. Futures studies should be structured with a mirror-image experimental group that will ultimately act as a control for the L1 English-L2 Spanish experimental group and vice versa. Studies that focus on the mode of instruction of the Lesser Taught Languages like Quechua, e.g. study abroad versus at-home, will aid government programs like FLAS (Foreign Language Area Studies) in understanding the effectiveness of these funded programs and classes. Overall, research devoted to L3 acquisition and Quechua are in short supply, but are necessary in order to fill in knowledge gaps that are beginning to surface as both of these subjects become more relevant in a multilingual, globalized world.

REFERENCES

Bardel, Camilla and Ylva Falk. 2012. The L2 status factor and the declarative/procedural distinction. *Third Language Acquisition in Adulthood*, ed. Jennifer Cabrelli Amaro, Suzanne Flynn & Jason Rothman, 61-78. Philadephia, PA: John Benjamins Publishing Company.

Baker, Wendy; Pavel Trofimovich; James E Flege; Molly Mack and Randall Halter. 2008. *Child-Adult differences in second-language phonological learning: The role of cross-language similarity.* Language and Speech. 51(4). 317-342.

Bardel, Camilla and Ylva Falk. 2007. The role of the second language in third language acquisition: The case of Germanic syntax. *Second Langauge Research*. 23. 459-484.

Boersma, Paul (2001). Praat, a system for doing phonetics by computer. *Glot International* 5(9/10). 341-345.

Cabrelli Amaro, Jennifer. 2012. L3 phonology: An understudied domain. *Third Language Acquisition in Adulthood*, ed. Jennifer Cabrelli Amaro, Suzanne Flynn & Jason Rothman, 33-60. Philadephia, PA: John Benjamins Publishing Company.

Cabrelli Amaro, Jennifer. 2013. Methodological Issues in L3 Phonology. *Studies in Hispanic and Lusophone Linguistics.* 6(1). 101-117.

Cabrelli Amaro, Jennifer and Jason Rothman. 2010. On L3 acquisition and phonological permeability: A new test case for debates on the mental representation of non-native phonological systems. *International Review of Applied Linguistics.* 48. 275-296.

Cabrelli Amaro, Jennifer; Suzanne Flynn and Jason Rothman, 2013. *Third Language Acquisition in Adulthood*. Philadelphia, PA: John Benjamins Publishing Company.

Carvalho, Ana María and Antonio José Bacelar da Silva. 2006. Cross-Linguistic influence in third language acquisition: The case of Spanish-English bilinguals' acquisition of Portuguese. *Foreign Language Annals.* 39(2). 185-202.

Cenoz, Jasone. 2003. The additive effect of bilingualism on third language acquisition: A review. *International Journal of Bilingualism.* 7(1). 71-87.

Cerrón-Palomino, Rodolfo. 1994. *Quechumara: Estructuras paralelas de las lenguas quechua y aimara.* Cuadros de investigación. La Paz, Bolivia: Centro de Investigación y Promoción del Campesinado. 42.

Cerrón-Palomino, Rodolfo. 2015. Personal Correspondence. University of Georiga.

Di Paolo, Marianna and Malcah Yaeger-Dror (eds.). 2011. *Sociophonetics: A student's guide.* Routledge: New York, New York.

Díaz-Campos, Manuel. 2004. Context of Learning in the Acquisition of Spanish Second Language Phonology. *Studies in Second Language Acquisition.* 26. 249-273.

Falk, Ylva and Camilla Bardel. 2011. Object pronouns in German L3 syntax: Evidence for the L2 status factor. *Second Language Research.* 27(1). 59-82.

Flege, James Emil; Ian R. A. MacKay and Diane Meador. 1999. Native Italian speakers' perception and production of English vowels. *Journal of the Acoustical Society of America.* 106(5). 2973-2987.

Freed, Barbara F.; Dan P. Dewey; Norman Segalowitz and Randall Halter. 2004. The Language Contact Profile. *Studies in Second Language Acquisition.* 26(2). 349-356.

Fridland, Valerie. 2012. Rebel Vowels: How Vowel Shift Patterns are Reshaping Speech in the Modern South. *Language and Linguistics*. 6(3). 182-192.

García Mayo, María and Jason Rothman. 2012. L3 morphosyntax in the generative tradition: The initial stages and beyond. *Third Language Acquisition in Adulthood*, ed. Jennifer Cabrelli Amaro, Suzanne Flynn & Jason Rothman, 61-78. Philadelphia, PA: John Benjamins Publishing Company.

Guitart, Jorge. M. 2004. *Sonido y sentido: Teoría y práctica de la pronunciación del español contemporáneo con audio CD.* Washington, D.C: Georgetown University Press.

Gut, U. 2010. Cross-linguistic influence in L3 phonological acquisition. *International Journal of Multilingualism*. 7(1). 19-38.

Herold, Ruth. 1997. Solving the Actuation Problem: Merger and Immigration in Eastern Pennsylvannia. *Language Variation and Change*. 9(2). 165-189.

Hillenbrand, James; Laura A. Getty, Michael J. Clark, and Kimberlee Wheeler. 1995. Acoustic characteristics of American English vowels. *The Journal of the Acoustical Society of America.* 97:5, Part 1. 3099-3111.

Howard, Rosaleen. 2013. *Kawsay vida: A multimedia Quechua course for beginners and beyond.* Austin, Texas: University of Texas Press.

Hunefeldt, Christine. 2004. *A brief history of Peru*. Checkmark Books: New York, NY. 12-50.

Kees, de Bot. 2012. Rethinking multilingual processing: From a static to a dynamic approach. In *Third Language Acquisition in Adulthood*, ed. Jennifer Cabrelli Amaro, Suzanne Flynn & Jason Rothman, 79-95. Philadelphia, PA: John Benjamins Publishing Company.

Klee, Carol and Andrew Lynch. 2006. *El español en contacto con otras lenguas.* Georgetown University Press. 113-168.

Kulundary, Valeria and Alison Gabriele. 2012. Examining the role of L2 syntactic development in L3 acquisition: A look at relative clauses. *Third Language Acquisition in Adulthood*, ed. Jennifer Cabrelli Amaro, Suzanne Flynn & Jason Rothman, 195-223. Philadelphia, PA: John Benjamins Publishing Company.

Ladefoged, Peter. 2007. *A course in phonetics.* Belmont, CA: Thomson/Wadsworth Publishers.

Lafford, Barbara A. 2006. The effects of study abroad vs. classroom contexts on Spanish SLA: Old assumptions, new insights and future research directions. In *Selected Proceedings of the 7th Conference on the Acquisition of Spanish and Portuguese as First and Second Languages*, ed. Carol A. Klee and Timothy L. Face, 1-25. Somerville, MA: Cascadilla Proceedings Project.

Language Samples Project, eds. 2001. "Sounds of Standard American English." *Varieties of English*. http://ic-migration.webhost.uits.arizona.edu/.

Lipski, John M. 1994. *Latin American Spanish*, ed. Barbara A. Lafford. New York: Longman Group Limited.

Lipski, John M. 2015. Colliding vowel systems in Andean Spanish: Carryovers and emergent properties. *Linguistic Approaches to Bilingualism.* 5(1). 91-121.

Llanes, Ángels and Carmen Muñoz. 2009. A short stay abroad: Does it make a difference? *System.* 37. 353-365.

Mora, Joan C. 2005. Learning context effects on the perception of phonemic contrasts by bilingual Spanish/Catalan Learners of English. Paper presented at *the 23rd AESLA Applied Linguistics Congress.* 1-14. Palma de Mallorca, Spain.

Morin, R. 2007. A Neglected aspect of the standards: Preparing foreign language Spanish teachers to teach pronunciation. *Foreign Language Annals, 40*(2), 342-360.

Morris, Craig and Adriana Von Hagen. 2011. *The Incas: Lords of the four quarters.* New York, New York: Thames & Hudson. 12-19

Ocampo, Francisco A. and Carol A. Klee. 1995. Spanish OV/VO word-order variation in Spanish-Quechua bilingual speakers. *Spanish in contact with other languages.* 71-82. Washington, D.C.: Georgetown University Press.

O'Rourke, Erin. 2010. Dialect Differences and the Bilingual Vowel Space in Peruvian Spanish. *Selected Proceedings of the 4th Conference on Laboratory Approaches to Spanish Phonology,* ed. Marta Ortega-Llebaria, 20-30. Somerville, MA: Cascadilla Proceedings Project.

Pasquale, Michael. 2009. Phonological variation in Peruvian Quechua speech community. In *Variation in Minority Languages,* ed. James N. Stanford and Dennis R Preston. 245-258. Philadelphia, PA: John Benjamins Publishing Company.

Patihis, Lawrence; Janet S. Oh and Tayopa Mogilner. 2015. Phoneme discrimination of an unrelated language: Evidence for a narrow transfer but not a broad-based bilingual advantage. *International Journal of Bilingualism.* 19(1). 3-16.

Pennington, Marcia C. 1998. The teachability of phonology in adulthood: A re-examination. *International Review of Applied Linguistics in Language Teaching.* 36(4). 323-341.

Penny, Ralph. 2000. *Variation and change in Spanish.* Cambridge, UK: Cambridge University Press.

Real Academia Española. 2011. *Nueva gramática de la lengua española: Fonética y fonología.* Madrid: Espasa Libros.

Rothman, Jason; Jennifer Cabrelli Amaro and Kees de Bot. 2013. Third language acquisition. *The Cambridge Handbook of Second Language Acquisition.* 372-393.

Sagasta, M. P. 2001. *La producción escrita en euskara, castellano e inglés en el model D y el el modelo de inmersión*. Leioa: Universidad del País Vasco.

Segalowitz, Norman; Barbara Freed; Joe Collentine; Barbara Lafford; Nicole Lazar; Manuel Diaz-Campos. 2004. A comparison of Spanish second language acquisition in two different learning contexts: Study abroad and the domestic classroom. *Interdisciplinary Journal of Study Abroad*. 1-18.

Thomas, Erik R. and Tyler Kendall. 2007. The Vowel Normalization and Plotting Suite: NORM. *lingtools.uoregon.edu.* University of Oregon.

Tremblay, M.C. 2007. L2 influence on L3 pronunciation: Native-like VOT in the L3 Japanese of English-French bilinguals. Paper presented at the L3 Phonology Satellite Workshop of ICPhS XVI, Freiburg, Germany.

Whitley, M. S. 2002. *A course in Spanish Linguistics: Spanish/English Contrasts*. Washington DC: Georgetown University Press.

Wrembel, Magdalena. 2012. Foreign accentedness in third language acquisition: The case of L3 English. *Third Language Acquisition in Adulthood*, ed. Jennifer Cabrelli Amaro, Suzanne Flynn & Jason Rothman, 61-78. Philadelphia, PA: John Benjamins Publishing Company.

APPENDICES

Appendix A

Background Questionnaire

Date: _____   Participant:_____

Background Questionnaire

1. Sex (Please circle one of the following options that best describes you.)
    a. Male   b. Female

2. Level of Education (Please circle one of the following options that best describes you.)
    a. High school diploma   d. Seeking Master's degree
    b. Some college, seeking   e. Completed Master's degree
       Bachelor's degree   f. Seeking Ph.d
    c. Completed Bachelor's degree   g. Complete Ph.d

3. Please indicate your **academic major (and minor)** by writing it on the line below.
   _____

4. What other languages do you speak? On a scale from 1 to 7, please indicate your spoken proficiency in each language, where 1 denotes a low proficiency and 7 denotes native proficiency.

<center>Spoken Proficiency</center>

Language	Low						High
_____	1	2	3	4	5	6	7
_____	1	2	3	4	5	6	7
_____	1	2	3	4	5	6	7
_____	1	2	3	4	5	6	7

5. Indicate your motivation to participate in the seven week intensive Quechua program by ranking the following options from 1-8. 1 indicates this was the most important motivator, 8 indicates this was the least important motivator.
    a. Travel experience _____   e. Visit friend/family _____
    b. Monetary compensation _____   f. Resume/Career _____
    c. Academic interests _____   g. Develop new perspective ___
    d. Course credit _____   h. Independence _____

When you have finished with the survey, please raise your hand and the researcher give you instructions for the next portion of the survey.

    beat, bit, bait, bet, bat, boot, foot, boat, bought, clock

Appendix B

Spanish Proficiency Test

Name: _____

Instructions: Please read the story below about a Hispanic female college student and select the answer that best completes each sentence.

Creo que es muy interesante _____ de los hábitos alimenticios de la gente. Yo, por mi parte,

- ☐ hablo
- ☐ hablar
- ☑ hablando

_____ vegetariana. Cuando voy a eventos sociales, como por ejemplo fiestas, bodas o bailes,

☐ soy
☐ estoy
☐ tengo

espero que _____ comida vegetariana allí. Algunas personas dicen que _____ representa un

- ☐ hay
- ☐ haya
- ☐ sea

- ☐ le
- ☐ los
- ☐ les

inconveniente proveer _____, pero yo creo que no _____ que ser así. De hecho, la comida

- ☐ lo
- ☐ la
- ☐ le

- ☐ tiene
- ☐ tenga
- ☐ tengo

vegetariana es muy fácil _____ preparar. Y cuando no _____ ofrece, puede ser _____ gran

- ☐ en
- ☐ a
- ☐ de

- ☐ la
- ☐ le
- ☐ se

- ☐ un
- ☐ una
- ☐ el

problema. Yo recuerdo una vez que _____ a una fiesta de cumpleaños y _____ ser todo un

- ☐ fui
- ☐ iba
- ☐ voy

- ☐ resultó
- ☐ resultaba
- ☐ resulté

desastre. La fiesta _____ en la casa de un amigo, y él había invitado a mucha gente. Me

- ☐ estaba
- ☐ era
- ☐ fue

Proficiency Test

sorprendió porque _____ ser un estudiante de postgrado con poco dinero, _____ una gran

☐ entre   ☐ tuvo
☐ por   ☐ tenía
☐ para   ☐ tuviera

variedad de comida para los invitados. Yo creo que si me _____ tocado a mí dar la fiesta, no

☐ hubiera
☐ habría
☐ había

_____ dado ni la mitad de lo que _____ allí. Pero pronto me _____ cuenta que él no había

☐ hubiera   ☐ era   ☐ doy
☐ habría   ☐ había   ☐ daba
☐ había   ☐ hubiera   ☐ di

preparado nada vegetariano. Yo no pongo problemas por ese tipo de cosas, pero una amiga

_____ sí _____ hace. _____ a quejarse en frente de todo el mundo, mientras el anfitrión

☐ mía   ☐ le   ☐ Empezó
☐ mi   ☐ se   ☐ Empezaba
☐ de mí   ☐ lo   ☐ Empezado

sólo _____ la escena con _____ boca abierta. Yo le dije a mi amiga que _____ de causar tanto

☐ miró   ☐ su   ☐ dejaba
☐ miraba   ☐ una   ☐ deje
☐ miraría   ☐ la   ☐ dejara

escándalo, pero no me puso atención. Por fin, el anfitrión dijo: "La próxima vez que tenga una

fiesta, _____ algo vegetariano." Yo le dije después a mi amiga: "Mejor tarde que nunca, ¿no?"

☐ prepararé
☐ prepararía
☐ preparara

Appendix C

Native Speaker Judgment

JUDGE: _____

PARTICIPANT: _____

Rate the participant's performance on a six point scale by circling the number that best fits the participant.

Overall degree of foreign accent (1= very foreign, 6 = native-like)

1   2   3   4   5   6

Intelligibility of the speaker (1 = not at all intelligible, 6 = completely intelligible)

1   2   3   4   5   6

Acceptableness of accent (1 = the participant's accent is very irritating, 6 = the participant's accent is completely acceptable)

1   2   3   4   5   6

Degree of certainty of your foreign accent judgement (1 = I am not at all certain of my judgement, 6 = I am very certain of my judgment)

1   2   3   4   5   6

Spoken Spanish proficiency (1 = very low proficiency, 6 = native-like proficiency)

1   2   3   4   5   6

Appendix D

Language Contact Survey

Post-study abroad background questionnaire (adapted from Freed et al. 2004)

Name: _____

1. Did you live with a host family? If so, describe your living arrangements with your host family:
> a. List the members of the family (e.g., mother, father, one 4-year-old daughter, one 13-year-old son)
> _____
> b. Did they speak English? ☐Yes ☐ No
> c. Were there other nonnative speakers of Quechua living with your host family? ☐ Yes ☐ No

2. If you did not live with a host family, where did you live? _____
> a. Who else lived with you? (students, etc.) _____
> b. Did they speak English? ☐Yes ☐ No
> c. Were there other nonnative speakers of Quechua living with you? ☐ Yes ☐ No

3. On average, how much time did you spend speaking, in Quechua, outside of class with native or fluent Quechua speakers during this summer?
> Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
> On those days, typically how many hours per day?
> ☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5

4. This summer, outside of class, I spoke Quechua to:
> a. my instructor
> Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
> On those days, typically how many hours per day?
> ☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5
>
> b. friends who are native or fluent Quechua speakers
> Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
> On those days, typically how many hours per day?
> ☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5
>
> c. classmates
> Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
> On those days, typically how many hours per day?
> ☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5
>
> 3. strangers whom I thought could speak Quechua
> Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
> On those days, typically how many hours per day?

☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

e. a host family or my roommate
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

f. service personnel (waiters, waitresses, people who work in stores, etc.)
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

g. other; specify: _____
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

5. How often did you use Quechua outside the classroom for each of the following purposes?
     a. to clarify classroom-related work
     Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
     On those days, typically how many hours per day?
     ☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

     b. to obtain directions or information (e.g., "Where is the post office?", "What time is the train to . . . ?", "How much are stamps?")
     Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
     On those days, typically how many hours per day?
     ☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

     c. for superficial or brief exchanges (for example, greetings, "Please pass the salt," "I'm leaving," ordering in a restaurant) with my host family, roommate, or acquaintances
     Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
     On those days, typically how many hours per day?
     ☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

     d. extended conversations with my host family, roommate, friends, or other native speakers of English with whom you speak Spanish
     Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
     On those days, typically how many hours per day?
     ☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

6. How often did you try deliberately to use things you were taught in the classroom (grammar, vocabulary, expressions) with native or fluent speakers outside the classroom?
     Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
     On those days, typically how many hours per day?
     ☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

7. How often did you take things you learned outside of the classroom (grammar, vocabulary, expressions) back to class for question or discussion?

　　Typically, how many days per week? ☐0　☐1　☐2　☐3　☐4　☐5　☐6　☐7
　　On those days, typically how many hours per day?
　　☐0–1　☐1–2　☐2–3　☐3–4　☐4–5　☐more than 5

8. How much time did you spend doing the following each week?

　　a. speaking a language other than English or Spanish or Quechua to speakers of that language (e.g., Chinese with a Chinese-speaking friend)
　　Typically, how many days per week? ☐0　☐1　☐2　☐3　☐4　☐5　☐6　☐7
　　On those days, typically how many hours per day?
　　☐0–1　☐1–2　☐2–3　☐3–4　☐4–5　☐more than 5

　　b. speaking Quechua to native or fluent speakers of Quechua
　　Typically, how many days per week? ☐0　☐1　☐2　☐3　☐4　☐5　☐6　☐7
　　On those days, typically how many hours per day?
　　☐0–1　☐1–2　☐2–3　☐3–4　☐4–5　☐more than 5

　　c. speaking English to native or fluent speakers of Quechua
　　Typically, how many days per week? ☐0　☐1　☐2　☐3　☐4　☐5　☐6　☐7
　　On those days, typically how many hours per day?
　　☐0–1　☐1–2　☐2–3　☐3–4　☐4–5　☐more than 5

　　d. speaking Spanish to native or fluent speakers of Quechua
　　Typically, how many days per week? ☐0　☐1　☐2　☐3　☐4　☐5　☐6　☐7
　　On those days, typically how many hours per day?
　　☐0–1　☐1–2　☐2–3　☐3–4　☐4–5　☐more than 5

　　e. speaking Quechua to nonnative speakers of Quechua (for example, classmates)
　　Typically, how many days per week? ☐0　☐1　☐2　☐3　☐4　☐5　☐6　☐7
　　On those days, typically how many hours per day?
　　☐0–1　☐1–2　☐2–3　☐3–4　☐4–5　☐more than 5

　　f. speaking English to nonnative speakers of Quechua (for example, classmates)
　　Typically, how many days per week? ☐0　☐1　☐2　☐3　☐4　☐5　☐6　☐7
　　On those days, typically how many hours per day?
　　☐0–1　☐1–2　☐2–3　☐3–4　☐4–5　☐more than 5

　　g. speaking Spanish to nonnative speakers of Quechua (for example, classmates)
　　Typically, how many days per week? ☐0　☐1　☐2　☐3　☐4　☐5　☐6　☐7
　　On those days, typically how many hours per day?
　　☐0–1　☐1–2　☐2–3　☐3–4　☐4–5　☐more than 5

9. How much time did you spend doing each of the following activities outside of class?

　　a. overall, in reading in Quechua outside of class

Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

b. reading Quechua newspapers outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

c. reading novels in Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

d. reading Quechua language magazines outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

e. reading schedules, announcements, menus, and the like in Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

f. reading e-mail or Internet web pages in Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

g. overall, in listening to Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

h. listening to Quechua television and radio outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

i. listening to Quechua movies or videos outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

j. listening to Quechua songs outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7

On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

k. trying to catch other people's conversations in Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

l. overall, in writing in Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

m. writing homework assignments in Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

n. writing personal notes or letters in Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

o. writing e-mail in Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

p. filling in forms or questionnaires in Quechua outside of class
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

10. On average, how much time did you spend speaking in English outside of class during this summer?
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

11. How often did you do the following activities in **English** during your time abroad?
a. reading newspapers, magazines, or novels or watching movies, television, or videos
Typically, how many days per week? ☐0   ☐1   ☐2   ☐3   ☐4   ☐5   ☐6   ☐7
On those days, typically how many hours per day?
☐0–1   ☐1–2   ☐2–3   ☐3–4   ☐4–5   ☐more than 5

b. reading e-mail or Internet web pages in English

Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
On those days, typically how many hours per day?
☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5

c. writing e-mail in English
Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
On those days, typically how many hours per day?
☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5

d. writing personal notes and letters in English
Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
On those days, typically how many hours per day?
☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5

12. How often did you do the following activities in **Spanish** during your time abroad?
a. reading newspapers, magazines, or novels or watching movies, television, or videos
Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
On those days, typically how many hours per day?
☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5

b. reading e-mail or Internet web pages in Spanish
Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
On those days, typically how many hours per day?
☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5

c. writing e-mail in Spanish
Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
On those days, typically how many hours per day?
☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5

d. writing personal notes and letters in Spanish
Typically, how many days per week? ☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7
On those days, typically how many hours per day?
☐0–1 ☐1–2 ☐2–3 ☐3–4 ☐4–5 ☐more than 5

Appendix E

Task 1—Interview

1. What is your name?
   ¿Cómo se llama?
   Iman sutyki?
2. How are you today?
   ¿Cómo está usted hoy?
   Imaynalla kashanki?
3. Where are you from?
   ¿De dónde es usted?
   Maymanta kanki?
4. Where do you live?
   ¿Dónde vive?
   Maypi tiyanki?
5. How long have you lived there?
   ¿Por cuánto tiempo ha vivido allí?
   Hayk'a wataña chayllatapi tiyanki?
6. Do you go to school? Where do you go to school? What do you study in school?
   ¿Asiste la escuela? ¿Qué escuela asiste? ¿Qué estudia?
   Escuelata rinkichu? Ima escuelaman rinki? Ima yachakuyki?
7. Do you work? Where do you work? What kind of work do you do?
   ¿Trabaja? ¿Dónde trabaja? ¿En qué trabaja?
   Llank'ankichu? Maypi llank'anki? Imapi llank'anki?
8. What would you like to do in the future?
   ¿Qué quiere hacer en el futuro?
   Imataq ruwayta munawaqrí?
9. What did you like to do when you were a child?
   ¿Qué le gustaba hacer cuando era niño/a?
   Erqe kashaqtiyki, imata ruwayta munaq kanki?.
10. Talk about a particularly memorable event that happened to you in the recent or far-off past.
    Dime todo lo que puede de un evento memorable que le pasó en el pasado.
    Willarikuway ima sumaq yuyakusqaykita.

Appendix F

Task 2- Readings

Alqochamanta Willakuy

Ch'uskamantawan, Takachamantawan

Ch'uska, wasiyta allinta qhawanki. Suwataq hamunman, allinta kanikunki. Qanpas Takacha

paqochata allinta michiysiwanki. Kundortaq owijata qechuwasunman, nispa mamakuqa iskaynin

alqoman mijunata qaran. Mamaku, qhawarikuqtinsi wasin punkupi, iskay runa tiyashasqa. Chay

runakunaqa sonqon ukhullapis ninku: Kay mamakuqa askha kaqniyoqmá kasqa. Imatan

apasunman? Llamantachu, ichaq qolqentachu. Pikunachá, imatachá munankun nispa mamakupas

puñuq haykupusqa. Ch'isintas kay millay runakunaqa suwakuq haykunku, alqokunata

manchakuspas, aycha kankata alqokunamanqa qaraykunku. Suwakunaqa, alqokunaq kanka

mijunankukamas mamakuq puñusqanman haykunku. Maypin qolqe? Maypin qori? Nispa

mamakuta mancharichinku. Payañan kani, manan kallpay kanñachu. Imatapas ruwawaychis.

Ichaqa, tusurqosaqraq, takiyqosaqraq, nispa. Mamakuqa takiyta qhallaykun. Ch'uskachay,

Takachay. Alqokunaqa sutinkuta uyarispas phawaykamunku. Suwakunata kanispas yaqa

wañuchinku.

Tarukakunamanta Willakuy

Iskay salq'a tarukachakunas kuskalla maymanpas puriqku. Huk p'unchayñataqsi manan mijunata

tarispa huyay purikushasqaku. Challyamansi, huk llaqta taruka rijurimuspa kay hinata willarisqa.

Uray wayq'opi sumaqtaña chakrakuna llanllarishan, phawaychis! Ama yarqaymanta

wañuychischu, nispa. Tarukakunaqqa usqayllas mijuna maskaq urayamunku. Cheqaqtas, sumaq

q'omer pamparaq: sara, hawas, papa wiñayushasqa. Tarukakunaqqa chayta tarispas wiqsankuq

hunt'anankama mijuykunku saqsasqataqsi puñurqapusqaku. Hukninkaq tarukaq riqch'arinapaqsi

hatun karay puma sumaqllata muskhiykushasqa. Malliyuytañas munashasqa. Tarukachakunaqa riqch'arispankus wichayman, urayman cheqerinku. Pumaqqa manas mayqenintapas hap'iyta atinchu. Aswansi p'atakiskaman urmaykuspa wañupusqa.

Atoqmanta Willakuy

Asnaq simi atoqmanta

Huk'uchas atoqwan pananta tiyananta munasqa. Chaysi atoqtaqa wasin rinanpaq mink'akun. Chaypi pananwan reqsikunanpaq. Atoqqa kusisqa huk'uchaq wasinman chayaspa, huk'uchata napaykukun. Huk'uchapas napaykuspa nin:

--   Wayqey, simiyki millayta asnashan. Manachu maqllirqakamuwaq.

--   Ari wayqey, unuchata q'oñirqachinpuway, nispa atoqqa nin.

Huk'uchaqa unutas q'oñirqachin, unuqa t'impurunsi. Opa atoqqa mankallamantan siminman hich'aykukun. Chayqa, siminta unut'impuwan phusullurqachikuspa qhaparqachaykun. Mana chanintas, waqaykun. Huk'uchatas k'amiykun: saqra huk'ucha; suwa huk'ucha, nispa.

Appendix G

Task 3

Name: _____

Task 3- Student Participants

Each number corresponds to a Quechua word that will be played three times. When listening to
the word, pay close attention to the first syllable, also the stressed syllable, in each word. Pay
special attention to the vowel sound of this syllable. After the word has been repeated all three
times, identify which English vowel sound represented by each word option is most similar to
the Quechua vowel sound of the stressed syllable by circling the English word. If you are having
a hard time choosing an option, please do not leave the question blank rather choose the best
option. Before beginning the task, you will participate in five practice words. When you are
ready to continue on to the next word, please notify the researcher by raising your hand. When
you are ready to begin the practice round for this task, please notify the researcher by raising
your hand.

Practice:

1. boot   foot   boat   bought   but
2. beat   bit   bait   bet   bat
3. boot   foot   boat   bought   but
4. beat   bit   bait   bet   bat
5. but   clock   bought   bet   bat

1. but   clock   bought   bet   bat
2. beat   bit   bait   bet   bat
3. beat   bit   bait   bet   bat
4. boot   foot   boat   bought   but
5. beat   bit   bait   bet   bat
6. boot   foot   boat   bought   but
7. but   clock   bought   bet   bat
8. beat   bit   bait   bet   bat
9. boot   foot   boat   bought   but
10. but   clock   bought   bet   bat
11. boot   foot   boat   bought   but

12. beat	bit	bait	bet	bat
13. boot	foot	boat	bought	but
14. beat	bit	bait	bet	bat
15. beat	bit	bait	bet	bat
16. but	clock	bought	bet	bat
17. boot	foot	boat	bought	but
18. boot	foot	boat	bought	but
19. beat	bit	bait	bet	bat
20. boot	foot	boat	bought	but
21. beat	bit	bait	bet	bat
22. boot	foot	boat	bought	but
23. beat	bit	bait	bet	bat
24. boot	foot	boat	bought	but
25. boot	foot	boat	bought	but
26. beat	bit	bait	bet	bat
27. beat	bit	bait	bet	bat
28. beat	bit	bait	bet	bat
29. boot	foot	boat	bought	but
30. beat	bit	bait	bet	bat
31. beat	bit	bait	bet	bat
32. boot	foot	boat	bought	but
33. boot	foot	boat	bought	but
34. boot	foot	boat	bought	but
35. beat	bit	bait	bet	bat
36. boot	foot	boat	bought	but