

Lateral Liquid Velarization in L1 Spanish/L2 English Phonology

Javier Dueñas
Research Project for LIN 5211
Linguistics Program
Florida International University

Email: javier.duenas@mdc.edu
Phone: (954) 376-9242

Abstract

Second Language Acquisition research has long recognized the importance of L1 phonological transfer in the interlanguage of second language learners and bilinguals. Likewise, the prevalence of velarized lateral liquids, also known as “dark” /l/, in syllable-final position for speakers of Standard American English has been well-documented. However, the degree of velarization present in the interlanguage of L1 Spanish-L2 English speakers has yet to be fully explored. The current project aims to shed light on the interaction of L1 transfer of the Spanish clear /l/ on the production of the dark /l/ target in Standard American English. The results of such research can be expected to have specific application in the field of Second Language Acquisition as well as the pedagogy of accent-reduction.

Introduction

Roy Major’s 2001 publication on Second Language phonology, Foreign Accent, mentions a velarized alveolar lateral approximant /l/, transcribed as [ɫ], that is produced by English speakers in coda position.² The available literature on velarized alveolar lateral approximants generally maintains this coda position restriction although some of the literature regarding the articulatory and acoustic properties of the dark [ɫ] have asserted that this allophone exhibits varying degrees of velarization across all the positions allowed by English syllable-structure in the dialects of Standard American English.² Onset position displays the least amount of velum raising, a rather “clearer” [ɫ], while coda position yields the darkest [ɫ].⁵ Thus, to amend Major’s observations in this respect, it should be clarified that syllable-initial position is less susceptible to velum raising, producing a “clearer” /l/, while syllable-final position, being more susceptible to

velum raising, yields the darkest /l/. One popular source attributes the perceived darkness of this [ɫ] allophone to other secondary articulation such as uvularization or pharyngealization rather than attributing it strictly to velarization.³ However, for purposes of the present study, all such distinctions will be collapsed into the category of “velarized” or “dark [ɫ],” with a caveat that further research into the relative place of articulation for dark [ɫ] may contribute data that could enhance the results of this study.

While describing the effects of perception on the interlanguage of speakers, Major also observes that the production of an L2 target is highly dependent on the L1 perceptual system of the speaker (Major 52). Thus, for the production of the [ɫ] allophone in Standard American English, an L1 Spanish-L2 English speaker can be expected to transfer the Spanish clear /l/ rather than producing the target [ɫ]. The pedagogy of accent reduction generally disregards such distinctions, as well as other allophonic alternants, possibly due to a lack of saliency or relevance. Consequently, the production of this off-target allophone is a relatively unexplored aspect of what may be termed the “Spanish accent” of the interlanguage of such speakers, despite the impression of a foreign accent that a complex of faulty, off-target pronunciations would communicate to a native listener.

The primary aim of this study is to analyze the formant frequencies of the /l/ allophones of the interlanguage of L1 Spanish-L2 English speakers in different stages of the L2 language acquisition process. Specifically, this study seeks to answer the following questions:

1. What is the typical range of formant frequency for Spanish lateral liquids produced in onset and coda position with front/back vowels by both male and female native speakers?
2. What is the typical range of formant frequency for English lateral liquids produced in onset and coda position with front/back vowels by both male and female native speakers?
3. What is the typical range of formant frequencies for English lateral liquids produced in onset and coda position with front/back vowels in the interlanguage of male and female bilingual L1 Spanish-L2 English speakers?
4. Does the height, back/front distinction, tense/lax distinction, or rounding of the preceding/ following vowels affect the darkness of the /l/ allophone?
5. Is there a correspondence between the degree of darkness of the /l/ allophone and the stage of L2 English acquisition achieved by L1 Spanish speakers?
6. What is the threshold for perception of velarization or lack thereof by monolingual speakers?

The expectation here is that L1 transfer impacts the darkness of the [ɫ] allophone in the interlanguage of the test subjects to varying degrees, roughly corresponding to the degree of L2 acquisition by the speaker. Analysis of the average and mean frequencies of the second formant (F2) is expected to provide acoustic evidence for this, as there is evidence that apical laterals with secondary narrowing at the back exhibit the lowest F2 frequencies among laterals.¹ Monolingual Spanish speakers are likely to exhibit the clearest [ɫ] allophones in both onset and coda position, while monolingual American

English speakers are likely to produce the darkest [ɫ] allophones in coda position following rounded, back vowels. The amount of deviation from these opposing targets is additionally expected to provide some evidence of a threshold for a listener's perception of an L2 English speaker's foreign accent, an observation which may provide valuable in accent reduction pedagogy and clinical applications.

Participants:

Participants for the study consisted of 42 male and female L1 Spanish-L1 English speakers, drawn on a voluntary basis from the English for Academic Purposes second language program of Miami-Dade College, Hialeah Campus (2 males/13 females from Levels I & II, 3 males/11 females from Levels III & IV, and 8 males/5 females from Levels 5 & 6), as well as one monolingual English speaker from the Miami area and two monolingual Spanish speakers from Bogota, Colombia. Test subjects were profiled for current level designation in the EAP program, gender, number of years in the United States, past cities of residence in the United States, and self-perception of skill and comfort level in English. No female monolingual English speakers were available for participation at the time of this study, and some difficulty was encountered in recruiting sufficient volunteers in each category, particularly in the category of "Beginning Males" due to the low ratio of male students in the English for Academic Purposes program and a general reluctance or apprehension on behalf of most students. Given sufficient time, additional volunteers can be obtained if needed. However, sufficient volunteers were obtained at the time of this study to begin making observations and generalizations

regarding the acquisition of velarized liquids and the degree to which this acquisition is observable in students of English as a second language.

Materials:

A portable I-River mp3 recorder was used to collect sample audio recordings for spectrographic analysis on the Speech Analyzer 2.7 software available from SIL International. The samples consisted of test subjects reciting a list of monosyllabic and multi-syllabic words containing the [l] target in onset position before front/back/high/low vowels and the /l/ target in coda position after front/back/high/low vowels. A comparable list of words in Spanish was created for the Spanish samples. The data was then compiled and analyzed, using Microsoft Excel to generate charts and group results.

Methods:

This study was structured in three distinct stages. In the first stage, subjects were given a confidentiality agreement. After that, they completed a brief questionnaire regarding their current level in the EAP program of Miami-Dade College, age, gender, years of residence in the United States, past cities of residence in the United States, self-perception of skill in English, and self-perception of comfort in English, for purposes of demographic analysis. Then they were asked to recite the following list of bi-syllabic words containing the [l] target in onset and coda position:

English Target Word List

Bisyllabic Words with Lateral in Onset Position	Bisyllabic Words with Lateral in Coda Position
<p>[i] liter</p> <p>[l] litter</p> <p>[ɛ] letter</p> <p>[u] loser</p> <p>[ou] loner</p> <p>[ɔ] lawyer</p> <p>[a] locker</p>	<p>[i] dealer</p> <p>[l] killer</p> <p>[ɛ] seller</p> <p>[u] cooling</p> <p>[ou] bowling</p> <p>[ɔ] falling</p>

To provide a reference point for the study, a monolingual native English speaker was asked to recite the same list and short text. Native Spanish speakers were asked to recite the following target word list containing [l] targets in the nearest comparable environments to those of the English list, given the particular phonology of each language:

Spanish Target Word List

Bisyllabic Words with Lateral in Onset Position	Bisyllabic Words with Lateral in Coda Position
<p>[i] listo</p> <p>[ɛ] lejos</p> <p>[u] luce</p> <p>[o] loco</p> <p>[a] lago</p>	<p>[i] filtro</p> <p>[ɛ] sueldo</p> <p>[u] dulce</p> <p>[o] bolsa</p> <p>[a] falda</p>

These productions were recorded on the digital mp3 recorder and analyzed on the Speech Analyzer 2.7 software as available. During the second stage of the study, which was not only partially realized in the current study, native English speakers were asked to qualitatively evaluate some of the recordings of the target sounds on a scale of one to five (1=poor, 2=somewhat poor, 3=unable to rate, 4=somewhat good, and 5=good) with

respect to a detectable foreign accent. The resulting data from both of these stages was catalogued and analyzed during the third stage of the study, where results were compared and conclusions drawn from the data collected.

Results:

Analysis of the data collected yielded various examples of the typical characteristics of lateral liquids described by Olive in Acoustics of American English Speech (215). A discontinuity was noted in the F2 and F3 formants for lateral onsets followed by [i] (see file# Voice069, monolingual male) as well as before lateral codas following [I] (see file# Voice059 and Voice060), and laterals exhibiting the characteristics for both the dark [ɫ] and clear [l] allophones appeared in intervocalic position between back and non-back vowels (i.e. “cooling,” and “falling”). However, it is important to note that, in most cases, the second formant was consistently higher than the norms established for both English laterals and Spanish laterals.

- [Table 1](#) – Comparison of Laterals in Onsets Produced by Female Subjects
- [Table 2](#) – Comparison of Laterals in Codas Produced by Female Subjects
- [Table 3](#) – Comparison of Laterals in Onsets Produced by Male Subjects
- [Table 4](#) – Comparison of Laterals in Codas Produced by Male Subjects

As expected, the formants of the laterals produced by the Advanced students came close to the formants recorded for the monolingual English control group and the averages listed by Yavas (122), and there is a definite correlation between the student’s

level in the English for Academic Purposes program and his/her degree of velarization of the lateral. There also seems to be a correlation between the backness of the vowel and frequency of the second formant. Likewise, the difference in F2 frequency of monolinguals versus bilinguals decreases in the presence of back vowels.

Discussion:

1. What is the typical range of formant frequency for Spanish lateral liquids produced in onset and coda position with front/back vowels by both male and female native speakers?

Women

Lateral onset with non-back vowels:

F1 = 528 Hz
F2 = 1928 Hz
F3 = 3130 Hz

Lateral coda with non-back vowels:

F1 = 383 Hz
F2 = 1010 Hz
F3 = 2185 Hz

Lateral onset with back vowels:

F1 = 396 Hz
F2 = 1385 Hz
F3 = 2486 Hz

Lateral coda with back vowels:

F1 = 422 Hz
F2 = 1412 Hz
F3 = 2987 Hz

Men

Lateral onset with non-back vowels:

F1 = 362 Hz
F2 = 1796 Hz
F3 = 2896 Hz

Lateral coda with non-back vowels:

F1 = 373 Hz
F2 = 1747 Hz
F3 = 3227 Hz

Lateral onset with back vowels:

F1 = 340 Hz
F2 = 1621 Hz
F3 = 3092 Hz

Lateral coda with back vowels:

F1 = 366 Hz
F2 = 1633 Hz
F3 = 2963 Hz

2. What is the typical range of formant frequency for English lateral liquids produced in onset and coda position with front/back vowels by both male and female native speakers?

Women*

Lateral onset with non-back vowels:

F1 = 360 Hz

F2 = 1300 Hz

F3 = 2500 Hz

Lateral coda with non-back vowels:

F1 = 360 Hz

F2 = 1300 Hz

F3 = 2500 Hz

Lateral onset with back vowels:

F1 = 360 Hz

F2 = 1300 Hz

F3 = 2500 Hz

Lateral coda with back vowels:

F1 = 360 Hz

F2 = 1300 Hz

F3 = 2500 Hz

Men

Lateral onset with non-back vowels:

F1 = 418 Hz

F2 = 1392 Hz

F3 = 2236 Hz

Lateral coda with non-back vowels:

F1 = 503 Hz

F2 = 1305 Hz

F3 = 2265 Hz

Lateral onset with back vowels:

F1 = 399 Hz

F2 = 1260 Hz

F3 = 2252 Hz

Lateral coda with back vowels:

F1 = 427 Hz

F2 = 921 Hz

F3 = 2770 Hz

*NOTE: Due to a lack of female, monolingual English speakers in the study, the figures listed are taken from Applied English Phonology by Yavas.

3. What is the typical range of formant frequencies for English lateral liquids produced in onset and coda position with front/back vowels in the interlanguage of male and female bilingual L1 Spanish-L2 English speakers?

Answer:

See Tables 1-4 for Formant Frequency Comparison

4. Does the height, back/front distinction, tense/lax distinction, or rounding of the preceding/ following vowels affect the darkness of the /l/ allophone?

Answer:

The backness of the neighboring vowel segment does seem to affect the formant frequencies. The first formant (F1), corresponding the resonance of the lateral, is typically lower with non-back vowels than with back vowels, possibly resulting from the difference between sub-glottal and supra-glottal pressure during production. Vowel height also seems to have an effect on lowering the second formant (F2). Low vowels, particularly low, back vowels, tend to have lower F2 values than high or high-non-back vowels.

5. Is there a correspondence between the degree of darkness of the /l/ allophone and the stage of L2 English acquisition achieved by L1 Spanish speakers?

Answer:

Yes, there is a strong correlation between level in the EAP program and production of the [l] / [ɫ] English target.

6. What is the threshold for perception of velarization or lack thereof by monolingual speakers?

Answer:

Insufficient time was allowed for exploration of this topic. Results are incomplete and inconclusive at the time of this study.

Given the fact that low F2 frequencies are considered typical for the Standard American English dark [ɫ], the common occurrence of higher than expected F2 frequencies in the speech of bilingual Spanish/English speakers in many instances suggests a possible contributing factor for the perception of a Spanish accent in these speakers. Additionally, in “Assessing Constraints on Second-Language Segmental Production and Perception,” James Emil Flege claims that, “When a new category is established in a portion of phonetic space occupied by an L1 sound, the new L2 category and the pre-existing L1 category may dissimilate from one another. If this happens, neither the L1 category nor the L2 category will be identical to the categories possessed by monolinguals.” (p 330) The implication for the current study is that the height of the F2 formant, uncharacteristic of either the English lateral or the Spanish lateral, may be a result of dissimilation.

Flege also notes that the quality of input received by a second-language learner affects his/her production of target sounds. Given the abundance of interlanguage forms encountered in the Miami area and the fact that many of the students in this region are learning English from Spanish-accented or other foreign-accented professors, this is often a matter of concern for students and professors of English as a second language, but

whether for one reason or another, there is no evidence of this occurring in the current study.

Conclusion:

- Concerning the question of dissimilation from Spanish and English laterals, further research into the production of Spanish laterals by L1 Spanish-L2 English bilinguals may be warranted by these results.
- An analysis of the formant frequencies of Beginning, Intermediate, and Advanced students, when compared to the formant frequencies of lateral liquids produced by monolingual Spanish speakers and monolingual English speakers, bears out the conclusion that, at least in the present case of lateral liquids, a segment that is not taught in the pedagogy of any educational system known to this author, the [ɭ] allophone of Standard American English, is being unconsciously integrated by language learners via language contact. Further research may determine whether the type of environment in which this language contact occurs has any effect on the degree of adoption of the [ɭ] allophone by L2 English bilinguals.
- Future research may consider the use of monosyllabic targets to avoid subject errors and off-target responses.

NOTES:

The results of this study are not intended as an evaluation of the efficacy of the program at Miami-Dade College, given the fact that the [ɫ] allophones is not a target that is taught in any system with which the author of this study is familiar, including that of Miami-Dade College. Such students are expected to be largely unaware of a clear [ɫ] versus dark [ɫ] allophonic alternation in Standard American English, making the student body of the EAP Program at Miami-Dade College an ideal candidate for this study. Any amount of velarization of the [ɫ] target, if significantly greater than the mean formant frequencies of the Spanish target, can thus be generally assumed to derive from actual language contact rather than pedagogical methods.

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