La Cruz, Erwin y Saravia, Leyra

* El Mag. La Cruz, es Profesor Agregado de la Escuela de Idiomas Modernos, Facultad de Humanidades y Educación, Universidad de Los Andes, Mérida, Venezuela.
* La Lic. Saravia, es Profesora en los Cursos de Extensión de Inglés de la Universidad del Zulia, Zulia, Venezuela.

Abstract

This paper reports on an attempt to find regularity in patterns in the reduction of syllable final clusters by English L2/Venezuelan Spanish L1 speakers. In previous studies, regularity has already been proved for several languages; however, such studies for Spanish speakers are scarce. We considered three phonological aspects: length of the codas, violation of the sonority scale and the presence of inflectional morphology. Four subjects were asked to record a total of 320 words containing different types of clusters. The results, as expected, showed a preference of short codas over long codas. The presence of inflectional morphemes was also a determiner in coda reduction, with a clear preference for reducing words that had a past tense or plural marker. However, cluster reduction due to violations to sonority scale hierarchy did not produce strong results.

Patterns of regularity in final cluster reduction in L2 English by L1 Spanish speakers

Key words

L2 phonology, English, L2 learning, syllabic structure

Palabras clave

Fonología de lenguas extranjeras, inglés, aprendizaje de lenguas extranjeras, estructura silábica

Resumen

Esta investigación trató de establecer los patrones de regularidad en la reducción de grupos consonánticos a final de palabra en hablantes nativos del español de Venezuela que aprenden inglés como lengua extranjera. En estudios anteriores, se han encontrado patrones de regularidad en varias lenguas; sin embargo, son escasos los estudios sobre este aspecto con hablantes del español. Se consideraron tres aspectos fonológicos: la longitud de las codas, la violación de la escala de sonoridad y la presencia de inflexiones. Participaron cuatro informantes grabando 320 palabras que contenían diferentes tipos de codas. Los resultados, como se esperaba, mostraron una preferencia por las codas cortas. La presencia de morfemas inflexivos también demostró ser determinante en las reducciones de codas, notándose una preferencia por reducir las palabras que tenían una marca de pasado o de plural. Sin embargo, la reducción de los grupos consonánticos debido a violaciones de la jerarquía en escala de sonoridad, no produjo resultados concluyentes.

Introduction

Consonant clusters in a language are regulated by a combination of two factors. The first is "a sonority hierarchy of generalization which determines that syllables are most sonorous at the nucleus and diminish in sonority as distance from the nucleus increases: obstruent → nasal → liquid → glide → vowel → glide → liquid à nasal → obstruent" (Selkirk,1982, cited in Osburne, 1996, p.165); and the second one is a "multivalued parameter which relates to a minimal degree of separation in sonority between adjacent consonants in a cluster" (Osburne, 1996, p. 165).

Studies in the production of consonant clusters by native speakers (Barry 1992; Bradley, 2007**;** Dixit and Flege, 1991; Gafos, 2002) have shown that consonants differ depending on their position in the word and on speech rate. In an electropalatographic study of articulatory variation as a function of speech rate in native speakers, Byrd and Tan (1996) found that a consonant's place, manner, and syllabic position were affected as speech rate increased. Two articulatory mechanisms were found at play as a function of speed: an increase in co articulation and a shortening of consonant duration. Although these mechanisms affected most consonants, some coronals (specifically, alveolar) were the most frequently reduced in word final position.

The differences between languages in final cluster structures make this phonological construction very hard to acquire and therefore to produce in L2. One of the main theoretical resources that functions as an explanatory factor for L2 phonological acquisition of interlanguages is that of typological universals. Eckman (1977, cited in James, 1989) used this Markedness Differential Hypothesis to show how a comparison of the typological markedness values of certain sound types in L1 and L2, as established by their occurrence in different word position, may explain the degrees of difficulty learners experience with these particular sound types in the target language. After a research done with L1 English learners of L2 German, he proved that word final clusters are more marked as opposed to word-initial or medial positions, and then, more difficult to capture in the interlanguage (James, 1989).

Another constraint for producing final clusters is their length. Findings indicate that the accuracy in production of word final clusters is higher in shorter codas than it is in longer ones (Hansen, 2001). In the same way, sonority plays an important role as another constraint on the L2 acquisition of sounds in a cluster. In a study of the L2 German of L1 Spanish speakers, it was demonstrated that the final cluster sound positions are acquired in the target language in order of their relative sonority (James, 1989). So nasals /m, n/ and liquids /l, r/ were acquired first, followed by fricatives /s, z, f, v/, while plosives /p, t, k/ were acquired last.

Final cluster reduction in English L2 speakers, the phonological process we focused on during this study, is a very common process in their speech. Some ways of modifying a final cluster are: final cluster reduction (the absence of one or more elements in the coda), epenthesis, and feature changes. Several studies have been carried out in this area; for instance, Weinberger (1987, cited in Hansen, 2001) studied English L2 in Mandarin speakers

and found that their production of word-final clusters was modified by the use of epenthesis, deletion and devoicing. Osburne (1996), in her study of a Vietnamese speaker, found regularity in the process of final cluster reduction. Likewise, Hansen (2001), studied the preferences in the modification of final clusters in English by native Mandarin speakers and the linguistic constrains in L2 acquisition. Previous to these studies, Brasington (1981) had attempted to find in Marshallese "a set of general principles governing the selection of different epenthetic vowels in the process of loan naturalisation" (p. 97). Here he claims that, universally, "in loan phonology epenthesis is natural initially and deletion finally" (p. 100).

In the present study, we hypothesised that, native Spanish L1 speakers, would face difficulties acquiring English L2 word final clusters, given the simpler syllabic structure found in Spanish. In this last language, word final clusters are limited to just single codas (i.e.: just one consonant) at the end of a word; also, a syllable can have a two member coda only word internally, but even in this case, codas are limited to a small number of combinations (mainly in the morphemes: ex- ins-, trans-, cons-). This is in sharp contrast with English, where codas of up to four members can occur word finally. Moreover, in English some codas even violate sonority scale constraints - such as when two fricatives (i.e. fi*fth*, cu*ffs)* or two plosives (i.e. tra*ct*, wor*ked*) occur together, feature that is not found in Spanish. Focusing on these language differences, we aimed to find a pattern of regularity in final cluster reductions in English L2 by Spanish speakers mainly based on three aspects: length (one, two, three and four coda members), the presence of inflectional morphology (mono-morphemic and bi-morphemic word final clusters) and sonority scale. Additionally, the cases in which epenthesis was added were briefly analyzed.

Methodology

Two female and two male native Spanish speakers studying English as a Second Language in the School of Modern Languages at the University of Los Andes were chosen on the following criteria:

1. They were between 22 and 26 years old,
2. They had normal hearing,
3. They had studied English only during secondary school before entering university,
3. They have not lived in a country where the language of daily communication was other than Spanish, and
4. They had taken two specific courses from the syllabi of their major: English IV and English Phonetics and Phonology II.

Throughout the paper the subjects' names are omitted in order to ensure confidentiality. The instrument used for collecting the data was as follows: they were orally given a word in Spanish and they had to say its English equivalent, when the word elicited was not the one required, a synonym was asked and clues were given in Spanish when necessary. These words were topically unrelated, and the number of words elicited by each subject was 80. In total, the instrument contained 320 instances of clusters: 40 words for samples of single codas, 40 for two-member codas, 40 for three-member codas and 20 for four-member codas; likewise, 100 words that had clusters violating the sonority hierarchy and 120 that followed it; and finally, 140 words

with mono-morphemic final clusters and 180 words with bi-morphemic final clusters (representing the presence of inflectional morphology). Some of the words were used for more than one category; for example, the word prefix was used in the list of two-member codas, as a mono-morphemic cluster and in the list of clusters violating the sonority hierarchy. (See the Appendix for the list of words used in the experiment).

The participants were recorded using a desktop computer equipped with an overhead microphone and running the application Praat 4.1.2. Each informant was recorded for approximately 15 minutes. Then the recordings were manually transcribed. The transcriptions were checked by the author and a native speaker of American English.

Results

Given that there were only four participants, and that the number of responses was rather small, we decided to present only descriptive results. From the overall amount of 320 words (80 words by subject) 94 were modified. Individual performances by subject are presented in table 1.

Table 1. Coda modifications

Modification / Subjects	Reduction	Epenthesis	
A 1	16	1	
A2	26	4	
A3	9	0	
A4	25	13	
Total	76 23.75%	18 5.63%	94 (out of 320) 29.4%

A total of 29.4% of the words elicited suffered modification. However, this cannot be considered a high level of inaccuracy in the production of clusters. Nevertheless, comparing the two strategies used for the modification of the cluster, we can observe that the reduction of the codas is much more frequent than the epenthesis, especially because most of these were made by only one of the subjects.

Inflectional Morphology

The 320 words of the data were divided in 140 words with mono-morphemic clusters and 180 words with bi-morphemic clusters. The modifications were made as follows:

Table 2. Coda modifications in mono-morphemic and bi-morphemic clusters

Modification / Subjects	Reduction in Monomorphemic clusters	Epenthesis in Monomorphemic clusters	Reduction in Bi-morphemic clusters	Epenthesis in Bi-morphemic clusters
A 1	7	0	9	1
A2	7	1	19	3
A3	0	0	9	0
A4	11	0	14	13
Total	25	1	51	17

The results show that the presence of a morpheme boundary has an effect on the reduction of codas. Only an 18.6% of the mono-morphemic words were modified, whereas a 37.8% of the bi-morphemic words were reduced.

The extent to which sonority values affected word coda production was also studied based on the scale of sonority values by Hogg and McCully (1987). In the study, 25 codas violated the sonority scale and 30 words did not violate it.

Table 3. Coda modifications by sonority scale

Modification / Subjects	Codas violating Sonority scale	Codas not violating sonority scale
A 1	2	7
A2	7	10
A3	2	1
A4	7	8
Total	18	26

Although the number of coda reductions in those violating the sonority scale is higher, the difference is not significant. However, these results are similar to the ones obtained in the research done by Osburne (1996) in which codas following the sonority hierarchy scale were more likely to be reduced that the ones that violated it.

Length

According to the length of the codas, the words were modified as follows:

Table 4. Coda modifications according to length

Modification / Subjects	Single member coda	Two-member coda	Three-member coda	Four-member coda
A 1	1	3	3	3
A2	0	3	4	5
A3	0	0	2	4
A4	1	2	4	5
Total	2	8	13	17

As we can see in table 4, the results showed that the longer the data, the higher the number of reductions. In the single codas, the reductions were made in bi-morphemic words, probably due to the fact that the subjects had not acquired the phonological rules for the pronunciation of plurals and the past tense of regular verbs in English. The majority of the epenthesis was introduced in words with two-member codas. In clusters with three-member codas the results were more random, but the bi-morphemic words were still more frequently reduced than mono-morphemic words. In four-member codas, reductions were made in almost all words and there is one point of interest in this kind of reduction. The subjects also make reductions in the words where reductions are expected even for native speakers. However, in several cases the sound elided was not the one a native speaker would do, e.g. "texts" was pronounced [tes] and not [teks] as one may expect.

Conclusion

The results of this study have shown that the process of reduction is more regular than random, with a clear preference for shorter codas over longer ones, and with more accuracy in the production of mono-morphemic final clusters than bi-morphemic clusters. A possible reason for this is the high rate of mispronunciations in the plural and regular past tense markers, which may indicate that the learners have not acquired the phonological rules for the pronunciation of plurals and regular past tense.

However, the results in the pattern of sonority are not really enough to determine whether the violation of the sonority scale is a constraint in the production of final clusters. It was already mentioned that the results of this study coincide with those of Osburne (1996); nevertheless, the explanation given by her is that many of the codas violating the sonority scale had the presence of a plural or past tense marker, and that this characteristic made the codas more salient to the subject and hence, less likely to be reduced. However, this does not coincide with the results of our study, since our subjects failed to pronounce correctly bi-morphemic clusters. On the other hand, Tropf (1987) and Carlisle (1991) showed that learners are less likely to modify

codas that follow the sonority hierarchy. One may infer that these contradictory results are due to the fact that cluster reduction is driven by both morphological and phonological factors.

E-mail: erwinlac@ula.ve
E-mail: leyrasmc@gmail.com

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APPENDIX

List of words elicited for the study (the words in italics have a bi-morphemic cluster)

Words containing one member codas:

1. faith
2. rat
3. green
4. sing
5. bread
6. *placed*
7. *keys*
8. *cries*
9. *lied*
10. *boys*

Words containing two member codas:

1. prefix
2. exact
3. month
4. second
5. Christ
6. *rocks*
7. *attacked*
8. *fourteenth*
9. *signed*
10. *expressed*

Words containing three member codas:

1. text
2. attempt
3. sculpt
4. next
5. exempt
6. *jumped*
7. artist
8. *asks*
9. *products*
10. *sends*

Words containing four member codas:

1. *texts*
2. *sixths*
3. *exempts*
4. *attempts*
5. *twelfths*

List of words used to analyze the effect of the sonority scale

Words containing plosive + fricative codas:

1. prefix
2. *rocks*
3. fox
4. takes
5. lapse
6. *cups*
7. relax
8. *looks*
9. *ethics*
10. *traffics*

Words containing plosive + plosive codas:

1. exact
2. *attacked*
3. pact
4. *packed*
5. contract
6. *talked*
7. tact
8. *locked*
9. compact
10. *looked*

Words containing sonorant + fricative codas:

1. rinse
2. *creations*
3. month
4. *fourteenth*
5. pulse
6. *pills*
7. tense
8. *pens*
9. *length*
10. *ninth*

Words containing sonorant + plosive codas:

1. second
2. *signed*
3. cold
4. *called*
5. pound
6. *rained*
7. gold
8. *pulled*
9. cent
10. *can't*

Words containing fricative + plosive codas:

1. list
2. *kissed*
3. gift
4. *laughed*
5. Christ
6. *expressed*
7. rest
8. *closed*
9. east
10. *used*

Words containing fricative + fricative codas:

1. *fifth*
2. *gloves*
3. *briefs*
4. *thruths*
5. *loves*