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THE PERCEPTION AND PRODUCTION OF PORTUGUESE MID-VOWELS
BY NATIVE SPEAKERS OF AMERICAN ENGLISH

By

Richard R. Kendall

A thesis submitted to the faculty of

Brigham Young University

in partial fulfillment of the requirements for the degree of

Master of Arts

Department of Spanish and Portuguese

Brigham Young University

April 2004

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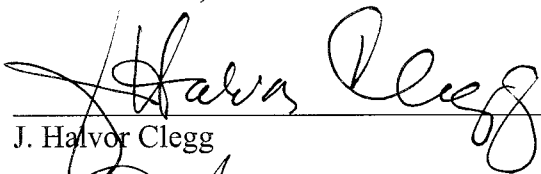
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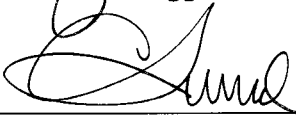
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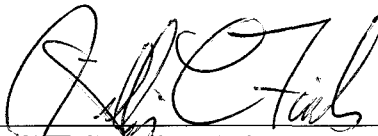
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ABSTRACT

THE PERCEPTION AND PRODUCTION OF PORTUGUESE MID-VOWELS BY NATIVE SPEAKERS OF AMERICAN ENGLISH

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Master of Arts

This thesis examines the difficulties that beginning and advanced American learners of Portuguese have correctly perceiving and producing the Portuguese mid-vowels / ϵ e ɔ o/. The beginning learners were enrolled in their second semester of Portuguese and had rudimentary knowledge of Portuguese. The advanced learners had all lived in Brazil for nearly two years and were enrolled in a more advanced Portuguese course.

To test for production, informants were asked to read a group of sentences that contained one hundred occurrences of the Portuguese mid-vowels. Each production occurrence was evaluated as being correct or incorrect by linguistically trained native Brazilians.

To test for perception, informants were evaluated on their ability to distinguish between the tokens (individual vowel sounds) [ϵ]/[e] and [ɔ]/[o] spoken in

context by native Brazilian speakers. These tokens used to test perception were recorded in a professional recording studio in Brazil.

The study found that beginning and advanced learners had difficulty perceiving and correctly producing the Portuguese mid-vowels. In the perception study, beginners scored 70% on the [ɔ]/[o] section and 68% on [ɛ]/[e] section, for a combined score of 69%. The advanced learners scored 78% on the [ɔ]/[o] section and 78% on [ɛ]/[e] section, for an average score of 78%.

In the production study, the advanced learners scored an average of 42% on the open vowels [ɔ] [ɛ] and 84% on the closed vowels [o] [e]. The beginners scored 23% on the open vowels and 97% on the closed vowels.

The most striking finding in the study was that advanced learners scored lower on the closed vowel [e] [o] production section than did the beginners. This was due to a hypercorrection phenomenon in the advanced learners. The advanced learners, once they learned that open vowels exist in Portuguese, seemed to produce them sporadically in their speech. They tended to open many vowels that should have been closed. Beginners, however, rarely used *any* open vowels in their speech. Beginners showed a strong correlation between perception and production capabilities. Advanced learners, however, did not demonstrate a strong perception-production correlation.

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CHAPTER 1: INTRODUCTION

Importance of the Portuguese Language

Although Portuguese is spoken by more than 200 million people worldwide and is the seventh most widely spoken language in the world, relatively little research has been published about the acquisition of Portuguese by nonnative Portuguese speakers. Much more research and many learning materials have been produced about languages ranked lower in the number of speakers, such as German (10th), French (11th), and Italian (15th). Although these languages are not as widely spoken, they are taught more frequently in the educational system in the United States. Economic, political, historical, cultural, and geographical factors may be reasons that Portuguese has never achieved prominence in the educational system in the United States.

If business and economic factors are dominant indicators that determine which languages are taught and studied, Portuguese will likely experience increased representation in the schools in the United States. The *Los Angeles Times* reported that “Spanish may be the dominant language of Latin America, but corporate executives and headhunters say the real need is for employees who speak Portuguese. That’s because Brazil, the biggest market in all of Latin America, has thrown open its investment doors and multinationals are moving in at a record pace. More than 1,000 U.S. firms now have subsidiaries there” (Hamilton, 1996). As Brazil, by far the most populous Portuguese-speaking country, continues to grow in economic importance (currently the 6th largest economy in the world), the desire to learn Portuguese may also increase. As demand to learn Portuguese rises, the limited resources for learning Portuguese will also increase.

Vowel Perception and Production in L2 Language Acquisition

People who learn a second language (L2) face a variety of difficulties in trying to produce fluent, native-like speech in that language. L2 acquisition is especially difficult for those who begin learning the L2 language after the age of 15. Most, if not all, of these individuals will always speak the foreign language with a detectable foreign accent (Flege, Bohn, & Jang, 1995, p. 437). One of the most difficult aspects of L2 acquisition is correctly speaking the vowels of the L2 language. The incorrect pronunciation of these vowels greatly affects the amount of a foreign accent that native speakers perceive.

Many different mistakes can be made when trying to correctly produce L2 vowels. Some of these include errors related to vowel quality, stress, duration, and degree of nasality. One of the most obvious mistakes an L2 speaker makes is a failure to produce the correct vowel quality. Even the phonetically untrained native listener easily detects a foreign accent associated with the mispronunciation of vowel sounds.

A problem commonly associated with vowel production is vowel perception. Vowel perception problems are manifest by an inability to perceive and distinguish L2 vowels correctly. I will study the particular problem of perceiving and producing the Portuguese mid-vowels in this thesis. In Portuguese, as in any foreign language, many aspects of language acquisition could be identified and studied. Vowel perception and production are only one aspect of the complexity of L2 acquisition. Even within Portuguese vowel perception and production, I will not deal with the numerous other vowels and vowel problems that could be studied. I will conduct tests to explore the mid-vowel production and perception ability of American learners of Portuguese.

The Portuguese Mid-Vowels

The Brazilian Portuguese vowel system consists of seven vowels /ɪ u e ε o ɔ a/ in the stressed position. These are reduced to five vowel sounds [ɪ u e o a] in the pretonic position. In the final unstressed position, these are reduced to three [ɪ ə u] allophones. Brazilian Portuguese also has five nasalized vowels, [ĩ ã õ ã õ] (Fails, 1998). The Portuguese mid-vowels /e ε o ɔ/ tend to present a particular difficulty for the American-English learner of Portuguese. The vowels /ε ɔ/ are “open” and the vowels /e o/ are “closed.” These vowels have also been classified as “semi-open” and “semi-closed.” For the purposes of this thesis, however, I will refer to them as “open” and “closed.” I will also use the term “Americans” to refer to L1 speakers of American English residing in the United States.

No absolute rules exist that govern the use of Portuguese mid-vowels. Very few words in Portuguese currently contain orthographic symbols that indicate vowel quality, such as {avó/avô-pode/pôde}. Over time, Portuguese orthography has been changed so as to exclude many of these orthographic symbols that historically have indicated vowel quality.

Certain patterns, however, do exist that can assist in predicting vowel quality in certain circumstances. These patterns of production can be helpful in some situations. The pronunciation patterns can be complex and contain many exceptions. The intent of this thesis is not to produce a comprehensive pronunciation guide or to cover all the patterns governing pronunciation of Portuguese vowels. To date, a *comprehensive* phonetics course for the American learner of Portuguese does not exist. As background

to the problem being addressed, however, I will briefly discuss some of the issues associated with each of the Portuguese mid-vowels. The following vowel descriptions are taken mostly from class notes from Dr. Willis Fails' Portuguese 326 course (Portuguese Phonetics and Pronunciation) taught in 1998 at Brigham Young University..

Phoneme /e/

The most obvious problem that American-English speakers have with [e] is that the sound occurs in English only as part of a diphthong [ej̩] as in the word {bait}. This can cause Americans to produce words requiring [e] with the entire English diphthong [ej̩] instead of the isolated [e]. An example of this would be to produce [k^hə'beɪsə] for the Portuguese word {cabeça}.

Phoneme /ɛ/

It is somewhat complex to understand why Americans have difficulty correctly producing [ɛ]. This sound is a part of the English language. The main problem is not the isolated sound but rather a phonotactic problem. In English, [ɛ] occurs only in closed syllables before a consonant at the end of a syllable, such as {bet}. In English, [ɛ] also never occurs at the end of a word. In Portuguese, [ɛ] occurs in both open and closed syllables, such as {fe} and {relva}. It is also very common for [ɛ] to occur at the end of words, as in {file} and {pe}.

A common tendency for Americans is to produce the English diphthong that normally appears in a similar position in English words. The word {fê} is commonly produced as [feɪ]. Even though the same symbol, [ɛ], is often used for both English and Portuguese in pronunciation dictionaries, an argument can be made that the [ɛ] used in Portuguese is more open than the English [ɛ]. I questioned several native speakers of Brazilian Portuguese about the pronunciation problems they perceive in Americans who speak Portuguese. One of the most common observations was that Americans rarely produce the Portuguese [ɛ] or [ɔ] sounds in their speech. Americans often produce the diphthong [eɪ] instead of [ɛ] or simply do not open the vowel enough for a native Brazilian speaker not to notice a foreign accent.

Phoneme /o/

The problem that Americans have with the [o] in Portuguese is that it also occurs in English only as part of the diphthong [ou] as in {boat}. Therefore, Americans tend to use the entire diphthong in place of the simple and short [o] sound that is used in Portuguese. Although the American speaker may not have any notion that he or she is producing the sound incorrectly, native Portuguese speakers notice an obvious foreign accent even if they understand the word being said. This happens in words such as {boca} which is often produced ['boʊkə] by American speakers. The vowel produced by Americans is generally longer and of a different vowel quality than what is correctly produced by native Portuguese speakers.

Phoneme /ɔ/

This is another sound that is extremely problematic for Americans. One might reasonably wonder why it is so problematic when pronunciation dictionaries routinely report that [ɔ] is a part of the English language. The fact is, however, that it occurs commonly only in some English dialects and not for most American English speakers. For example, the word {caught} is produced in two different ways, [kɔt] or [kat]. The sound [ɔ] exists regularly, as in this example, in British English and in some eastern dialects in the United States. For the purpose of my study, however, I will not be dealing with people who speak these dialects of English but rather with Americans who speak dialects where [ɔ] is systemically not present. One situation in which [ɔ] is present in nearly all dialects of English is before the phoneme /r/, such as in {for}-[fɔɹ]. The problems that Americans have producing [ɔ] in Portuguese seem to be the following:

The tendencies are to produce either [ɑ] or [ou] instead of [ɔ]. It seems as if [ou] is usually produced in the initial stages of Portuguese learning. Once the learner realizes, for example, that {avô} and {avó} are produced differently, a tendency is to produce [ɑ] if the [ɔ] cannot be produced correctly.

Common Patterns of Portuguese Mid-Vowel Production

In addition to difficulty producing each Portuguese mid-vowel, American learners also have trouble with the often confusing patterns that govern, in some situations, when these vowels should be used. Over the past several decades, the Portuguese language has undergone several orthographic modifications that have essentially minimized the

occurrence of orthographic accent marks that once were commonplace in Portuguese orthography. One of the side effects of these changes to orthography has been an added difficulty for the L2 learner of Portuguese. L2 learners are often left to guess the correct vowel pronunciation when referring to modern Portuguese orthography.

The L1 vowel inventory often influences the categorization and production of L2 vowel sounds. For our purposes, I will not address potential diphthong errors but only discuss the alternation of [ɔ], [o] and [ɛ], [e] from the phonemes /o/ and /e/. I will deal with the problem of confusion as to whether to produce [e] or [ɛ] and whether to produce [ɔ] or [o] when {e} and {o} appear in written Portuguese.

This confusion seems to be prevalent in virtually all stages of L2 Portuguese learning. Certain patterns can be identified that may help in predicting vowel quality in many circumstances. These patterns, however, are by no means absolute but serve only as general paradigms that apply to certain situations. Many Portuguese vowel qualities simply have to be memorized by the L2 learner on a word-by-word basis, because no strict rules or orthographic indication exists.

Again, this thesis is not meant to be a comprehensive pronunciation guide. I will, however, outline some general patterns that govern, in some cases, when to use [ɔ], [o] and [ɛ], [e]. In the first pattern, open vowels *generally* occur only in the stressed syllable. In the pretonic position in which vowel harmony can apply, the vowels /ɛ ɔ/ change to /e o/ categorically: [ˈpɛdra] 'stone' > [peˈdreyru] 'mason', [ˈsɔlu] 'solo' > [soˈlar] 'to play a solo.' This pattern, interpreted as *neutralization*, has some restrictions. It does not apply with some diminutive or superlative suffixes: [kaˈfɛ] 'coffee' > [kafɛˈzɪnu] (diminutive):

[ˈbɛla] ‘beautiful’ > [bɛˈlisima]; [ˈpɔbre] ‘poor’ but not [pɔbrɛˈziɲa]. It also does not apply in situations such as the diminutive for words that have an open vowel. In the diminutive form, the openness of the vowel is maintained. An example of this is the name {Sérgio}. In the diminutive form {Sérginho}, the {e} remains open [ɛ] (Bisol, 1989, p. 195).

For the great majority of words, however, open vowels will be found only in the stressed position. There are three pronunciation patterns that I will discuss. These patterns deal with nouns, adjectives, and verbs. For nouns, a common pattern is that if a noun ends in a {-a} or {-e}, the vowel in the stressed position is open. Examples of this are {nota} and {rocha}. Many exceptions to this common pattern exist, even among common Portuguese words. Two notable exceptions where the vowel remains closed are {boca} and {moça}.

For adjectives with an {o} in the stressed position, a very common pattern often predicts quality of the mid-vowel. Generally, the only time the vowel remains closed is in the singular masculine form of the adjective. The following is an example of this vowel alternation pattern:

gost[o]so	gost[ɔ]sa
gost[ɔ]sos	gost[ɔ]sas

For verbs, the pronunciation issues are a bit more complex. I will give a few examples of patterns of vowel alternation. These examples indicate the complexity and importance of understanding vowel alternation for the L2 learner of Portuguese.

Verbs also adhere closely to alternation patterns. I emphasize that in verbs the vowel in the unstressed position is closed. On the other hand, not every occurrence of vowels in the stressed position is open. For {-ar} verbs, the following pattern exists in the present tense conjugations: The mid-vowel in the stressed position in {-ar} present tense verb conjugation is generally open. All of the other mid-vowels (in the unstressed position) are closed. The following shows a pattern that is common for {-ar} verbs:

f[ɛ]cho	f[e]chamos
f[ɛ]chas	f[e]chais
f[ɛ]cha	f[ɛ]cham

For {-er} and {-ir} verbs in the present tense, the tendency changes slightly. The difference is that in the first person of the present tense, the vowel remains closed. The rest of the verb forms follow the pattern previously described for the {-ar} verbs. Here is an example of this alternation for {-er} and {-ir} verbs in the present tense:

d[e]vo	d[e]vemos
d[ɛ]ves	d[e]veis
d[ɛ]ve	d[ɛ]vem

With different verb tenses, different mid-vowel production patterns may occur. For example, in the conjugation of the imperfect subjunctive tense, vowels with an irregular stem, such as {ter}, have an open vowel in the stressed position, as in {tivéssemos}. For vowels with a regular stem, such as {dever}, a closed vowel is in the stressed position, as in {devêssemos}.

Possible Explanations for Mid-Vowel Difficulty

Many factors may contribute to the difficulty that Americans have in correctly incorporating the Portuguese mid-vowels. The first one is that *American learners may have difficulty perceiving the correct quality of the vowels*. Specifically, they cannot distinguish between [ɛ] and [e] and between [ɔ] and [o] in vowels spoken in context by native Portuguese speakers. Since Americans cannot correctly distinguish between these vowels, they have difficulty producing the correct vowel.

Another possible problem is that they *have not been phonetically trained to produce these vowels*, some of which do not phonotactically occur similarly in American English.

Perhaps they can both perceive and produce the vowels but are *unclear about the patterns and circumstances where these vowels occur* and therefore do not use them correctly.

Difficulty could also arise because *lexical signals predispose them to ignore differences in vowel quality*. In other words, they assume that, given the spelling of a word, it must be pronounced as if they were using English pronunciation and their L1

vowel inventory and phonotactic rules. Portuguese has no systemic orthographic distinction that makes vowel quality predictable.

Apathy or indifference also could cause these errors to be made. Perhaps with minimal effort Americans could correctly produce these vowels but see no need to try because the native people seem to understand them the way that they speak. They don't care about improving their accent as long as they can be understood. Very few words have a minimal pair that changes the meaning based on only one vowel segment (example: avó-avô). Even in these rare examples, context generally makes the listener forgiving to vowel quality errors (example: *minha avó*) pronounced [ˈmĩɲaˈvo] as the word becomes evident by its modifier or gender. In languages where minimal pairs are common and essential in understanding speech, there is a greater need to learn individual vowel quality.

As I explore the problems of production and perception, I will determine if an actual problem with perception and production exists with American learners of Portuguese. These learners will be divided into two groups, “beginners” and “advanced learners.” Once the production and perception abilities are evaluated, I will analyze a possible correlation between perception and production of the Portuguese mid-vowels. I will also study the differences between the two groups of learners.

CHAPTER 2: REVIEW OF LITERATURE IN VOWEL PERCEPTION-PRODUCTION

Vowel perception and production have been studied in a variety of ways. I will briefly review some of the research done in both L1 and L2 vowel acquisition, with an emphasis on L2 vowel perception and production.

L1 Vowels

Vowel perception begins to develop within the first few months of life. By one year of age, the perceptual abilities have been proven to be similar to those phonemic categories used by adult native speakers (Werker & Lalonde, 1998). L1 vowel inventories are formed early and have a tremendous influence on eventual L2 language acquisition capabilities. However, if a child is raised bilingual (speaks two languages learned simultaneously with equal native fluency), the child establishes new phonetic categories for certain L2 vowels. One study showed no evidence that early Italian/English bilinguals differed from monolingual native speakers of English in producing or perceiving English vowels (Flege, Mackay, & Meader, 1999). Many learners of foreign languages begin to learn the L2 language later in life and are not bilingual. These learners do not benefit from dual vowel inventories.

L2 Vowels

Research has shown that experienced nonnative English-speaking subjects produced English vowels more accurately than did inexperienced subjects from the same

L1 background. One experiment involved English, German, Spanish, Mandarin, and Korean subjects (Flege, Bohn, & Jang, 1997). The study demonstrated that the amount of English-language experience of nonnatives exerted an important influence on how they perceived English vowels. When identifying the members of the *bat-bet* continuum, the experienced nonnative subjects made significantly more use of spectral cues than did the inexperienced subjects. Spectral distance scores were calculated to estimate the extent to which the nonnatives' vowels differed from the native English subjects' in front/back versus high/low space (p. 456). Conversely, they made significantly less use of temporal cues. Vowel duration was measured from the first positive peak in the periodic portion of each digitized waveform to the constriction of the postvocalic consonant, which was signaled by a decrease in overall amplitude and a decrease in waveform complexity (p. 451).

The researchers also demonstrated that the accuracy with which nonnatives perceive and produce English vowels is related. Finally, the nonnatives' degree of accuracy in producing and perceiving English vowels, as well as the extent to which their performance improved with experience in English, varied as a function of which specific L1 background they came from (Flege, Bohn, & Jang, 1997).

Most of the research completed in vowel perception is divided into two categories. The first category is learners who have little or no experience with the L2 language being studied. The second category is learners who have an advanced or fluent knowledge of the second language. Native speakers have often acted as control groups for L2 vowel perception studies in their native language. A general conclusion seems to

be that correctly perceiving L2 vowels is more difficult than correctly perceiving vowels in one's native language.

The native language seems to interfere with the perception of vowels in a second language. I will now reference the results of various L2 vowel perception and production studies.

Researchers studying vowel perception have described some cross-language vowels as being either *identical* or *similar*. L2 Vowels that were similar but not identical to L1 vowels posed a greater difficulty than vowels that are identical in both languages (Bohn & Flege, 1990). In the Portuguese-English vowel relationship, most vowels would fall into the identical or similar category phonetically. These vowel similarities may cause confusion for the L2 learner of Portuguese.

One of the most influential theories used to study vowel perception has been the Native Language Magnet (NLM) theory proposed by Kuhl (1991). Part of the NLM theory states that phonetic categories of one's L1 language are organized in terms of prototypes that remain in the long-term memory. These prototypes begin to function early in infancy as perceptual magnets by attracting or assimilating similar members of the same phonetic category. The NLM theory is a possible explanation of the problem with adult L2 vowel perception. Infants have been shown to have a waning attention to foreign language sounds over the second six months of life (Werker & Desjardins, 1995). A possible explanation for this phenomenon is the NLM theory.

One process of vowel perception is *categorization*. For example, an English listener hears two different vowel sounds when a speaker pronounces the words 'bead'

and 'bid.' The different meanings of those words depend on the phonemic distinction between the vowels /i/ and /ɪ/. The question of how listeners manage to identify the different vowels of a language is classified as a *vowel categorization problem* (Rosner & Pickering, 1994, p. 1). L2 perceptual studies using categorization have been performed in many language combinations. A general conclusion among studies is that vowel perception problems are prevalent when learning an L2 language. I will outline some examples of this phenomenon.

A study of American English speakers' perception of French vowels concluded that native speakers of French identified the vowels of their language significantly more accurately than native speakers of American English who speak French (Gottfried, 1982). As for Americans who do not speak French, Gottfried concluded that they are less accurate in distinguishing French vowels than native speakers of American English who speak French. In a subsequent study comparing different contexts to the perception of French vowels, Gottfried again concluded that native speakers of French are generally better able to perceive the vowels of their L1 language than nonnative speakers and nonspeakers of French (Gottfried, 1984, p. 111).

In a study of Japanese and Korean perception of Australian English vowels, the contrast between /e-æ/ was studied and found to present perceptual difficulties (Ingram & Park, 1997). The Japanese listeners, however, performed better than the Korean listeners in making this distinction. Through a series of complex tests using a variety of subjects, the researchers concluded: "In general, our findings suggest that L2 learners confronted with the identification of foreign vowels seek to apply or modify perceptual strategies for

phonological feature identification that were acquired in the course of first language learning” (p. 365). The unique vowel inventories of Korean and Japanese may explain why Japanese listeners did better than Korean listeners. The L1 vowel inventory of a learner apparently affects the acquisition of a foreign language. Difficulties seem to arise when the L2 vowel system being acquired differs phonemically, phonetically, phonotactically, or orthographically from the L1 inventory.

A study (Leon, 1965) of American English speakers learning French as a second language concluded that the most difficult French vowel for Americans to interpret was [ɔ], which was mostly interpreted as English [ʌ]. Leon showed that the French (ɔ) was interpreted as an American-English (ɔ) with a low score of 23% by L1 English speakers. The (ɔ) was interpreted as (ʌ) at a rate of 50.3% and as (ɑ) at a rate of 10%. The American-English (ʌ) was interpreted in a variety of ways, including (æ+r) 6.21%, (A) 9.4%, (a) 22.72%, and (ɔ) 50.30% (p. 143). Leon concluded that the hardest vowel to acquire for American learners is the French [ɔ] (p. 135).

In a study which, in part, involved German L1 listeners, the English /ɛ/-/æ/ contrast was better perceived by German learners of English with more English experience than by German learners with little English experience. However, German learners of English did not differ with regard to the predominant use of either temporal or spectral information to differentiate the English /i/-/ɪ/ contrast (Flege, Bohn, & Jang, 1997, p. 458). This was probably due to the fact that /æ/ does not exist in the German vowel system.

In another study of German learners of English, the group results confirm the traditional difficulties that German speakers have with the production of /e- æ/. The study also showed a positive perceptual correlation to production (Barry, 1989).

Very little research has been published concerning the vowel perception-production capabilities of American learners of Portuguese. In a study that concentrated on Spanish speakers who were learning Portuguese, Simões and Kelm (1991) concluded that Spanish speakers correctly perceived the Portuguese mid-vowels at a much lower level than the control group, Portuguese learners without Spanish experience. Spanish-speakers perceived the [ɛ]/[e] contrast at 64% compared to the control group, which perceived this contrast at a rate of 89%. The [ɔ]/[o] contrast was perceived by Spanish-speakers at a rate of 82% and a rate of 92% by non-Spanish speakers.

The researchers concluded that the reason Spanish speakers have such difficulty is because they have a false confidence in learning Portuguese due to the structural similarity of Spanish and Portuguese (p. 662). Although the language has many structural similarities, the vowel pronunciation differs tremendously. The pronunciation of Portuguese orthographic vowel symbols does not follow the same phonetic rules as Spanish.

The studies previously discussed show that L2 vowel perception and production are often problematic. This study concentrates on the vowel perception and production of both beginning and advanced learners of Portuguese who are not fluent in Spanish or any other foreign language. Anecdotally, Brazilians have claimed that Americans have tremendous difficulty correctly using the mid-vowels in spoken Portuguese. It is these

reports and personal observation that led me to an interest in conducting this study. The study conducted in this thesis will investigate mid-vowel perception and production within the two test groups. The perception and production capabilities will then be compared between groups and analyzed for potential correlations.

CHAPTER 3: METHODOLOGY

The objective of this study was to determine the level of difficulty that American learners of Brazilian Portuguese have perceiving and producing the Portuguese mid-vowels. I also wanted to investigate the progression of the acquisition of the mid-vowels by testing two different groups, beginning and advanced learners of Portuguese. I will refer to the two study groups as “beginners” and “advanced learners.” Both terms leave room for interpretation and must be defined in detail. I will explain, later in the thesis, the exact level of Portuguese learning that the subjects had achieved.

The first part of my study was to create sentences containing abundant examples of Portuguese mid-vowels. These sentences were then recorded in Brazil by native Brazilians. Words containing mid-vowels were then extracted from the sentences to be used in testing vowel perception. Production was tested by recording a list of sentences spoken by the two test subject groups. These recordings were evaluated by native Brazilians to determine whether or not the vowels in question were spoken correctly. The results of both the perception and production tests were scored and evaluated. I will now describe in more detail the methodology used to conduct and evaluate the results of these tests.

Recording of Sentences by Native Brazilians

Forty-eight sentences (see Appendix A) were created that contained numerous examples of the mid-vowels /e ε o ɔ/. These sentences were created with the assistance

of the linguistics department faculty of Universidade Estadual Paulista in Araraquara, São Paulo, Brazil. Six native Brazilians living in the state of São Paulo volunteered to read the sentences in a professional recording studio. The six volunteers consisted of males (n=3) and females (n=3). They were a combination of university students (n=2), a university professor (n=1), and professionals (n=3). The ages of the subjects ranged from twenty-one to thirty-five, with the average age of twenty-eight. The subjects did not know what was being studied in their recordings. The subjects were also asked to choose a topic and speak freely about it for several minutes. The recordings of the responses to these topics, however, were not used in this study.

The subjects were instructed to read the sentences in the most natural voice possible. The equipment used was all state-of-the-art digital components. The microphone used was a Neumann TLM103. The signal then went to a preamplifier (Aphex 107) and through a compressor limiter (DBX 166A). The signal passed unfiltered through a digital mixer (Yamaha 03D) and directly through a digital soundcard (Wavecenter) before being stored as data on a computer. The audio was organized using Sound Forge 4.0 computer software and recorded directly to a CD using a Ricoh recordable compact disc drive. The sentences would later be used as the source to extract tokens to test for perception.

Test Subjects

Two different groups were selected to participate in the study. The subjects were all native speakers of American English, and all began to learn Portuguese after the age

of seventeen and were not bilingual. Their only significant second language experience they had was with Portuguese. A few of the students had taken high school Spanish courses but were not fluent. The first group, or “beginning learners,” were students enrolled in Portuguese 102 (2nd Semester Portuguese) at Brigham Young University. These students had previously completed Portuguese 101 (1st Semester Portuguese). These students had a basic understanding of Portuguese but were not considered fluent or even near-fluent. Their level of Portuguese was very basic and rudimentary. I will refer to this group as “beginners” or “beginning learners” throughout the study.

The second test group consisted of students enrolled in Portuguese 315 (Intermediate Portuguese). Although this course is called “intermediate,” I will refer to these students as “advanced learners” of Portuguese because of their experience with and knowledge of Portuguese. All the advanced learners had lived in Brazil as missionaries for nearly two years. Their level of language fluency was high; they could all easily communicate (both understand and speak) in Portuguese. Their language instruction to this point had been a mixture of classroom study and residence in Brazil. They had obviously been exposed to native Brazilian speech for an extended period of time.

The students who chose to participate in the study did so voluntarily and did not receive any compensation for their participation. A total of twenty students participated in the study. Ten of the students were male (n=10) and ten were female (n=10). Also, ten of the students were beginning learners (n=10) and ten were advanced (n=10). The students’ age range was between eighteen and twenty-four, the average age being twenty-one.

Production Test

The first process in the production portion of the study was to record both groups of subjects. This was done in order to evaluate their ability to produce the vowels in question. The production portion was completed first so the subjects would not know what was being tested. The subject matter would become evident during the perceptual study. Twenty-eight sentences (see Appendix C) were selected from the forty-eight original sentences. The sentences were chosen so that the total occurrence of each vowel sound in question would be similar. Each vowel sound occurred at least twenty-five times in the sentences. If the vowel occurred more than twenty-five times, only twenty-five occurrences were selected for analysis so that the total number would be one hundred.

The twenty informants read the sentences into a microphone, and the sentences were recorded for later evaluation. The same group of informants were used later as subjects for the perceptual study.

Scoring of the Production Test

The production results were determined by having two linguistically trained native Brazilians listen to the sentences and mark whether or not the vowel sound tokens were produced correctly. The two evaluators were currently enrolled as students at Brigham Young University. Since the purpose of the study was not to evaluate vowel duration or the inclusion of a diphthong as a part of the vowel segment, evaluators did not mark the vowel wrong for these mistakes. The evaluators were simply asked to

consider the vowel quality. Evaluators were instructed to be generous in their determinations of vowel quality and grade only the core quality of each vowel in question. If the produced vowel sound *obviously* reflected a foreign accent based on the vowel quality, it was marked as being incorrect. Because dialects and vowel production differ within Brazil, the evaluators were asked to be flexible in their evaluations to include possible regional variations of accent and dialect.

The two evaluators listened to the recordings individually so they could make independent decisions about the quality of each vowel. Because a small percentage of the vowels were not easily identifiable, any vowel that *both* graders did not agree upon was deemed correct. The percentage of disagreed upon vowels between the two evaluators was less than 2%. Since the percentage of disagreement was negligible, I did not have additional evaluation of the vowels and determined that the obtained results were valid and consistent. If a significant percentage of the vowel tokens were disagreed on by the evaluators, I would have gone through a much more extensive grading process involving more evaluators. As stated, if any vowel was not marked as *obviously* being wrong *or* was disagreed on by the evaluators, the informant's vowel production of the vowel in question was judged as being correct.

Creation of Tokens for Perception Test

The base of the perception study was the recordings, previously described, of native Brazilian speakers. Using Sound Forge software, fifty-six tokens were extracted from the sentences contained in the recordings. Since vowel perception has often been

linked to context, I did not separate the vowel phonemes or vowel segments. The tokens consisted of *entire words* that contained the occurrences of the mid-vowels [o, ɔ, e, ε]. Fourteen tokens of words containing each of the four vowel sounds were extracted from the sentences to equal fifty-six total tokens (see Appendix D). These tokens were placed on a digital compact disc to test the subject's perception of the vowel sounds.

Perception Test

To test for perception, the subjects were tested on their ability to distinguish between [o]/[ɔ] and [e]/[ε] alternations. The first part of this section involved distinguishing between [o] and [ɔ]. The second part involved distinguishing between [e] and [ε]. The subjects were given an introduction to the differences between the Portuguese vowels sounds. The subjects were also given examples contrasting [o]/[ɔ] and [e]/[ε] sounds successively by native speakers of Brazilian Portuguese. The sounds were presented to the informants in words (n=5) and also as separate, isolated vowel sounds (n=5). The isolated vowel examples were pronounced with extended duration to emphasize vowel quality difference and contrast. This training was minimal so that the results would not be inflated.

After the introduction, the informants were asked if they understood the differences between the vowel sounds in the examples and explanations. All subjects indicated that they perceived some difference (especially in the extended duration sounds), and most had previously known, to some extent, of the existence of these different vowel qualities in the Portuguese language.

The informants were given a test sheet (see Appendix D) and asked to identify if each token heard was open or closed by marking the corresponding answer on the test sheet. Each token was repeated three times, with a 1.5 second interval between each repetition. Each set of tokens was divided by a three second pause so that the informants could record their response.

The test was a *forced answer* test (if the informants did not know the correct answer, they selected their answer by guessing). Each subject had a total of fifty-six chances to identify the correct vowel sound. Since the vowels were segments of entire words, the vowel in question was underlined on the answer sheet. As mentioned, the informants were allowed to both hear and see the word being evaluated.

The tokens were extracted from natural speech, so the vowel sounds were generally shorter and less exaggerated than many of the examples given in the initial instructions and introduction. After the test was complete, the informants were asked if the test made sense and if they understood what was required during the testing period. All twenty subjects responded that they understood the test and had no concerns or questions about the format or requirements of the test.

Perception Control Group

As a control group, three native Brazilians took the identical test while listening to the same recordings and instructions. The Brazilians all scored 100% and seemed to identify the vowels with ease. Since all three native Brazilians received perfect scores

with no noticeable difficulty, I saw no reason to have a larger control group and assumed that the test was a valid tool for measuring vowel perception.

Scoring of the Perception Test

The scoring of the perception portion of the study was completely objective. Each vowel sound being evaluated was either open or closed by its phonetic definition. Each subject's responses were marked as being correct or incorrect.

The results of both the perception and production study were entered into a spreadsheet for tabulation and final scoring. Although this is not a statistical study, some statistical analysis was performed on the study results. In some situations, the p-value may not reach statistical significance. However, trends seem to be consistent, and conclusions will be valuable for further research and pedagogy. The statistical analysis was performed in the Brigham Young University statistics laboratory using Minitab Release 14 and S-Plus 6.0 statistical software packages. All beginning learners are labeled "B1, B2, etc.," and the advanced learners are labeled "A1, A2, etc.," on subsequent graphs and charts containing test results.

In the following chapter, I will outline the results of the perception and production studies. Both data and graphs will be used to present outcomes of the studies.

CHAPTER 4: RESULTS AND ANALYSIS

Perception Study Results

The results of the perceptual study show that both the beginners and advanced learners had difficulty correctly identifying and categorizing the vowel sounds. The results showed that as experience with Portuguese increases, the perception scores also increases. Within each informant group, the score for correctly distinguishing between [ɔ] and [o] was similar to the score for distinguishing between [ɛ] and [e]. The beginners scored 70% on the [ɔ]/[o] section and 68% on [ɛ]/[e] section, for a combined score of 69%. The advanced learners scored 78% on the [ɔ]/[o] section and 78% on [ɛ]/[e] section for an average score of 78%. The range for the beginners was 57% to 70% for the [ɔ]/[o] section and 57% to 86% for the [ɛ]/[e] section. The range for the advanced learners was 54% to 96% for the [ɔ]/[o] section and 32% to 100% for the [ɛ]/[e] section.

Since an answer was required on each token and only two options were given, guessing on any given question would have a 50% chance of being correct. It is therefore possible that the correct vowel was not actually perceived correctly on many of the correct answers, and scores could reflect a score higher than the learners' actual ability to perceive the vowels correctly. It can also be assumed that many of the learners performed only moderately better than if they had guessed on every question. Only one test subject, however, received a score of less than 50% on any perception section. Ironically, it was one of the advanced learners who scored a 32% on the [ɛ]/[e] section. The same subject also scored the lowest score, 54%, on the [ɔ]/[o] section. If this subject

were eliminated from the results, the advanced learners would have scored 81% on the [ɔ]/[o] section and 84% on the [ɛ]/[e] section. The following are the scored results of the perceptual study:

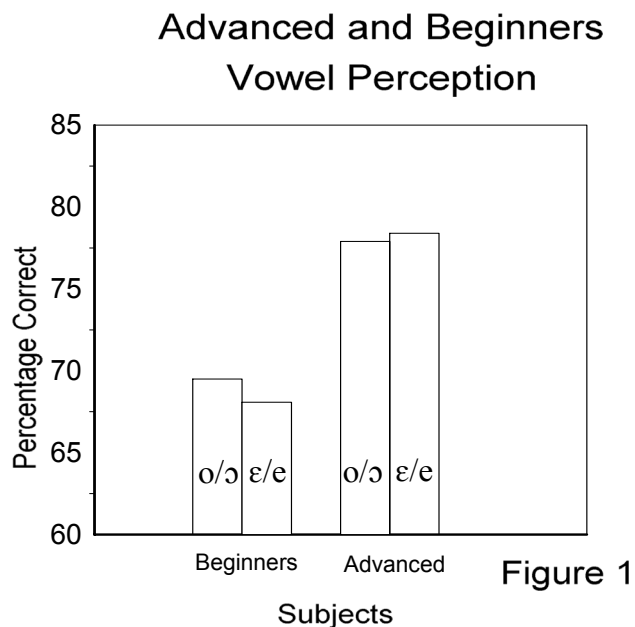
Perception Results

Beginning Learners	[ɔ]/[o]		[ɛ]/[e]	
	# Correct	% Correct	# Correct	% Correct
B1	16/28	57%	20/28	71%
B2	21/28	75%	20/28	71%
B3	18/28	64%	15/28	54%
B4	20/28	71%	16/28	57%
B5	22/28	79%	24/28	86%
B6	20/28	71%	20/28	71%
B7	18/28	64%	19/28	68%
B8	18/28	64%	21/28	75%
B9	20/28	71%	20/28	71%
B10	22/28	79%	16/28	57%
	Average	70%	Average	68%
	Combined Average	69%		

Advanced Learners	[ɔ]/[o]		[ɛ]/[e]	
	# Correct	% Correct	# Correct	% Correct
A1	23/28	82%	27/28	96%
A2	23/28	82%	28/28	100%
A3	22/28	79%	21/28	75%
A4	21/28	75%	21/28	75%
A5	15/28	54%	9/28	32%
A6	19/28	68%	20/28	71%
A7	24/28	86%	27/28	96%
A8	21/28	75%	24/28	86%
A9	23/28	82%	18/28	64%
A10	27/28	96%	25/28	89%
	Average	78%	Average	78%
	Combined Average	78%		

Table 1

The results of the perception study were consistent with my expectations. A perceptual problem definitely exists with American learners of Portuguese. This problem seems to decrease with increased exposure and study of Portuguese. However, even among advanced learners of Portuguese who have lived in Brazil, the problem is still prevalent. The following is a graphical representation of the results:



Production Study Results

The production results also showed a slightly higher overall score for the advanced learners. However, some very striking and interesting findings will be discussed as a part of these results. The advanced learners scored an average of 20% on [ɔ] production and 89% on [o] production. The advanced learners also scored 64% and 78% on [ε] and [e] respectively. The beginning learners scored an average of 12% on [ɔ] production and 98% on [o] production. They also scored 33% and 96% on [ε] and [e]

respectively. The combined production average for all four phonemes for the advanced learners was 63%, as opposed to 60% for the beginning learners.

This very minimal difference in overall production could be explained by chance or learner selection. The more compelling conclusions are drawn from analyzing the individual scores from each phoneme as detailed in the following results:

Beginners Production Study Results

Beginning Learners	[ɔ]		[o]	
	# Correct	% Correct	# Correct	% Correct
B1	3/25	12%	24/25	96%
B2	2/25	8%	24/25	96%
B3	1/25	4%	25/25	100%
B4	4/25	16%	24/25	96%
B5	8/25	32%	25/25	100%
B6	1/25	4%	24/25	96%
B7	1/25	4%	25/25	100%
B8	2/25	8%	25/25	100%
B9	6/25	24%	25/25	100%
B10	1/25	4%	25/25	100%
	Average	12%	Average	98%
	Combined Average		54%	

Beginning Learners	[ɛ]		[e]	
	# Correct	% Correct	# Correct	% Correct
B1	5/25	20%	25/25	100%
B2	19/25	76%	23/25	92%
B3	1/25	4%	24/25	96%
B4	10/25	40%	21/25	84%
B5	13/25	52%	24/25	96%
B6	5/25	20%	23/25	92%
B7	5/25	20%	25/25	100%
B8	6/25	24%	25/25	100%
B9	9/25	36%	25/25	100%
B10	10/25	40%	25/25	100%
	Average	33%	Average	96%
	Combined Average		65%	

Table 2

The beginning learners had significant problems with both open vowels. As far as the [ɔ] was concerned, beginning learners rarely produced this vowel correctly. The [ɛ] also was very problematic. The closed vowels [o] and [e] were much easier for the beginners to pronounce: an almost perfect combined score. In beginning levels of Portuguese, it appears that the open mid-vowels are very difficult to acquire because they were almost universally mispronounced by the beginners. As mentioned earlier, if the core vowel sound was correct, even if pronounced as part of a diphthong, the response was considered correct. Future studies can study production by looking at vowel length and diphthong errors.

The following data represent the results of the advanced learners production study:

Advanced Learners Production Study Results

Advanced Learners	[ɔ]		[o]	
	# Correct	% Correct	# Correct	% Correct
A1	8/25	32%	19/25	76%
A2	3/25	12%	21/25	84%
A3	1/25	4%	24/25	96%
A4	2/25	8%	23/25	92%
A5	2/25	8%	21/25	84%
A6	7/25	28%	23/25	92%
A7	12/25	48%	22/25	88%
A8	7/25	28%	22/25	88%
A9	1/25	4%	25/25	100%
A10	6/25	24%	23/25	92%
	Average	20%	Average	89%
		Combined Average		55%

Advanced Learners	[ɛ]		[e]	
	# Correct	% Correct	# Correct	% Correct
A1	16/25	64%	21/25	84%
A2	15/25	60%	24/25	96%
A3	13/25	52%	19/25	76%
A4	17/25	68%	18/25	72%
A5	20/25	80%	20/25	80%
A6	16/25	64%	19/25	76%
A7	17/25	68%	17/25	68%
A8	15/25	60%	18/25	72%
A9	15/25	60%	21/25	84%
A10	16/25	64%	17/25	68%
	Average	64%	Average	78%
		Combined Average	71%	

Table 3

In both study groups, the production results of the open vowels were disastrous. The beginners had a combined score of only 23% and the advanced learners scored a combined total of 42%. Although the advanced learners had nearly double the score of the beginners, they produced the correct open vowel less than half of the time. Both groups did better with the [ɛ] sound. The most problematic sound for both groups was [ɔ].

With regard to the closed vowels, a very interesting phenomenon occurred among the advanced learners. The evaluators reported that many of them tended to *hypercorrect* (using an open vowel instead of the closed vowel) when trying to pronounce the closed vowels. As their ability to produce the open vowels increased, they seemed to insert erroneously, in an unpredictable pattern, open vowel sounds in the place of the closed

vowels. In general, the advanced learners incorporated the open vowels to some degree in their spoken Portuguese. As mentioned, their overall open vowel production score was an average of 42%, as opposed to only 22% for the beginners. Their ability to produce these open vowels correctly nearly doubled with their increased experience to Portuguese. The unexpected results, however, were with the closed vowels. The beginners scored much higher on the production of the closed vowels than did the advanced learners. This may seem counterintuitive until the results are examined closely. As stated, the errors generally made with the closed vowels were the common production of the open vowels [ɛ] and [ɔ] in place of the closed vowels [e] and [o]. The following is a comparison between the production of the open vowels between the two study groups:

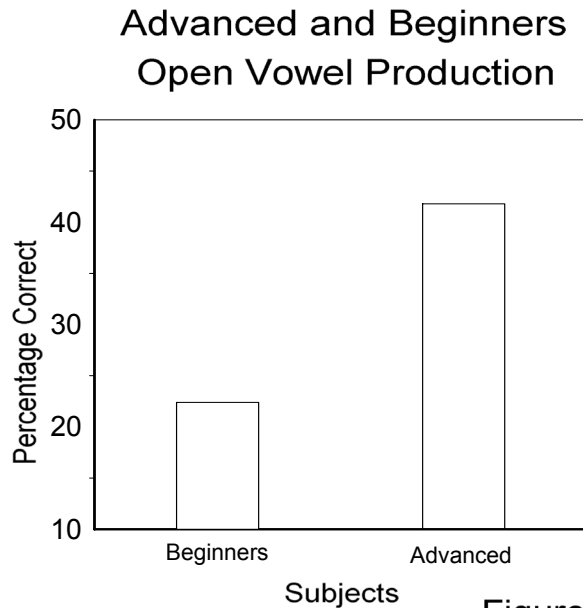
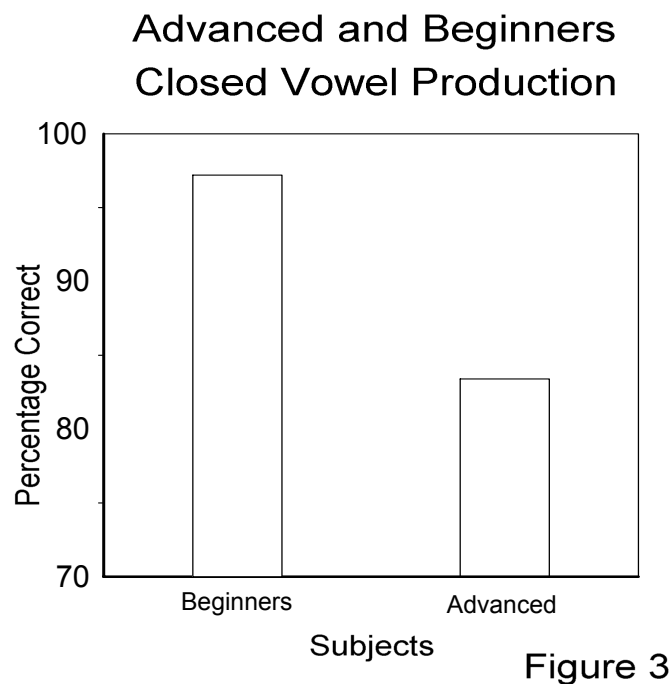


Figure 2

As indicated, the open vowel production was significantly higher among the advanced learners. As far as open vowel production is concerned, increased exposure and study of Portuguese seem to increase production success. However, this increased success rate was not the case for the closed vowels. The following is a comparison between closed vowel production for the two study groups:



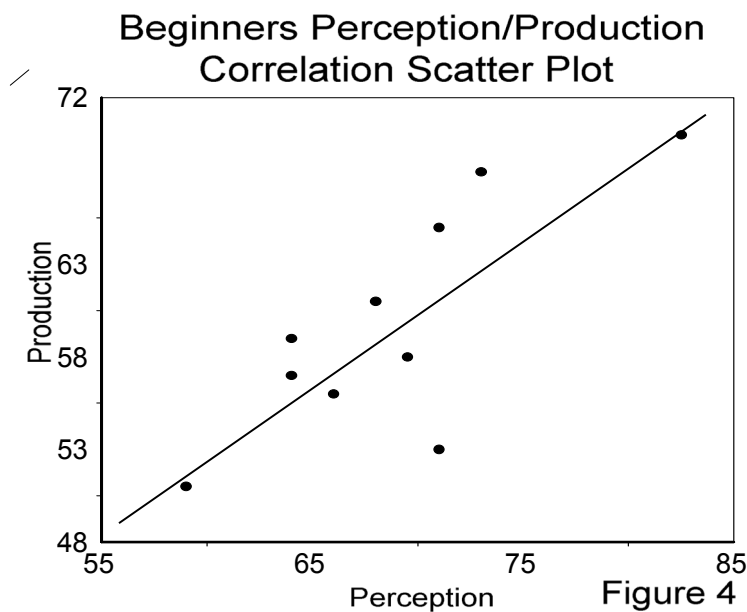
The beginners, who rarely produced an open vowel when required, did not make the same mistake as the advanced users by producing open vowels when they should be closed. Perhaps their naiveté to the very existence of the open vowels caused the beginners to rarely produce them in *any* circumstance. This was the only part of the entire study where the beginning learners outperformed the advanced learners. I will study the implications of these results in my conclusion.

Perception-Production Correlation

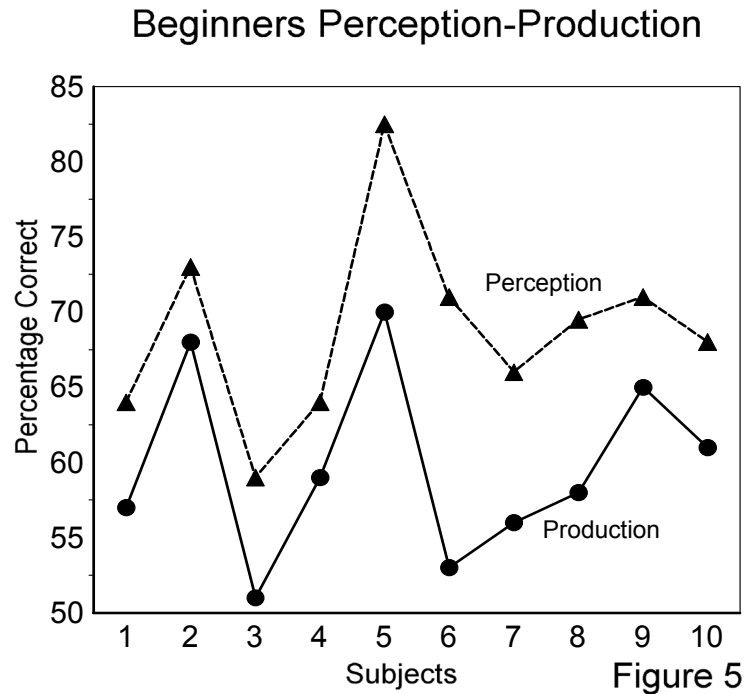
The results of the correlation analysis were also very surprising to me. The two study groups had completely different results concerning the correlation between the ability to perceive the vowels correctly and to produce them in context correctly. The beginners showed a high correlation between perception and production, whereas the advanced learners showed nearly no correlation.

The correlation, based on a Pearson and Spearman correlation analysis, showed a correlation coefficient of .79 (R-Square = 0.6240 and $p = 0.007$) for the beginners. This shows a strong relationship between perception and production for the beginning learners.

Although the relationship was not perfect, the data show that the beginning learners who better perceived the mid-vowels had a much higher probability of producing them correctly. In the following chart, the strong correlation is shown in a scatter plot analysis:



The following line plot chart gives another visual representation of the data that



support a perception-production correlation in the beginning learner:

The advanced learners did not follow the same pattern as the beginning learners.

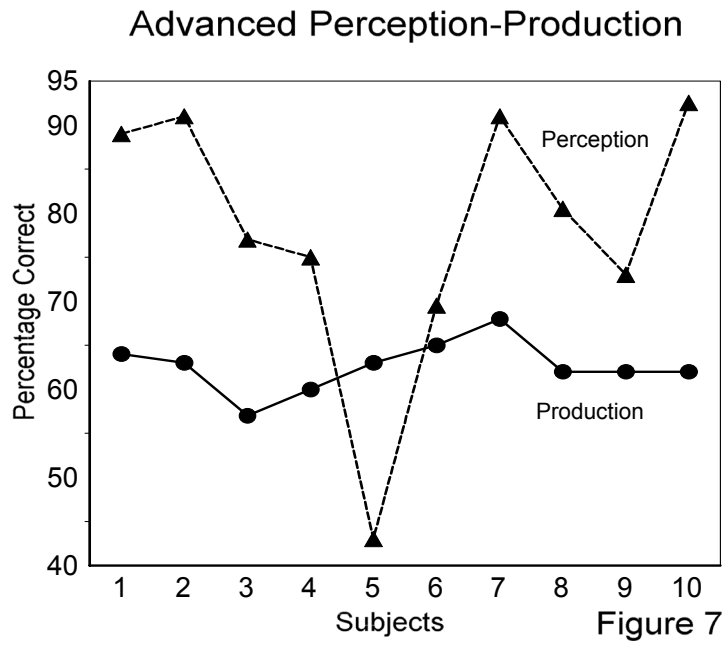
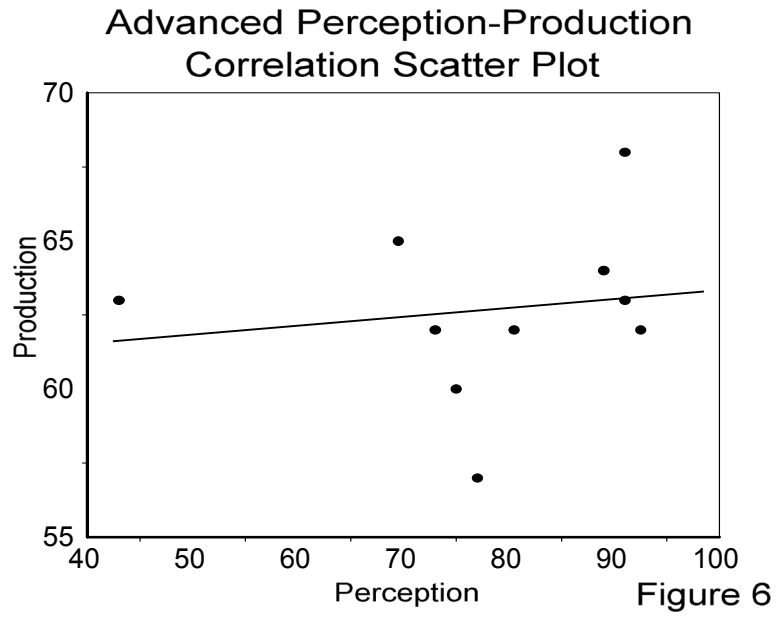
The same Pearson and Spearman correlation analysis was run with the following results:

the correlation coefficient =0.16 (R-Square=0.0256). There was almost no correlation

between perception and production for the advanced learners.

The following scatter and line plots show a lack of a perception-production

correlation for the advanced learners:



The data do not suggest a strong correlation between perception and production among advanced learners. Even excluding the subject represented on the far left of the plotter graph (possibly a statistical outlier), the results still would not show a strong perception-production correlation for the advanced learners.

In summary, the correlation results were very surprising. The entire study results seemed to be influenced by the hypercorrection phenomenon that occurred among advanced learners. In this study, the Portuguese learning continuum seemed to follow a desultory path of progression. The conclusions and implications of this study will be discussed in the following chapter.

CHAPTER 5: DISCUSSION AND PEDAGOGICAL IMPLICATIONS

Discussion

This study concluded that both a perceptual and a production problem exist with beginning and advanced learners of Portuguese. The production of the open vowels for both study groups was extremely poor. However, production capabilities for the open vowels increased tremendously with the advanced learners. Problems tend to diminish as a result of increased Portuguese language exposure and practice. However, both perceptual and production problems remain extremely evident among advanced learners.

Among the beginning learners, mid-vowel perceptual discrimination and classification had a strong correlation with production capabilities. With advanced learners, no significant perception-production correlation was found. Perhaps the most striking result of the study was the declined production capabilities of the [o] and [e] allophones for the advanced learner. This seemed to be due to a hypercorrection being made by these advanced learners. The advanced learners often produced the open vowels [ɔ] and [ɛ] instead of the closed vowels [o] and [e].

Based on the results of the study, I hypothesize that at some point in the Portuguese learning process, a notion of the Portuguese mid-vowels [ɛ] [ɔ] begins to develop. This may be a result of classroom instruction or the extended exposure to native Portuguese speech. Over time, learners begin to incorporate these vowels into their speech. At this point, however, they seem to become confused as to *when* to use the open and closed vowel sounds. As a result, advanced learners appear to almost randomly produce these vowels in

their speech, while the beginning learners seem to rarely incorporate [ɛ] [ɔ] into speech. Although the beginners scored higher on closed vowel production, the awareness of the open vowels seems to be a type of improvement in overall Portuguese language knowledge and phonetic progress. If learners of Portuguese at a more advanced level than the two study groups included in this thesis were studied, I hypothesize that the problem of hypercorrection would eventually diminish. To expedite this learning process, very intense phonetic training needs to be incorporated into Portuguese learning materials. This comprehensive phonetic component is virtually absent in current Portuguese learning materials.

Further research should include an analysis of the effect that a greater emphasis on phonetic training has on Portuguese vowel perception and production. It would also be helpful to analyze, on a word-by-word basis, which words present the greatest difficulties in vowel perception and production for American learners of Portuguese.

Pedagogical Implications

In the initial stages of Portuguese learning, emphasis should be placed on perceiving and distinguishing the mid-vowels. As it is not known whether perception capability predicted production or whether production capability predicted perception in this study, both perception and production should be taught simultaneously with equal importance. Training should include exaggerated examples of individual phonemes. Since vowels in fluid speech are harder to detect, beginning learners need to be exposed to isolated vowel sounds spoken individually and repetitively. The very nature and

similarities of the Portuguese and English vowel systems can create a deceptive confidence in the pronunciation patterns of the L1 English speaker who learns Portuguese.

It is my opinion that intense phonetic training of individual phonemes needs to occur from the beginning of Portuguese learning. Teaching materials should include multi-media pronunciation tools that incorporate examples of native speech, as well as orthographic representations of word patterns. This could also be accomplished by linguistically trained instructors who understand and can model the individual Portuguese phonemes and their English contrasting or similar vowels and diphthongs. Again, there is currently a lack of teaching materials which emphasize pronunciation for the American learner of Portuguese.

As the learning process advances, teaching *when* to use the mid-vowels should be emphasized. Confusion among the advanced learners about when to use the open vowels was a major finding in this thesis. Instruction should include detailed descriptions of the patterns of vowel usage included in this thesis as well as other patterns which I did not address. Learning materials that emphasize the patterns and descriptions of mid-vowel usage are also virtually nonexistent. Learners need to be better taught the patterns that influence and help to predict mid-vowel production. Learners also need to be taught to notice and learn vowel qualities in individual words that do not follow a predictable pattern of pronunciation. Therefore, qualities of the vowels contained in many words will need to be memorized individually.

Appendix A

Instructions for Recordings in Brazil

Instruções para a gravação das frases:

1. Leia a primeira frase para si mesmo silenciosamente.
Leia-a novamente em voz alta com a maior naturalidade possível.
3. Repita esses dois passos para as frases restantes.
--Se, durante a leitura, ocorrer algum problema (erros, risos, etc.), não se preocupe; apenas comece novamente a leitura da frase.

Antes de começar, diga seu nome, idade, profissão, e lugar de nascimento.

1. A nossa avó fez um bolo bem gostoso.
2. Se eu fosse cantora, eu cantaria bossa-nova.
3. A neta puxou o bigode do avô.
4. Ela fritou um filé com cebola na panela.
5. Ele tem cabelo preto.
6. A terra é boa para o plantio da soja.
7. Posso usar o telefone do seu sogro agora?
8. Nós concordamos com um terço do termo de compromisso.
9. A serra tirou o pó da rocha.
10. O povo nobre do Brasil tem fé.
11. A dona do bar pode fazer um café para você na hora.
12. Ela estava com pressa, e não pôde ver a novela ontem.
13. Ricardo tirou nota dez na tese.
14. A porta do dormitório da minha sogra está fechada.
15. É bom andar a pé na relva.
16. O homem maldoso foi preso.
17. Para tornar-se sócio, é necessário um depósito de dez reais.
18. Nove soldados foram usados na defesa de nosso castelo.
19. O troco está no bolso do garoto.
20. A moto roda desde 1977.
21. O homem tosse seco por causa da tuberculose.
22. Esta é a mesa do conselho de curso.
23. A cobra ficou com a boca aberta e engoliu a mosca.
24. Aquela é uma morena exótica e charmosa.
25. O soldado estava em seu posto, imóvel e sólido.
26. Este romance tem um trecho malicioso.
27. Era ela que estava na espera do telefonema.
28. O espelho refletia a tristeza marcada na testa.
29. Este rapaz é metuculoso e tem boa cabeça.
30. Leva logo o remédio porque o menino está com febre.

31. A carne na grelha parece ser gostosa.
32. Roberto ganhou uma maravilhosa esmeralda como dote de casamento.
33. O banco nos fez um empréstimo muito alto.
34. A famosa baronesa anda sempre na moda.
35. Tenha dó do cachorro mimoso.
36. A nobreza e o seu famoso príncipe participaram do jantar ontem.
37. Fui fazer a troca da mesa na loja de móveis.
38. Meu neto quebrou o fecho da janela do prédio.
39. O novelo de lã estava perto da vela de cera.
40. A professora tem um modo especial de ensinar.
41. O pai sentiu ódio da careta do filho.
42. A sobremesa é servida após o almoço.
43. Eu quero que você pegue o óleo na cozinha.
44. Aquela senhora fez promessa para sarar de uma doença no olho.
45. As pessoas que assistem às óperas são seletas.
46. O médico fez um projeto de pesquisa em oftalmologia.
47. O lema do Brasil é ordem e progresso.
48. A carta traz um selo valoroso.

Escolha um ou mais dos tópicos abaixo e exponha suas idéias sobre ele(s) em alguns minutos.

1. Qual deveria ser o papel do governo na vida das pessoas?
2. Há alguma coisa que deveria ser mudada no sistema de educação no Brasil?
3. A pobreza e a violência no Brasil têm solução?
4. Quais são as suas lembranças mais marcantes da juventude?

Appendix B

Phonetic representations of vowels analyzed (ɔ, o, ε, e)

Note: These vowels are only being analyzed when:
 They are found in the stressed syllable of the word.
 They are not nasalized.

1. A nossa avo fez um bolo bem gostoso.
2. Se eu fosse cantora, eu cantaria bossa-nova.
3. A neta puxou o bigode do avo.
4. ela fritou um file com cebola na panela.
5. ele tem cabelo preto.
6. A terra e boa para o plantio da soja.
7. Possu usar o telefone do seu sogro agora?
8. Nos concordamos com um terço do termo de compromisso.
9. A serra tirou o po da rocha.
10. O povo nobre do Brasil tem fez.
11. A dona do bar pode fazer um cafe para voce na hora.
12. ela estava com pressa, e não pôde ver a novela ontem.
13. Ricardo tirou nota dez na tese.
14. A porta do dormitorio da minha sogra está fechada.
15. e bom andar a pe na relva.
16. O homem maldoso foi preso.
17. Para tornar-se socio, e necessário um deposito de dez reais.
18. Nove soldados foram usados na defesa de nosso castelo.
19. O troo está no bolso do garoto.
20. A moto roda desde 1977. (Mil novecentos e noventa e sete)
21. O homem tosse seco por causa da tuberculose.
22. esta e a mesa do conselho de curso.
23. A cobra ficou com a boca aberta e engoliu a mosca.
24. Aqela e uma morena exotica e charmosa.
25. O soldado estava em seu posto, imovel e solido.
26. este romance tem um treocho malicoso.
27. era ela que estava na espera do telefonema.
28. O espelho refletia a tristeza marcada na testa.
29. este rapaz e metoculoso e tem boa cabeça.
30. Leva logo o remedio porque o menino está com febre.
31. A carne na grelha parece ser gostosa.

32. Roberto ganhou uma maravilhosa esmeralda como dote de casamento.
33. O banco nos fez um empréstimo muito alto.
34. A famosa baronesa anda sempre na moda.
35. Tenha do do cachorro mimoso.
36. A nobreza e o seu famoso príncipe participaram do jantar ontem.
37. Fui fazer a troca da mesa na loja de móveis.
38. Meu neto quebrou o fecho da janela do prédio.
39. O novelo de lã estava perto da vela de cera.
40. A professora tem um modo especial de ensinar.
41. O pai sentiu odio da careta do filho.
42. A sobremesa é servida após o almoço.
43. Eu quero que você pegue o óleo na cozinha.
44. Aquele senhora fez promessa para sarar de uma doença no olho.
45. As pessoas que assistem às operas são seletas.
46. O médico fez um projeto de pesquisa em oftalmologia.
47. O lema do Brasil é ordem e progresso.
48. A carta traz um selo valoroso.

Appendix C

Instructions for Recordings of Test Subjects

- Please state your name and age.
- Read each sentence one time.
- If you feel you have made a mistake, feel free to go back to the word or phrase in question and continue from that point.
(You don't need to repeat the entire sentence.)

1. A nossa avó fez um bolo bem gostoso.
2. Se eu fosse cantora, eu cantaria bossa-nova.
3. Ela fritou um filé com cebola na panela.
4. Posso usar o telefone do seu sogro agora?
5. Nós concordamos com um terço do termo de compromisso.
6. O povo nobre do Brasil tem fé.
7. A dona do bar pode fazer um café para você na hora.
8. Ela estava com pressa, e não pôde ver a novela ontem.
9. Ricardo tirou nota dez na tese.
10. É bom andar a pé na relva.
11. O homem maldoso foi preso.
12. Para tornar-se sócio, é necessário um depósito de dez reais.
13. O troco está no bolso do garoto.
14. Esta é a mesa do conselho de curso.
15. Aquela é uma morena exótica e charmosa.
16. O soldado estava em seu posto, imóvel e sólido.
17. Este romance tem um trecho malicioso.
18. O espelho refletia a tristeza marcada na testa.
19. Este rapaz é meticoloso e tem boa cabeça.
20. Ele tem cabelo preto.
21. A carne na grelha parece ser gostosa.
22. O banco nos fez um empréstimo muito alto.
23. Tenha dó do cachorro mimoso.
24. O pai sentiu ódio da careta do filho.
25. A professora tem um modo especial de ensinar.
26. A sobremesa é servida após o almoço.
27. Eu quero que você pegue o óleo na cozinha.
28. A cobra ficou com a boca aberta e engoliu a mosca.

Appendix D

Mid-Vowels Analyzed for Production Test

ɛ	e	ɔ	o	
	1	2	2	A n <u>o</u> ssa av <u>o</u> f <u>e</u> z um b <u>o</u> lo bem gost <u>o</u> so.
		2	2	Se eu f <u>o</u> sse cant <u>o</u> ra, eu cantaria b <u>o</u> ssa-n <u>o</u> va.
3			1	ela fritou um fil <u>e</u> com ceb <u>o</u> la na pan <u>e</u> la.
		2	2	P <u>o</u> ssu usar o telef <u>o</u> ne do seu sogr <u>o</u> agr <u>o</u> ?
	2	1		N <u>o</u> s concordamos com um t <u>e</u> r <u>ç</u> o do t <u>e</u> r <u>m</u> o de comprom <u>i</u> ss <u>o</u> .
1		1	1	O p <u>o</u> vo n <u>o</u> bre do Brasil tem f <u>e</u> .
1	2	2	1	A d <u>o</u> na do bar p <u>o</u> de faz <u>e</u> r um caf <u>e</u> para vo <u>e</u> na h <u>o</u> ra.
3	1		1	ela estava com p <u>r</u> essa, e n <u>o</u> p <u>o</u> de v <u>e</u> r a nov <u>e</u> la ontem.
2		1		Ricardo tirou n <u>o</u> ta d <u>e</u> z na t <u>e</u> se.
3				u <u>e</u> bom andar a p <u>e</u> na r <u>e</u> lva.
	1	1	1	O h <u>o</u> mem mald <u>o</u> so foi p <u>r</u> eso.
2		2		Para tornar-se s <u>o</u> cio, u <u>e</u> necess <u>o</u> rio um dep <u>o</u> sito de d <u>e</u> z reais.
			3	O t <u>r</u> oco est <u>a</u> no b <u>o</u> lso do gar <u>o</u> to.
1	2			est <u>a</u> u <u>e</u> a m <u>e</u> sa do consel <u>h</u> o de curso.
2		2		Aq <u>e</u> la u <u>e</u> uma morena ex <u>o</u> tica e charm <u>o</u> sa.
		2	1	O soldado estava em seu p <u>o</u> sto, im <u>o</u> vel e s <u>o</u> lido.
	2		1	est <u>e</u> romance tem um t <u>r</u> echo malic <u>o</u> so.
1	2			O esp <u>e</u> lho refletia a tristeza marcada na t <u>e</u> sta.
1	2		2	est <u>e</u> rapaz u <u>e</u> meticul <u>o</u> so e tem b <u>o</u> a cabe <u>ç</u> a.
	3			ele tem cabelo p <u>r</u> eto
1	2	1		A carne na g <u>r</u> elha p <u>a</u> re <u>e</u> s <u>e</u> r gost <u>o</u> sa.
1	1		1	O banco n <u>o</u> s f <u>e</u> z um empr <u>e</u> stimo muito alto.
		1	2	Tenha d <u>o</u> do cachorr <u>o</u> mim <u>o</u> so.
	1	1		O pai sentiu <u>o</u> dio da care <u>t</u> a do filho.
		1	1	A profess <u>o</u> ra tem um m <u>o</u> do especial de ensinar.
	1	1	1	A sobrem <u>e</u> sa u <u>e</u> servida ap <u>o</u> s o almo <u>ç</u> o.
2	2	1		eu q <u>e</u> ro que vo <u>e</u> p <u>e</u> gue o <u>o</u> leo na cozinha.
1		1	2	A c <u>o</u> bra ficou com a b <u>o</u> ca ab <u>e</u> rta e engoliu a m <u>o</u> sca.
25	25	25	25	Totals

Appendix E

Answer Sheet for Perception Test

		Open [ɔ]	Closed [o]
1	p <u>ô</u> de		
2	mos <u>ca</u>		
3	o <u>d</u> io		
4	met <u>ic</u> ulo <u>so</u>		
5	ag <u>o</u> ra		
6	pe <u>so</u> as		
7	gar <u>o</u> to		
8	bo <u>l</u> o		
9	tele <u>f</u> one		
10	s <u>ó</u> cio		
11	no <u>ss</u> a		
12	mal <u>ic</u> io <u>so</u>		
13	po <u>v</u> o		
14	po <u>d</u> e		
15	no <u>t</u> a		
16	ex <u>ó</u> tica		
17	tro <u>c</u> o		
18	fo <u>s</u> se		
19	bo <u>ss</u> a		
20	im <u>ó</u> vel		
21	gost <u>o</u> sa		
22	no <u>s</u>		
23	mim <u>o</u> so		
24	po <u>ss</u> o		
25	profess <u>o</u> ra		
26	mo <u>d</u> o		
27	bo <u>c</u> a		
28	tro <u>c</u> a		

		Open [ɛ]	Closed [e]
29	em <u>pr</u> éstimo		
30	tr <u>e</u> cho		
31	cab <u>e</u> ça		
32	f <u>e</u> z		
33	fil <u>e</u>		
34	pan <u>e</u> la		
35	t <u>e</u> se		
36	v <u>e</u> r		
37	peg <u>e</u>		
38	voc <u>e</u>		
39	ter <u>ç</u> o		
40	caf <u>e</u>		
41	pr <u>e</u> ssa		
42	trist <u>e</u> za		
43	sobrem <u>e</u> sa		
44	p <u>e</u>		
45	<u>e</u> la		
46	gr <u>e</u> lha		
47	<u>e</u> sta		
48	pr <u>e</u> so		
49	aqu <u>e</u> la		
50	pr <u>e</u> to		
51	faz <u>e</u> r		
52	d <u>e</u> z		
53	f <u>e</u>		
54	<u>e</u> le		
55	conselh <u>o</u>		
56	t <u>e</u> sta		

Appendix F

Detailed Beginners Perception Results

[ɔ]/[o]

<u>Tokens</u>	<u>Subjects</u>										Total
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	
pôde	x			x	x	x		x	x	x	70%
mosca		x	x		x	x	x	x	x		90%
ódio	x	x	x	x	x	x		x	x	x	90%
meticuloso				x	x	x	x		x	x	60%
agora	x	x		x	x	x	x		x	x	80%
peçoas	x	x	x	x	x		x	x	x	x	90%
garoto	x	x			x	x	x	x		x	70%
bolo		x	x	x	x	x	x		x		70%
telefone				x	x	x		x	x	x	60%
sócio	x	x	x	x		x	x	x		x	80%
nossa	x		x		x					x	40%
malicioso		x	x	x	x	x	x		x		70%
povo		x			x	x	x		x	x	60%
pode		x	x	x			x				40%
nota		x	x	x		x	x	x		x	70%
exótica	x	x	x	x	x	x		x	x	x	90%
troco	x	x	x	x	x	x				x	70%
fosse			x	x	x	x	x	x	x	x	80%
bossa	x				x	x	x	x	x	x	70%
imóvel	x	x	x	x	x	x		x	x	x	90%
gostosa	x	x	x	x	x	x		x	x	x	90%
nos				x			x				20%
mimoso		x	x	x	x	x	x		x		70%
posso	x	x		x				x		x	50%
professora	x	x	x		x		x	x	x	x	80%
modo		x	x					x	x	x	50%
boca	x	x			x		x	x	x	x	70%
troca	x	x	x	x	x	x	x	x	x	x	100%
# Correct	16/28	21/28	18/28	20/28	22/28	20/28	18/28	18/28	20/28	22/28	195/280
% Correct	57%	75%	64%	71%	79%	71%	64%	64%	71%	79%	70%

[ɛ]/[e]

<u>Tokens</u>	<u>Subjects</u>										Total
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	
empréstimo	x	x	x		x	x	x	x	x		80%
trecho	x	x			x	x	x	x	x		70%
cabeça		x	x	x	x		x	x		x	70%
fez	x				x		x	x	x	x	60%
filé	x	x	x	x	x	x		x	x	x	90%
panela	x		x			x	x	x	x	x	70%
tese	x	x		x	x		x	x	x		70%
ver	x	x		x	x				x		50%
pegue	x	x		x		x		x		x	60%
você		x	x		x	x	x		x	x	70%
terço		x		x	x			x	x		50%
café	x	x	x		x	x	x	x	x		80%
pressa	x	x		x	x		x		x	x	70%
tristeza		x	x			x		x			40%
sobremesa					x	x	x		x	x	50%
pé	x	x	x		x	x	x		x		70%
ela	x	x	x	x	x	x	x	x	x	x	100%
grelha	x	x		x		x	x		x		60%
esta	x	x	x	x	x	x	x	x		x	90%
preso			x	x	x	x	x	x	x		70%
aquela	x			x	x	x	x	x		x	70%
preto	x		x		x	x	x	x	x		70%
fazer		x		x	x			x		x	50%
dez	x		x	x	x			x		x	60%
fê	x	x	x	x	x	x	x	x	x	x	100%
ele	x	x	x	x	x	x		x	x	x	90%
conselho		x			x	x					30%
testa	x				x	x	x	x	x	x	70%
# Correct	20/28	20/28	15/28	16/28	24/28	20/28	19/28	21/28	20/28	16/28	191/280
% Correct	71%	71%	54%	57%	86%	71%	68%	75%	71%	57%	68%

Appendix G

Detailed Advanced Learners Perception Results

[ɔ]/[o]

Tokens	Subjects										Total
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	
pôde		x	x	x		x	x	x		x	70%
mosca	x	x	x			x	x	x	x	x	80%
ódio	x	x	x	x	x	x	x	x	x	x	100%
meticuloso	x	x	x	x			x	x	x	x	80%
agora	x	x	x	x	x	x	x	x	x	x	100%
pessoas	x	x	x		x	x	x	x	x	x	90%
garoto	x		x				x	x	x	x	60%
bolo	x	x	x	x	x	x	x			x	80%
telefone	x		x		x	x		x		x	60%
sócio	x	x		x	x	x	x		x	x	80%
nossa	x	x				x	x	x	x	x	70%
malicioso		x	x	x		x	x	x	x	x	80%
povo	x	x			x	x	x	x		x	70%
pode	x	x	x	x		x	x	x	x	x	90%
nota	x		x	x	x		x		x	x	70%
exótica	x	x	x	x		x	x	x	x	x	90%
troco	x	x	x	x	x	x			x	x	80%
fosse	x	x		x	x	x	x	x	x	x	90%
bossa	x	x	x	x	x				x	x	70%
imóvel	x	x	x	x	x	x	x	x		x	90%
gostosa	x	x		x		x	x	x	x	x	80%
nos			x	x			x		x	x	50%
mimoso	x	x	x	x		x	x	x	x	x	90%
posso	x	x	x					x	x	x	60%
professora	x	x	x	x	x		x	x	x		80%
modo			x	x	x		x	x	x	x	70%
boca		x	x	x			x		x	x	60%
troca	x	x		x	x	x	x	x	x	x	90%
# Correct	23/28	23/28	22/28	21/28	15/28	19/28	24/28	21/28	23/28	27/28	217/280
% Correct	82%	82%	79%	75%	54%	68%	86%	75%	82%	96%	78%

[ɛ]/[e]

<u>Tokens</u>	<u>Subjects</u>										Total
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	
empréstimo	x	x	x	x		x	x	x	x	x	90%
trecho	x	x	x	x	x	x	x	x	x	x	100%
cabeça	x	x	x	x			x	x	x	x	80%
fez	x	x	x	x		x	x	x		x	80%
filé	x	x	x	x		x	x	x	x	x	90%
panela	x	x	x	x			x	x		x	70%
tese	x	x	x				x			x	50%
ver	x	x				x	x	x	x		60%
pegue	x	x	x			x	x	x	x	x	80%
você		x			x	x	x	x	x	x	70%
terço	x	x		x		x	x	x	x		70%
café	x	x		x		x	x	x	x	x	80%
pressa	x	x	x	x	x			x		x	70%
tristeza	x	x	x		x	x	x	x		x	80%
sobre mesa	x	x	x				x	x		x	60%
pé	x	x	x	x		x	x	x	x	x	90%
ela	x	x	x	x	x	x	x	x	x	x	100%
grelha	x	x	x	x	x	x	x	x	x	x	100%
esta	x	x	x	x		x	x	x	x	x	90%
preso	x	x	x	x		x	x	x		x	80%
aquela	x	x	x	x		x	x		x	x	80%
preto	x	x	x		x		x	x		x	70%
fazer	x	x		x		x	x		x	x	70%
dez	x	x		x			x		x		50%
fê	x	x		x		x	x	x	x	x	80%
ele	x	x	x	x	x	x	x	x	x	x	100%
conselho	x	x	x	x			x	x		x	70%
testa	x	x	x	x	x	x	x	x		x	90%
# Correct	27/28	28/28	21/28	21/28	9/28	20/28	27/28	24/28	18/28	25/28	220/280
% Correct	96%	100%	75%	75%	32%	71%	96%	86%	64%	89%	79%

Appendix H

Approval to Conduct Study

INSTITUTIONAL REVIEW BOARD
FOR HUMAN SUBJECTS



July 15, 2003

Richard Kendall
1038 South 250 West #B
Provo, UT 84601

Dear Richard:

Thank you for your recent correspondence concerning your protocol entitled "The Perception and Production of Portuguese Mid-Vowels by Native Speakers of American English." The research appears to pose minimal risk to human subjects and meets the Federal guidelines.

You are approved to begin your research. This approval is good for a maximum of one year, at which time, and sooner as need arises, the study will be reviewed again if the work is still in progress. Enclosed is a date stamped consent form. Please use this in obtaining consent. We will be sending a continuing review form before the expiration date. Please fill this form out in a timely manner to insure that there is not a lapse in your approval.

Please notify Nancy Davis, (801) 422-2970, A-261 ASB, of any changes made in the instruments, consent form, or research process before instigating the alterations, so that we can approve them.

If you have any questions, please let us know. We wish you well with your research!

Sincerely,

Dr. Shane S. Schulthies, Chair /
Nancy A. Davis, CIM, Administrator
Institutional Review Board for Human Subjects
SSS/sgf

Enclosure

Appendix I

Student Consent Form

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Consent Form

This survey is being conducted by Richard Kendall, MA candidate from the BYU Department of Spanish and Portuguese. The study will determine the ability of students to perceive and produce certain vowel sounds in the Portuguese Language.

Participants will be volunteers who meet certain linguistic requirements. These volunteers will be from both beginning and advanced Portuguese courses taught in Fall 2003. Ten advanced students and ten beginning students will be selected. Also, five native Portuguese speakers will be involved in the study.

The survey consists of students listening to fifty tokens of vowel occurrences in pre-recorded speech. The subjects will determine the vowel classification of each token. The subjects will also read thirty sentences which will be evaluated for correctness of vowel quality. The entire study should take less than one hour to complete.

There are minimal risks are minimal to participants in the study. Involvement in this research project is voluntary. You may withdraw at any time without penalty or refuse to participate entirely. There will be no reference to your identification at any point in the research. If you have questions regarding this study you may contact Richard Kendall, Researcher at (801) 636-1212 or Dr. Willis Fails, at (801) 422-3452.

If you have questions regarding your rights as a participant in research projects, you may contact Dr. Shane S. Schulthies, Chair of the Institutional Review Board for Human Subjects, 120B RB, Brigham Young University, Provo, UT 84602; phone, (801) 422-5490.

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