

**The Spanish Syllable among illiterate adults:
Comparison of the unclear cases in Puerto Rico and Colombia**

Marc L. Schnitzer and Nicholas Faraclas

Universidad de Puerto Rico

Abstract: The anomalous behavior of Spanish [s] relative to other Spanish consonants presents a problem for Spanish syllable division. The occurrence of [s] word internally sometimes forces a choice between a two-consonant coda and a two-obstruent onset, both of which are disallowed at word edge. Previous work by Schnitzer (1999) utilizing illiterate informants suggested an ambisyllabic analysis of such forms. It was impossible to draw firm conclusions on the basis of this work, however, because of the phenomenon of post-nuclear [s] deletion among the informants. This paper reports on a replication of that study, using a population whose speech is not subject to this phenomenon. It is argued that the results of both investigations lend support to an extrasyllabic interpretation of [s] within an autosegmental model.

1. Statement of the problem

The Spanish [s] is a consonant whose phonotactic possibilities are different from all other Spanish consonants. In general, Spanish favors a canonical syllable structure that consists of

- 1) an optional onset consisting of one consonant, or (maximally) an obstruent ([p t k b d g f]) followed by a liquid ([l r]),
- 2) an obligatory nucleus consisting of a vowel, optionally preceded and/or followed by a glide, and
- 3) an optional coda of one consonant.

But [s] does not fit neatly into this pattern. Indeed, Harris (1983) had to postulate 2 kinds of rhymes, as shown in Table 1 (adapted from Harris 1983: 14-15). As he says, "The phoneme /s/ has a special status not shared with any other segments: for every permissible rhyme type . . . not ending in /s/ there is a corresponding permissible s-final type . . . to the maximum length of three segments" (Harris 1983: 15).

Type	Nonfinal	Final	Type	Nonfinal	Final
1. V	pata	tapa	V[s]	pasta	res
2. VG	autor	ley	VG[s]	clauastro	seis
3. VL	salta	mar	VL[s]	perspicaz	vals
4. VN	compra	sartén	VN[s]	monstruo	Mayans
5. VS	segmento	red	VS[s]	abstracto	Félix
6. GV	nuevo	apio	GV[s]	fiesta	pues
7. GVG	--	buey			
8. GVL	fuerte	fiel			
9. GVN	siempre	Juan			
10. GVS	diagnosis	Goliat			

Table 1. Spanish Rhymes*

*Possibilities which Harris cites for which there are no examples are not included

V = vowel, G = glide, L = lateral, N = nasal, S = Stop

In each case, Harris analyses the [s] as belonging to the coda of the preceding syllable, yielding syllables such as *pers*, *mons* and *abs*. In word-final position, the only codas with two consonants are limited to proper nouns and to very exceptional borrowings such as *vals* (the only Spanish word to end in [ls]) and *bíceps* (the only one to end in [ps]).

Harris is here following the traditional analysis, as given for example in the VOX dictionary (1973), which implicitly recognizes the exceptional status of [s] as the only consonant permitted to follow another consonant at the end of a syllable:

Los grupos *pr, pl, br, bl, fr, fl, tr, dr, cr, cl, gr y gl* forman sílaba con la vocal que les sigue: *re-pri-mir, co-pla, pue-blo, a-tre-vi-do, re-cla-ma, a-grio.*

En cualquier otra combinación de dos consonantes, iguales o diferentes, la primera se agrupa con la vocal anterior y la segunda con la siguiente: *res-pi-ra, ob-ser-var, in-na-to, hon-ra.*

Entre tres consonantes, las dos primeras forman sílaba con la vocal que precede y la tercera con la que sigue: *ins-tin-to, obs-tá-cu-lo, pers-pi-caz.*

Si en un grupo de tres o más consonantes las dos últimas son pr, pl, br, bl, fr, fl, tr, dr, cr, cl, gr, gl, éstas se juntan a la vocal siguiente y las demás a la precedente: com-pra, tem-plo, en-tre, ins-tru-men-to, abs-trac-to, cons-crip-to (VOX 1973: 1448).

(The groups *pr, pl, br, bl, fr, fl, tr, dr, cr, cl, gr* y *gl* each form a syllable with the following vowel: *re-pri-mir, co-pla, pue-blo, a-tre-vi-do, re-cla-ma, a-grio*.)

In any other combination of two consonants (whether identical or not), the first is grouped with the previous vowel and the second with the following one: *res-pi-ra, ob-ser-var, in-na-to, hon-ra*.

In the case of three consecutive consonants, the first two are grouped with the preceding vowel and the third with the following one: *ins-tin-to, obs-tá-cu-lo, pers-pi-caz*.

If in a group of three or more consonants, the last two are *pr, pl, br, bl, fr, fl, tr, dr, cr, cl, gr*, or *gl*, these last two consonants are grouped with the following vowel and the other(s) are grouped with the preceding one: *com-pra, tem-plo, en-tre, ins-tru-men-to, abs-trac-to, cons-crip-to* (VOX 1973: 1448).)

The problem with this analysis is the postulation of syllables such as *ins, obs,* and *pers*, given the apparent impossibility of two-consonant codas as evidenced by their absence in word-final position. It might seem that a possible solution might be to assign word-internal [s] in these cases to the onset of the following syllable. This is exactly what is done in words such as *lap-so, con-su-mo, ab-suel-to*, and, in *seseo* dialects, *ac-ce-so* or *oc-ci-den-te*. Cases in which the last consonant in a sequence of 3 is a liquid are not problematic because the penultimate consonant is always assigned to the onset of the following syllable along with the liquid (e.g., in *in-truso* or *con-cluir*) and such cases will not be addressed in this paper. The problem arises in words in which there are 3 or more consecutive consonants in which the last is not a liquid. In such cases the [s] is always the second consonant, and Spanish phonotactic restrictions prohibit the possibility of syllable-initial [s] followed by a consonant in either native or borrowed forms: when foreign words containing word-initial [s]C are borrowed into Spanish, a prothetic [e] is inserted (e.g., [estatus] from Latin *status*; [esmol] from English *small*).

A conundrum regarding Spanish syllable division thus arises:

- 1) The absence of word-final sequences of C + [s] constitutes evidence that such sequences do not occur in word-internal codas.
- 2) The impossibility of word-initial sequences of [s] + C constitutes evidence that sequences of [s] + C do not occur in word-internal onsets.
- 3) However, as shown in the second column of Table 1, there are word-internal occurrences of [s] that must violate one or the other of these word-edge restrictions.

2. Research in Puerto Rico

One way to resolve this conundrum is to claim either (a) that the requirement that codas be limited to one consonant applies only word finally, or (b) that the requirement that onsets be limited to one obstruent applies only word initially. But which? The obvious way to determine this would be to ask native speakers to syllabify words containing internal [s] in clusters of 3 or 4 consonants. This was done with a group of students at the University of Puerto Rico, Río Piedras campus, who confirmed the traditional analysis, as stated in the VOX, without exception. The problem with this result, however, is that these students had all studied the officially accepted rules of Spanish syllable division. To eliminate the possibility that such results reflected prescriptive rules rather than native intuitions, a study was conducted involving 6 adult illiterates born and raised in Puerto Rico. The procedures and results of that study are reported in Schnitzer (1999). The data obtained are reproduced here in Table 2. All varieties of lexical *s* were counted as [s] for purposes of syllable division, including alveolar [s], glottal [h], and assimilated [sp] (-->[f]).

ITEM	Subject 1 PR	Subject 2 PR	Subject 3 PR	Subject 4 PR	Subject 5 PR	Subject 6 PR
constante	con-stan-te	con-tan-te	con-t[ã]-te	con-stan-te	con-tan-te	con-stan-te
construcción	con-tru-cion	con-tru-cion	con-tru-cion	con-truc-cion	con-truc-cion	con-tru-cion
conspirador	con-pi-ra-dor	con-pi-ra-do r	con-pi-ra-dor	con-spi-ra-dor	con-pi-ra-dor	con-spi-ra-dor
conscripción	con-crip-cion	con-cri-cion	con-cri-cion	con-scri-cion	con-crip-cion	con-cri[s]-sion
instante	in-tan-te	in-tan-te	is-ta-te	in-stan-te	ins-tan-te	in-tan-te
instrucción	in-tru-cion	in-tru-cion	in-tru-cion	in-truc-cion	in-truc-cion	in-tru-cion
inspiración	in-pi-ra-cion	in-pi-ra-cion	i-pi-ra-cion	in-spi-ra-cion	in-pi-ra-cion	in-spi-ra-cion
abstinencia	a[n]-ti-nen-cia	a[r]-ti-nen-cia	a-sti-nen-cia	ab-sti-nen-cia	ab-sti-nen-cia	as-ti-nen-cia
abstracto	as-tra-[s]to	a[l]-tra-to	a-b[i]s-tra-to	ab-strac-to	abs-trac-to	as-tra-to
transmitir	tran-mi-tir	tras-mi-tir	tras-mi-tir	tran-mi-tir	trans-mi-tir	tras-mi-tir
transporte	tran-por-te	tran-por-te	tras-po-te	tran-spor-te	trans-por-te	tra-spor-te
transgresión	tran-gre-sion	tran-gre-sion	tran-gre-sion	tran-sgre-sion	trans-gre-sion	trans-gre-sion
perspectiva	per-pe[s]-ti-va	per-[f]ec-ti-va	pes-pe-ti-va	per-spec-tiva	per-pec-ti-va	per-pe-ti-va
extender	e[s]-ten-der	e[s]-ten-der	e[s]-ten-der	e[s]-ten-der	e[s]-ten-der	e[ks]-ten-der
extra	e[s]-tra	e[k]-tra	e[s]-tra	e[s]-tra	e[ks]-tra	e[ks]-tra
exportar	e[s]-por-tar	e[s]-por-tar	e[s]-por-tar	e[s]-por-tar	e[ks]-por-tar	e[ks]-por-tar
expresión	e[s]-pre-sion	e[h]-pre-sion	e-pre-sion	e[s]-pre-sion	e[ks]-pre-sion	e[ks]-pre-sion

Table 2. Syllabification data from Puerto Rican subjects

The most salient findings were the following (see Schnitzer 1999 for complete details on this study):

- 1) that word internal syllables could begin with [s] + C (Five of the six subjects had at least one response of this type and there were a total of 18 such responses.);
- 2) that word internal syllables could end with C + [s] (Although only two of the six responded in this way; there were a total of 13 such responses.);
- 3) the situation is complicated by the tendency in Puerto Rican Spanish to delete postnuclear [s] in all contexts but especially when it is followed by a consonant (see Terrell 1978; López Morales 1983).

We can see that there was no general consensus among the Puerto Rican subjects. The study tentatively concludes that the [s] in the context considered may be ambisyllabic, an interpretation strengthened by the fact that in several cases, the subjects assigned the [s] in question both to the coda of the first syllable and to the onset of the second (e.g., *es-sac-to (exacto)*; *as-sur-do (absurdo)*).

However, to conclude ambisyllabicity based on the judgments of only six subjects would seem premature, especially considering the tendency in Puerto Rican Spanish to

delete post-nuclear [s] even when there is no following consonant. This tendency is strongly borne out in these data: in 47 cases out of 102, the [s] in question was deleted entirely.

Because of this tendency, nearly half of the data proved to be irrelevant. To confirm the ambisyllabicity of these word-internal [s]s, it would be necessary to submit these forms to subjects whose Spanish was not subject to s-deletion.

3. Research in Colombia

The present study is essentially a replication of the Puerto Rican research, using adult illiterates living in Bogotá, all born and raised in Colombia.

3.1. Subjects.

The six subjects were all female, aged 19 to 30. All were native speakers of Spanish. Three of them were students in the first grade at an elementary school for adults in Bogotá, Instituto Nueva Colombia, where they attended Sunday classes. None had completed more than three classes at the time the test was administered. The other three were residents of Bogotá that had never attended school. Three of the subjects had been raised in Bogotá; the others had been raised in Muzo (Department of Boyacá), Armenia (Department of Quindío), and Cajicá (Sabana Centro). The Spanish of these areas is not subject to deletion or aspiration of post-nuclear [s]. Nor did any of the subjects display such a tendency in their oral discourse.

3.2. Protocol.

Each subject was read the following:

“Estoy llevando a cabo un estudio sobre cómo la gente de varias regiones del país divide las palabras. Estoy cooperando con un compañero en Puerto Rico que quiere comparar a los colombianos con los puertorriqueños.

Si digo la palabra TECHO lentamente--TE-CHO--se nota que tiene dos partes, TE y CHO.

Si digo la palabra PON, se nota que PON tiene una sola parte, no se puede dividir.

Si digo la palabra REPITE lentamente--RE-PI-TE-- se nota que REPITE tiene 3 partes, RE, PI, y TE.

Estas partes se llaman sílabas.

¿Cómo dividiría usted la palabra P O N E?

¿Cómo dividiría usted la palabra C A S A?

¿Cómo dividiría usted la palabra R O J O?

¿Cómo dividiría usted la palabra C O M I D A?

¿Cómo dividiría usted la palabra M E C Á N I C O?

Ahora vamos a comenzar el estudio sobre la división entre sílabas.”

(Translation: I am conducting a study of how people in various regions of the contry divide words. I am cooperating with a colleague in Puerto Rico who wants to compare Colombians with Puerto Ricans.

If I say the word TECHO slowly—TE-CHO—we can see that it has two parts, TE and CHO.

If I say the word PON, we can see that PON has only one part; it cannot be divided.

If I say the word REPITE slowly---RE-PI-TE—we can see that it has 3 parts, RE, PI, and TE.

These parts are called *syllables*.

How would you divide the word P O N E?

How would you divide the word C A S A?

How would you divide the word R O J O?

How would you divide the word C O M I D A?

How would you divide the word M E C Á N I C O?

Now let's begin the study of division into syllables.)

When the subject showed that she understood the task, the syllabification test was administered. The test items used appear in the first column of Table 3. Other items not listed appeared among the test items as distractors; these did not have internal s-clusters.

ITEM	Subject 1 C	Subject 2 C	Subject 3 C	Subject 4 C	Subject 5 C	Subject 6 C
constante	cos-tan-te	cons-tan-te	cos-tan-te	cos-tan-te	cons-tan-te	cons-tan-te
construcción	cos-truc-cion	cons-truc-cion	cos-tru-cion	cos-truc-cion	cos-tru-ci-on	cons-truc-cion
conspirador	cos-pi-ra-dor	cons-pi-ra-dor	cos-pi-ra-dor	cos-pi-ra-dor	cos-pi-ra-dor	cons-pi-ra-dor
conscripción	cos-cri-cion	cons-crip-cion	cos-cri-ci-on	cos-crip-cion	cos-crip-cion	cons-crip-cion
instante	is-tan-te	ins-tan-te	is-tan-te	ins-tan-te	ins-tan-te	ins-tan-te
instrucción	is-truc-cion	ins-tru-ccion	is-tru-cion	ins-truc-cion	is-truc-cion	ins-truc-cion
inspiración	is-pi-ra-cion	ins-pi-ra-cion	is-pi-ra-cion	ins-pi-ra-cion	is-pira-cion	ins-pi-ra-cion
abstinencia	as-ti-nen-cia	as-ti-nencia	abs-ti-nen-cia	abs-ti-nen-cia	as-ti-nen-cia	abs-ti-nen-cia
abstracto	ab-tra-to	as-trac-to	as-trac-to	as-trac-to	abs-trac-to	as-trac-to
transmitir	tras-mi-tir	tras-mi-tir	tras-mi-tir	trans-mi-tir	tras-mi-tir	tras-mi-tir
transporte	tras-por-te	tras-por-te	trans-por-te	trans-por-te	tras-porte	trans-por-te
transgresión	trans-gres-sion	trans-gre-sion	trans-gres-sion	trans-gres-sion	tras-gre-sion	trans-gre-si-on
perspectiva	pers-pe-tiva	pers-pe-ti-va	pers-pe-ti-va	pers-pec-tiva	pers-pec-tiva	pers-pec-ti-va
extender	eks-ten-der	es-ten-der	es-ten-der	eks-ten-der	eks-tender	eks-ten-der
extra	es-tra	es-tra	es-tra	eks-tra	es-tra	eks-tra
exportar	es-por-tar	es-por-tar	es-por-tar	eks-por-tar	eks-por-tar	eks-por-tar
expresión	ek-pre-sion	eks-pre-sion	eks-pre-sion	eks-pre-sion	eks-pre-sion	eks-pre-sion
obstáculo	os-ta-culo	obs-ta-cu-lo	os-ta--cu-lo	os-ta-cu-lo	obs-taculo	obs-ta-cu-lo

Table 3. Syllabification data from Colombian subjects

3.3 Results

What is remarkable about these results is how different they are in most ways from the Puerto Rican ones. Whereas the Puerto Rican subjects responded only rarely by maintaining all the segments of the presented forms, this was the most common response among the Colombian subjects. The predominant response among the Puerto Rican subjects was the dropping of the [s] under consideration, but there were only two examples of this response among the Colombian subjects, both from the same subject. The second most common response among the Colombian subjects was a syncopic cluster reduction in the coda, maintaining the [s] in coda-final position, while dropping the preceding consonant. There were twice as many responses of this type among the Colombian subjects as there were among the Puerto Rican ones (48% vs. 24%). There was no evidence either of ambisyllabicity or of assigning the [s] in question to the onset of the following syllable. Table 4 shows the comparative results.

Coda (+ onset) Type	Puerto Rican Subjects	Colombian Subjects
1. C + [s]] _σ	13	54
2. Ø + [s]] _σ	24*	52
3. C + Ø] _σ	44	2
4. C + Ø] _σ σ[[s]	16**	0
5. Ø] _σ	3***	0
6. Ø] _σ σ[[s]	2	0

* includes *eh-pre-sion*

** includes *per-fec-ti-va* with [f] counted as realization of [sp]

*** includes *a-bis-tra-to* (*abstracto*)

Table 4. Coda Types among the Puerto Rican and Colombian Subjects

4. Discussion

4.1. Linear analysis

The Bogotá data can be conveniently accounted for in the following way:

- i. The [s] in question originates in the coda of the preceding syllable;
- ii. The following optional rule applies:

$$C_1C_2]_{\sigma} \rightarrow C_2]_{\sigma}$$

The Puerto Rican data can be accounted for by (i) and (ii) plus two additional optional rules:

- iii. $C]_{\sigma} \rightarrow \sigma[C$

- iv. $C_1C_2]_{\sigma} \rightarrow C_1]_{\sigma}$.

If one wishes to account for the two Bogotá forms in which the coda final [s] is deleted one need only apply rule (iv) to these forms as well (*ab-tra-to*; *ek-pre-sion*). There are five Puerto Rico forms which while they do conform to this analysis, nevertheless involve additional processes of consonant modification (*an-ti-nen-cia*; *ar-ti-nen-cia*; *al-tra-to*; *per-fec-ti-va*) or

vowel epenthesis (*a-bis-tra-to*). We consider these to be nonsystematic mistakes which we will not consider further.

The Puerto Rican data can be accounted for equally well by assuming that the [s] originates in the onset of the following syllable, in which case rule (iii) would have to be cast as its mirror image (with appropriate adjustments in its formulation due to Spanish phonotactics):

$$\text{iii.a. } \sigma[\text{sC}] \rightarrow \text{s}]_{\sigma} \sigma[\text{C}]$$

However, this approach would not be desirable for the Bogotá data because all of the forms would be subject to this rule, no version of which is needed if the [s] originates in the coda. For this reason, this linear approach in which [s] originates in the onset will not be considered further.

By placing the [s] underlyingly in the coda rather than in the onset, this analysis conforms to the traditional analysis of Spanish syllabification. In addition, this account captures the general tendency for codas (rather than onsets) to be simplified in most varieties of Spanish (including Central Colombian and Puerto Rican) as well as for postnuclear [s] to be deleted in Caribbean varieties (including Puerto Rican).

4.2. Autosegmental analysis.

In this section we will consider four autosegmental approaches involving both a syllabic and a segmental tier. In all four, rule (ii) applies. What differentiates the four approaches is how a consonant occurring between two other consonants is either linked to or delinked from the preceding or following syllable. In the data we have been considering, this segment is invariably [s], since as noted in Section 1, when the last consonant in a sequence of 3 is a liquid, the penultimate consonant is always assigned to the onset of the following syllable along with the liquid, and therefore could never be ambisyllabic or extrasyllabic. Therefore, sequences of obstruent + liquid are not controversial and hence will not be considered in the following analysis.

4.2.1. Ambisyllabic [s]

Figure 1 illustrates the manner in which a consonant (C, which must always be [s]) is simultaneously linked to the coda of the preceding syllable and the onset of the following syllable in an ambisyllabic approach.

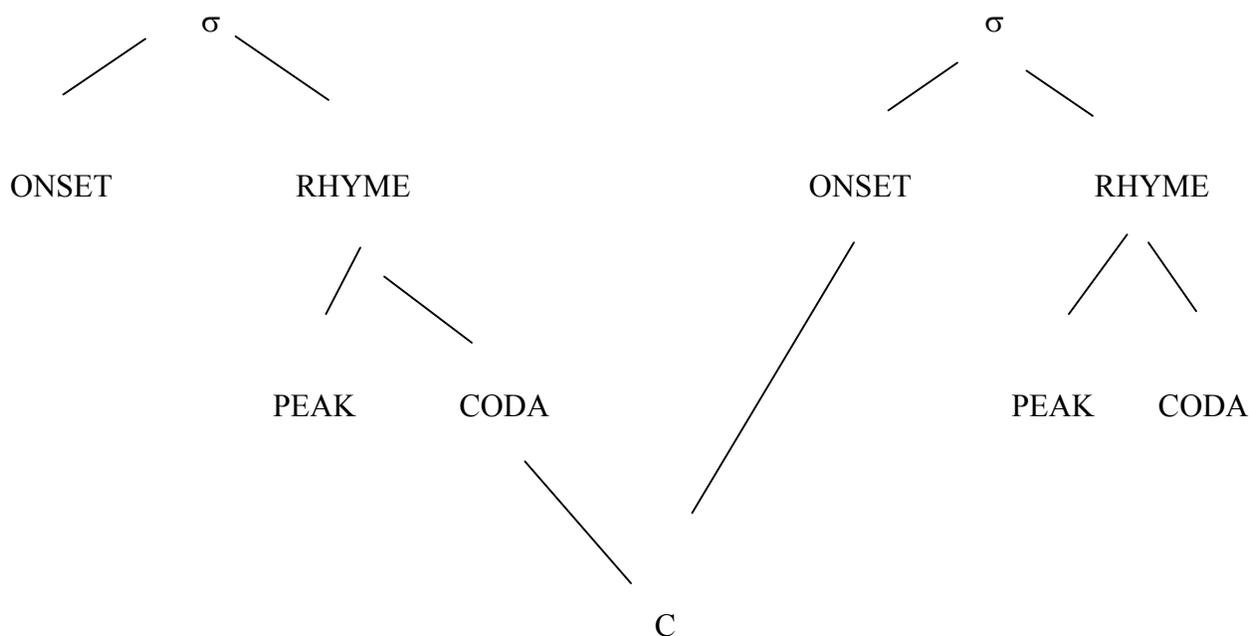


Figure 1.

Figure 2 illustrates the three possible outcomes resulting from [s] being delinked from one syllable and/or the other. In 2a, [s] is delinked from the following syllable and remains in the coda of the preceding syllable. In 2b, [s] is delinked from the preceding syllable and remains in the onset of the following syllable. In 2c, [s] is delinked from both the preceding and following syllable, resulting in its deletion because of a licensing violation whereby undominated elements cannot be phonetically expressed.

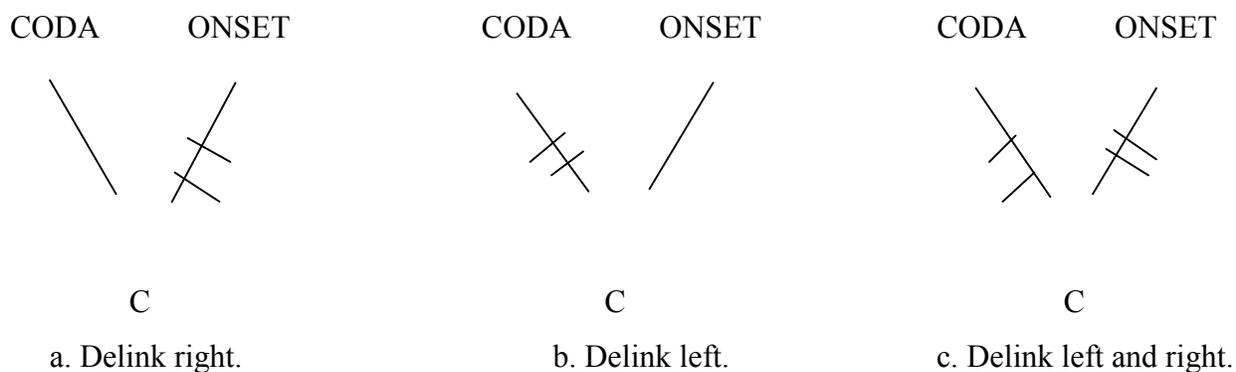


Figure 2.

The Bogotá data require that the [s] be delinked from the following syllable in all cases. Rule (ii) may then optionally apply.

The Puerto Rico data require that [s] be delinked from one or both of the adjacent syllables, thereby allowing all three outcomes illustrated in Figure 2. Rule (ii) may then optionally apply.

4.2.2 Extrasyllabic [s]

Figure 3 illustrates the manner in which (C which must always be [s]) is underlyingly linked to neither the coda of the preceding syllable nor the onset of the following syllable in an extrasyllabic approach.

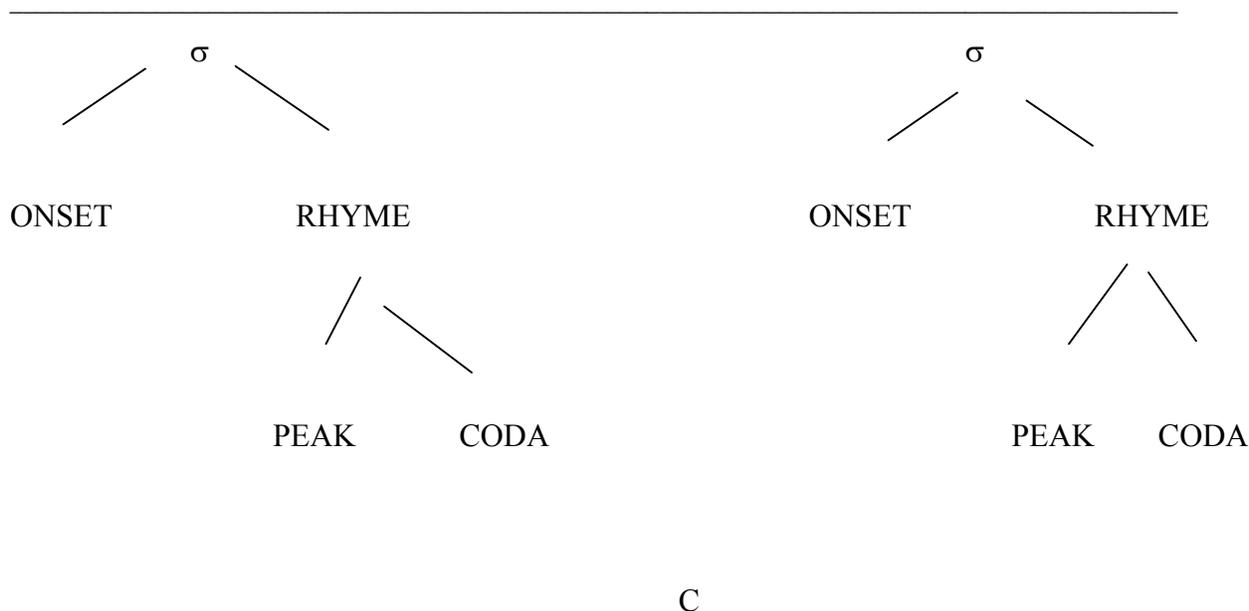


Figure 3.

Figure 4 illustrates the two possible outcomes resulting from [s] being linked to one syllable or the other. In 4a, [s] is linked to the coda of the preceding syllable. In 4b, [s] is linked to the onset of the following syllable. Any [s] with no link to any syllable is subsequently deleted because of a licensing violation whereby undominated elements cannot be phonetically expressed.

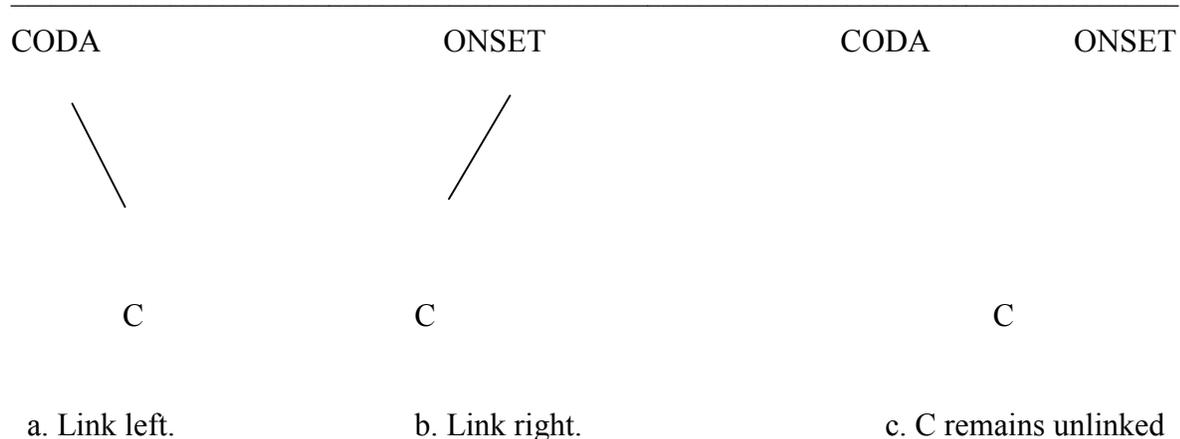


Figure 4.

The Bogotá data require that the [s] be linked to the preceding syllable in all cases. Rule (ii) may then optionally apply.

The Puerto Rico data permit [s] to be optionally linked to either of the adjacent syllables, thereby allowing [s] to be attached to the coda or to the onset or to be deleted. Rule (ii) may then optionally apply.

4.2.3. Underlying [s] in Coda or Onset

In an autosegmental analysis, if [s] were assigned underlyingly to the onset of the following syllable, one rule which delinks the [s] from the onset and an additional rule which then links the [s] to the coda of the preceding syllable would be required for both the Bogotá and the Puerto Rico data. Rule (ii) could then optionally apply.

If [s] were instead assigned underlyingly to the coda of the preceding syllable, although no extra rules would be needed to account for the Bogotá data, one rule which delinks the [s] from the coda and an additional rule which then links the [s] to the onset of the following syllable would be required for the Puerto Rico data. Rule (ii) could then optionally apply.

Because both of these proposals require additional derivational steps relative to the previous accounts (4.2.1 and 4.2.2) without providing any advantages, neither will be considered further.

5. Optimality Theory analysis

It could be argued that the high degree of variability exhibited in the data (especially those collected in Puerto Rico) ought to lend itself to an Optimality Theory (OT) account. (See for example Archangeli and Langendoen 1997; Kager 1999; Prince and Smolensky 2004.) In spite of the fact that what is being considered in the present study is the result of the application of metalinguistic judgments to presented surface phonetic forms (i.e., not the conventional type of data to which OT analyses are generally applied), the Bogotá forms can be neatly accounted for with two well known constraints:

- 1) MAX-IO. There is no deletion from the output form relative to the input form.
- 2) *COMPLEX. Syllables have at most one consonant at an edge (beginning or end of syllable).

The observed variation is presented in Tableau 1.

Input: C s C (r)	MAX-IO	*COMPLEX
C s . C (r)		* (*)
s . C (r)	*	(*)

Note that the parenthetical asterisks correspond to the parenthetical *r*'s in the input and candidates.

Tableau 1. OT representation of Bogotá data.

Note that there is no finger pointing at a "winning candidate," as is generally the case in OT analysis. We see here a tension between the forces of faithfulness (maintaining the presented form) and "unmarkedness" (conforming to phonotactic requirements), with faithfulness being favored in the forms retaining all the segments and unmarkedness being favored in those with a deleted consonant in the coda (thus adhering to the canonical Spanish single-consonant coda). (See Gussenhoven and Jacobs 1998: 47.) The two constraints appear to be equally weighted, as is borne out by the fact that the two tendencies are represented by an almost identical number of responses (54 versus 52, as shown in Table 4). Furthermore, we cannot speak here of different stylistic varieties as favoring one tendency over the other (as does Morris 2000, for stylistic variants of codas in Peninsular Spanish), since these are responses made not in various speech styles but in the context of a single artificial task.

The Puerto Rico data are much more complicated, and much more interesting from an OT standpoint. In order to account in OT terms for these data, it is necessary to consider two additional constraints:

3) *CODA. No coda is permitted.

4) *s]_σ. No syllable final alveolar fricatives are permitted (introduced by Kenstowicz 1996, and used by Bakovic 1998, Bradley 2006, Colina 1997, Coleman Young 2000, and Wiltshire 2002). Whereas in the Colombian data, the segment deleted was almost uniformly the consonant preceding the [s], in the case of the Puerto Rican data we must include this additional constraint to account for the numerous cases of coda apocope. This constraint is roughly equivalent to Morris's (2000) constraint *C/[+cont] (no continuants in the coda). The latter is not used, however, because of the presence of [l] and [r] in *artinencia and *altrato. (These last forms violate IDENT-IO, but they are so rare that they are ignored for purposes of this analysis.)

In Tableau 2 the rows are listed from most to least prevalent responses. The columns are arranged from the most highly ranked (least often violated) constraints at the left to the least highly ranked (most often violated) constraints at the right.

Input: C s C (r)	*COMPLEX	*s] _σ	MAX-IO	*CODA
C . C (r) (44)	(*)		*	*
s . C (r) (24)	(*)	*	*	*
C . s C (r) (16)	* (*)			*
C s . C (r) (13)	* (*)	*		**
. C (r) (3)	(*)		**	
. s C (r) (2)	* (*)		*	

Note that the parenthetical asterisks correspond to the parenthetical *r*'s in the input and candidates. The numbers in parenthesis correspond to the number of responses for each candidate (as presented in Table 4).

Tableau 2. OT representation of Puerto Rico data.

In most OT accounts, for each input form, there is a clear "winner," determined by the relative ranking of the constraints. But in the Puerto Rico data, there is no clear winner and no

relevant contextual variation to account for the six kinds of results indicated in Table 4. The kind of phonological variation traditionally dealt with by means of variable rules (e.g., Labov 1972) has been dealt with in OT in a number of ways, the most promising being the "floating constraints" of Reynolds (1994; Nagy and Reynolds 1997), the partial ranking of Anttila (1997; Anttila and Cho 1998) and stochastic optimality theory (e.g., Boersma and Hayes 2001; Clark 2005). In the first two of these approaches, the ranking of constraints is not absolute but rather is relaxed in such a way that certain constraints are ranked relative to some other constraints but not to all. In the last the "selection point" of a constraint is mitigated by a style factor which is set at 1 in "maximally formal speech" and at 0 in "maximally casual speech." (See Morris 1998, for a detailed OT analysis of stylistic phonological variation in Spanish.)

But in the Puerto Rico data under consideration we find neither stylistic nor dialectal factors involved, since all the judgments would presumably correspond to the most self-conscious, careful style, and since they were elicited from a group of speakers from rural Puerto Rico with no attested regional differences among them. It is therefore inappropriate to apply the floating constraints of Reynolds or the partial ranking of Anttila to these data.

Nonetheless, there are some clear trends in the Puerto Rico data with respect to constraint weighting, based on the number of responses reported in Table 4. First of all, it is clear that the least important constraint is *CODA. This constraint is so weak that it is adhered to only by the two candidates that are most rarely chosen (representing only 5 responses). Next weakest is MAX-IO, which is violated by the two most favored candidates, but not by the two in the next two positions. The strongest constraint is *COMPLEX, adhered to by the two most favored candidates and not by most of the rest. In second place we find *s]_σ, adhered to by the most favored candidate, but violated by the candidate in second place. We thus find, solely on the basis of the number of responses for each candidate, the following weighting order for the Puerto Rico data: *COMPLEX >> *s]_σ >> MAX-IO >> *CODA.

6. Conclusion

The linear analysis (Section 4.1) correctly captures the facts found in the data sets from Bogotá and Puerto Rico. However, it fails to focus on the nature of the problem of syllabic assignment of [s] in terms of its peculiar positional possibilities. In other words, rules such as (iii) and (iv) tell us where [s] is eventually assigned or whether it is deleted, but they do not tell

us why. In particular, the fact that [s] must be mentioned in rule (iv) as a specific phonetic entity does not allow for the distinction between [s] as a phonetic entity and Spanish [s] as a particular structural unit. This is undesirable because it is clearly only the latter that is relevant, given the fact that in *seseo* dialects, historical [θ] does not behave in this manner (i.e., there are no examples of the grapheme <z> preceded by a consonant and followed by a non-liquid consonant).

We find the OT approach unsatisfactory for similar reasons. In this model, it is not possible to distinguish the syncope tendency prevalent among the Bogotá data from the apocope which prevails in the Puerto Rico data, without using a constraint such as *s]_σ. This is undesirable for two reasons. First of all, this constraint seems an unlikely candidate for membership in a list of universal constraints, given its specificity to certain varieties of Spanish that motivated it in the first place. But more importantly, this constraint also makes reference to [s] as a particular phonetic entity rather than as a structural unit. In Optimality Theory, one cannot refer to this [s] by its position in the syllable and still distinguish it from any other coda consonant. And since OT is by definition nonderivational, it is impossible to capture the fact that the [s] in question is one which occurs between two consonants, since the [s] in fact occurs between two consonants only when MAX-IO is adhered to (in only 28% of the Puerto Rico data).

This deficiency is remedied in the autosegmental analyses, since the focus shifts from [s] as a phonetic entity to [s] as a particular structural unit, as evidenced by the fact that it is not even necessary to identify the [s] by name, but merely by position, as illustrated in Figures 1-4. For this reason, it can be concluded that the autosegmental framework can account for the data in a more satisfactory way than either the linear or the OT framework.

In Section 4.2.3. we rejected autosegmental analyses in which [s] originates in the coda or the onset of a syllable, leaving only the ambisyllabic and extrasyllabic approaches for consideration. We find the extrasyllabic approach slightly preferable because of the fact that to account for [s] deletion in the ambisyllabic approach one must posit a process in which [s] is simultaneously delinked from both the preceding and the following syllables (Fig. 2c), whereas in the extrasyllabic approach, no special additional procedure is necessary to account for the non-occurrence of [s] (Fig. 4c). Therefore, Occam's Razor mandates the choice of the extrasyllabic analysis.

A final word is in order regarding the question that prompted these studies of Puerto Rican and non-coastal Colombian illiterate adults. The Colombian data clearly support the traditional analysis concerning the place of word-internal [s] in the Spanish syllable, as stated at the outset in the quote from the VOX dictionary. Yet the Puerto Rican data remain problematic, with the [s] sometimes appearing in the coda of the first syllable, sometimes in the onset of the second, and most frequently disappearing altogether. We have shown that these tendencies are best explained in an autosegmental framework in which the Spanish [s] is extrasyllabic when it occurs between two consonants.

Note

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