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Strong Onsets and Spanish Fortition*

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“The Spanish [ɣ] is often not very fricative, and more like an approximant. It may be more accurately transcribed using the symbol for a voiced velar approximant [...].”

—Ladefoged (1982:148)

1 Abstract

Spanish has in its phonetic inventory three sounds, transcribed here as [β], [δ], and [ɣ], often described as *voiced fricatives* in the literature. Based on my own observations and on the above description by Ladefoged, I take these sounds to actually be voiced *approximants*, with little or no frication at all. These approximants alternate with the voiced stops [b], [d], and [g], respectively, in what is standardly taken to be *spirantization* of underlying stops (Harris 1969). In this paper I argue that this alternation between stops and approximants is due to contextual hardening (*fortition*) of underlying approximants, following arguments originally made by Lozano (1979). The driving force behind fortition is a constraint, STRONG ONSET, interacting with other constraints in the grammar of Spanish (in the Optimality-theoretic sense of constraint interaction; see Prince & Smolensky 1993). I then argue that the strikingly similar distribution of the Spanish tap [r] and trill [rr] is a reflex of the basic fortition account laid out here, a relationship previous spirantization accounts must deny. The disparities between the two phenomena are shown to be the product of there being two phonological levels in Spanish: a word-level and a breath group-level.

2 Background, Data, and Proposal

In the sound change from Vulgar Latin to Spanish, intervocalic voiced stops were lenited to become approximants. The complementary distribution between voiced stops and approximants has been reanalyzed in Modern Spanish: the environment of the approximants is no longer just between vowels, as shown by the boxed examples in (1). All of the examples in (1) are words or phrases pronounced in isolation, constituting a *breath group*, defined by Macpherson (1975:33) as a group of “speech sounds [that] run together into an unbroken stream of movements, with no break or pause between them.”

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(1)	[labial]	[coronal]	[dorsal]
#__	[<u>b</u> eso] ‘kiss’	[<u>d</u> ato] ‘date’	[<u>g</u> ato] ‘cat’
	[<u>b</u> lando] ‘soft’	[<u>d</u> rama] ‘drama’	[<u>g</u> rande] ‘big’
N__	[um <u>b</u> eso] ‘a kiss’	[un <u>d</u> ato] ‘a date’	[uŋ <u>g</u> ato] ‘a cat’
L__	[el <u>b</u> eso] ‘the kiss’	[el <u>d</u> ato] ‘the date’	[el <u>ɣ</u> ato] ‘the cat’
C__	[dar <u>β</u> esos] ‘give kisses’	[dar <u>ð</u> atos] ‘give dates’	[dar <u>ɣ</u> atos] ‘give cats’
	[a <u>δ</u> βerso] ‘adverse’	[a <u>β</u> ðikar] ‘abdicate’	[e <u>δ</u> ɣar] ‘Edgar’
V__	[ese <u>β</u> eso] ‘that kiss’	[ese <u>ð</u> ato] ‘that date’	[ese <u>ɣ</u> ato] ‘that cat’
	[o <u>β</u> tener] ‘obtain’	[a <u>δ</u> kirir] ‘acquire’	[i <u>ɣ</u> norar] ‘ignore’
	[a <u>β</u> landar] ‘soften’	[i <u>ð</u> ratar] ‘hydrate’	[a <u>ɣ</u> randar] ‘enlarge’

The following descriptive generalizations can be established based on (1). The voiced stops [b], [d], and [g] (in the shaded cells) occur breath group-initially (#__), after homorganic nasals (N__), and, for coronal [d], after homorganic laterals as well (L__). The voiced approximants [β], [ð], and [ɣ] occur after other nonhomorganic consonants (L__, C__) and after vowels (V__).

Standard research in Spanish phonology has assumed that the synchronic process is equivalent in directionality to the diachronic: *spirantization* of underlying stops. For example, Harris (1969) proposes a rule of spirantization, although he argues that the approximants are in the “elsewhere” environment:

“Let us assume, perhaps incorrectly, that the directionality of the alternations [...] is from stop to continuant.” (Harris 1969:37)

In the form of powerful notational conventions available in the SPE framework (Chomsky & Halle 1968), Harris’ (1969:40) rule effectively disguises the fact that it is written as a rule spirantizing stops *except* when in the environments where stops occur (cf. Harris’ 1968:39 “first approximation”). As Harris concedes:

“The complete generalization is [that the alternants] appear as continuants *except initially and after homorganic noncontinuant sonorants*.” (Harris 1969:39, emphasis added)

Based on this generalization and on arguments presented by Lozano (1979), I claim that the stop~approximant alternation is actually a case of hardening or *fortition*, and that the alternants are underlyingly approximants. These approximants are contextually hardened to stops by a constraint demanding that all syllables begin with complete *oral closure*, following proposals made by Steriade (1992, 1993) on the phonological representation of closure and release.

This constraint, which I dub STRONG ONSET, is of course violated rampantly throughout Spanish. This is because it is a constraint in the Optimality-theoretic sense (Prince & Smolensky 1993, McCarthy & Prince 1993ab, *inter alia*), in that it is *ranked* with respect to other constraints of the language and is as a result *violable*, with violation being forced only by higher-ranked constraints. In §3, I show how STRONG ONSET, ranked relative to other constraints, inserts oral closure breath group-initially before the underlying approximants to create stops. This is shown informally in (2).

(2) # [oral closure] + /β/, /ð/, /ɣ/ = [b], [d], [g]

Following a proposal made by Padgett (1994), I assume that Place-sharing in homorganic nasal/lateral + approximant clusters entails sharing of the nasal/lateral closure because stricture is

dominated by Place in the feature geometry. The result, as shown informally below in (3), is a nasal/lateral + voiced stop cluster, satisfying STRONG ONSET.

- (3) oral closure (nasal) + /β/, /ð/, /ɣ/ = [mb], [nd], [ŋg]
 oral closure (lateral) + /ð/ = [ld]

Fortition in other environments is precluded by a constraint that is ranked higher than STRONG ONSET. This constraint demands that an input representation be parsed into a contiguous (uninterrupted) string, and is hence dubbed CONTIGUITY by McCarthy & Prince (1993a).

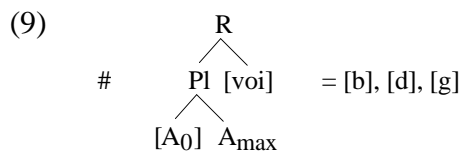
In §4, I show how this analysis can be generalized to account for the similar yet elusive distribution of the coronal tap [r] and trill [rr] of Spanish.¹ The data in (4) are representative of the distribution.

(4) V__V	[per <u>o</u>]	‘but’	[kar <u>o</u>]	‘expensive’
	[per <u>ro</u>]	‘dog’	[kar <u>ro</u>]	‘car’
# _ω __	[<u>r</u> rana]	‘frog’	[<u>rr</u> oto]	‘broken’
N/L__	[on <u>rr</u> a]	‘honor’	[al <u>rr</u> e <u>de</u> ðor]	‘around’
C__	[k <u>r</u> eo]	‘I believe’	[a <u>β</u> re]	‘it opens’
__C	[mar <u>r</u> tes]	‘Tuesday’	[mar <u>so</u>]	‘March’
__# _ω	[pa <u>r</u>]	‘pair’	[i <u>rr</u>]	‘to go’

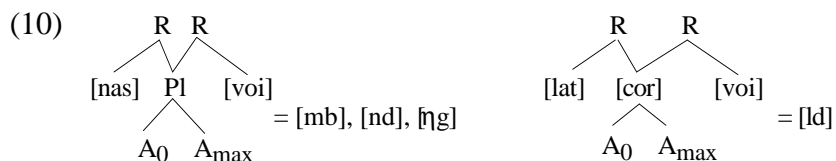
Based on (4), we can establish the following descriptive generalizations. The tap [r] and trill [rr] contrast intervocally within words (V__V), but otherwise their distribution is predictable. The trill (in the shaded cells) occurs word-initially (#_ω__) and after (homorganic) nasals and laterals (N__, L__). The tap occurs after other (nonhomorganic) consonants (C__), preconsonantly (__C), and word-finally (__#_ω). Compare these generalizations to those made about the stops and approximants after the data in (1). The similarities are truly striking, enough to warrant an attempt at a unified explanation of them that will also account for their differences. Harris (1983:144, note 16) claims that the distribution of the tap and trill “has been confused with the behavior of Spirantization, which is different. Spirantized phones do occur in word-initial, utterance-medial (= *breath group-medial*—EJB) position [...], although [r] is impossible in this environment.” Another difference, of course, is that [r] and [rr] contrast intervocally within words. This contrast is shown in §4 to be the key that distinguishes the stop~approximant alternation from the distribution of the tap and trill, and the breath group-level from the word-level in Spanish.

¹ Even though it is a single segment, I represent the trill as [rr] for typographical convenience; see Harris (1983:65-66) for comments on this point.

My proposal is that the stop~approximant alternants are *underlyingly* approximants. Fortition of these approximants is enforced by the constraint STRONG ONSET, demanding that syllables begin with a closure—an A₀. The diagram in (9) shows how closure is inserted breath group-initially before the approximants to satisfy STRONG ONSET. The inserted A₀ is demarcated by square brackets. The result: the Place node of the approximant now dominates both an A₀ closure and an A_{max} release, creating a stop.⁵



Due to Place sharing, the closures of homorganic nasals and laterals are likewise shared under Place by the approximants, satisfying STRONG ONSET. The diagrams in (10) show the relevant configurations.⁶



In the following subsection I show how the interaction between STRONG ONSET and other constraints in the grammar of Spanish delimits the application of STRONG ONSET to just the environments in (9) and (10).

3.2 Optimality Theory: Evaluating the Representations

In Optimality Theory (OT: Prince & Smolensky 1993), constraints on candidate output representations are universal but violable, because they are language-particularly ranked with respect to each other. A constraint is violated in an actual output only if a higher-ranked constraint forces such violation. In this subsection I show that fortition follows from the representations assumed from §3.1 and from a few basic arguments for the relative ranking of well-motivated constraints in Spanish.

Prince & Smolensky (1993:§6) argue that very general syllable structure constraints and faithfulness constraints (constraints on the correspondence between input and output), differently ranked with respect to each other in different languages, characterize the basic syllabic patterns of the world's languages. In (11) I give the four basic constraints that together, in any ranking relationship, predict that [CV]_σ is the unmarked syllable in any language.⁷

⁵ If we were to assume that the Spanish spirants are fricatives (see fn. 5), then the result of closure-insertion is an affricate and not a stop. This is the analysis necessary to account for the Porteño Spanish palatal segments [ʒ] and [dʒ] (Lozano 1979). These segments exhibit the same alternation as the approximants and stops, though the fricative [ʒ] has a more limited distribution than the approximants because it alternates independently with the glide [j]. (See §3.2.2 for more on affricates.)

⁶ To account for the fact that laterals only assimilate to coronals, I assume that [lateral] is licensed by [coronal] Place alone (see §3.2.2).

⁷ By “unmarked” here I mean that given an input /CV/, a parse [CV]_σ will incur no violations (= “marks”) of the constraints in (11). This follows the conception of markedness in OT advanced by Smolensky (1993, 1994).

- (11) *Syllable structure constraints*
 ONSET: Syllables must have onsets.
 NOCODA: Syllables must not have codas.
Faithfulness constraints
 PARSE: Underlying elements must be parsed.
 FILL: Nonunderlying elements must not be inserted.

McCarthy & Prince (1993b:19) note that ONSET and NOCODA can be stated in terms of their Generalized Alignment schema proposal.⁸

- (12) *Syllable structure constraints—Alignment versions*
 ONSET = Align-L (σ , C)
 ‘Every syllable must be left-aligned with a consonant.’
 NOCODA = Align-R (σ , V)
 ‘Every syllable must be right-aligned with a vowel.’

STRONG ONSET, I propose, is simply a more specific form of ONSET that is strongly active (i.e. highly ranked) in the grammar of Spanish.

- (13) STRONG ONSET = Align-L (σ , A₀)
 ‘Every syllable must be left-aligned with an oral closure.’

3.2.1 *Breath group-initial fortition*

On the face of it, STRONG ONSET seems needlessly strong. The post-homorganic nasal/lateral environment of the stops is already predicted by the resulting representation in (9) (but see the end of §3.2.2 for some discussion on this point), and the only other environment is that in (8)—the left edge of a breath group. I do not posit a constraint aligning an A₀ with the left edge of a breath group for a simple reason: a breath group is defined as a functional unit and not as a phonological or morphosyntactic constituent. It is a group of speech sounds unbroken by pause or breath (Macpherson 1975:33, quoted at the beginning of §2). An alignment constraint, which demands phonological or morphosyntactic units as its two category arguments, can thus not be defined on a breath group.

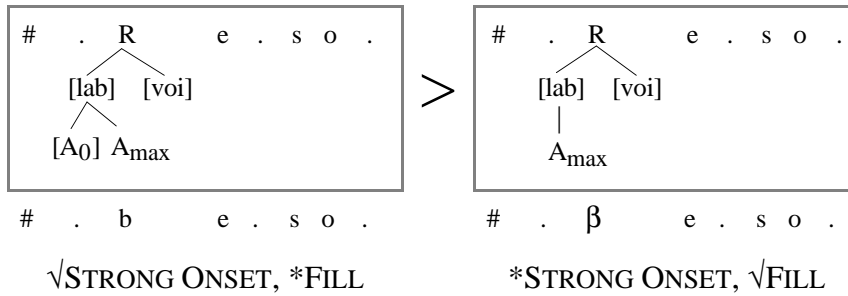
Instead, I rely crucially on the existence of a *breath group*-level in addition to a *word*-level of phonology in Spanish. The major piece of evidence for the existence of the breath group as a unit is that it is the domain of resyllabification in Spanish (see Harris 1983) to which some segmental processes are sensitive. Positing a breath group-level in OT means that at this level, a breath group is the input to GEN, the function that associates each input with a set of candidate analyses of that input. From this assumption, the breath group-initial fortition facts fall out from two simple constraint rankings.

First, consider breath group-initial [beso] ‘kiss’. The output is not *[beso], so a closure must be inserted before the labial approximant to make it a stop. STRONG ONSET therefore dominates the faithfulness constraint FILL, militating against insertion of nonunderlying elements.⁹

⁸ See Itô & Mester (1994) for extensions of this alignment-theoretic analysis of ONSET, NOCODA, and CODACOND.

⁹ In the following diagrams, the actual output on the left is compared with another possible analysis of the input, crucially violating the higher-ranked of the constraints at hand, on the right. The optimality of the actual output is indicated by the symbol ‘>’ between the candidates. Periods denote syllable breaks, square brackets around an aperture node mean that it is inserted (FILL-violating), and angled brackets mean that it is unparsed (PARSE-violating). To minimize clutter, only the feature geometry of the relevant segment is given. The actual segmentation of each candidate is aligned below its respective diagram, with the constraint(s) it satisfies marked with a check ‘✓’ and the constraint(s) it violates marked with an asterisk ‘*’.

- (14) Breath group-level [beso], *[βeso]: STRONG ONSET » FILL

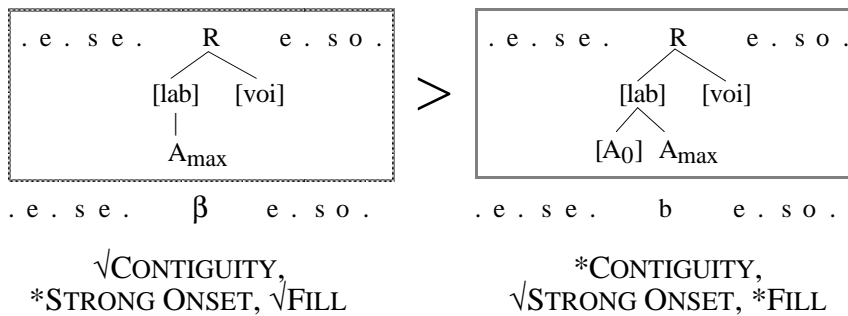


Consider now the intervocalic approximant in [ese βeso] ‘that kiss’. The output is not *[ese beso], so some constraint must dominate STRONG ONSET to prevent closure insertion from applying breath group-internally. This constraint is CONTIGUITY, first proposed to account for effects in prosodic morphology by McCarthy & Prince (1993a).

- (15) CONTIGUITY: The output is a contiguous parse of the input string.

Insertion of a closure within breath groups would disrupt the contiguity of an input parse. Thus, if we rank CONTIGUITY above STRONG ONSET (and, by transitivity, above FILL), we achieve the desired effect, as shown in (16).

- (16) [ese βeso], *[ese beso]: CONTIGUITY » STRONG ONSET » FILL

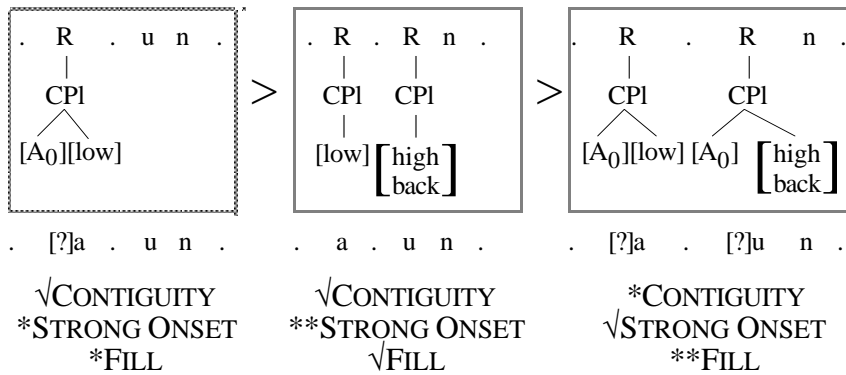


This constraint ranking accounts for the insertion of glottal stops (represented as [ʔ] below) before (otherwise) onsetless vowels, also only breath group-initially. This is exemplified by the data in (17).

- | | | | | |
|------|--------------------|---|--------------------|----------------|
| (17) | /aun/ | → | [ʔaun] | ‘yet’ |
| | /pero aun no/ | → | [pero aun no] | ‘but not yet’ |
| | /entonses/ | → | [ʔentonses] | ‘then’ |
| | /pero entonses no/ | → | [pero entonses no] | ‘but not then’ |

These facts can be readily subsumed under the present account if we assume that glottal stop is represented simply as an A₀ (and laryngeal features, which may be ignored here). When this A₀ is inserted prevocally, it links to the vowel’s C-Place node, which also dominates V-Place (following the feature geometry proposed by Clements & Hume 1993, modifying it to accommodate my adaptation of Padgett’s 1994 Place-dominates-structure proposal). The result is as shown in (18), which compares three candidates of /aun/ ‘yet’.

(18) [ʔaun], *[aun], *[ʔaʔun]: CONTIGUITY » STRONG ONSET » FILL



The results of the comparison of these three viable candidate parses of /aun/ ‘yet’ are tabulated in (19) in the more familiar OT tableau format.

(19)	/aun/ ‘yet’	CONTIGUITY	STRONG ONSET	FILL
☞	a) . [ʔ]a . un .		*	*
	b) . a . un .		**!	
	c) . [ʔ]a . [ʔ]un .	*!		**

The optimal candidate (19a) is indicated by the pointing hand ‘☞’, and this candidate is optimal because it violates STRONG ONSET only once, breath group-internally. Any attempt to stave off this violation, such as in candidate (19c), results in a fatal violation (highlighted by an exclamation point ‘!’) of higher-ranked CONTIGUITY. Of course, failure to adhere to STRONG ONSET at least breath group-initially, as in candidate (19b), results in a second and fatal violation of that constraint, even though this better satisfies low-ranking FILL.

We can determine that NOCODA is also ranked above STRONG ONSET. Breath group-internally, complex onsets like [βl] are not syllabified as coda + onset clusters, which would satisfy STRONG ONSET (because the [l] is an A₀; see §3.2.2) but violate NOCODA.¹⁰

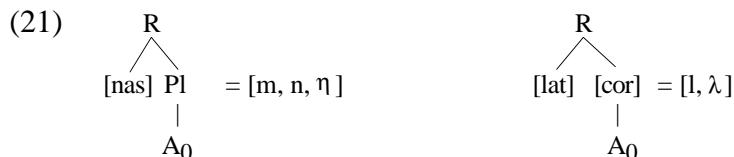
(20)	/paβlo/ ‘Paul’	NOCODA	STRONG ONSET
☞	a) . pa . βlo .		*
	b) . paβ . lo .	*!	

I now summarize the constraint ranking of breath group-initial fortition. STRONG ONSET, demanding syllable-initial closure, forces the insertion of oral closure because it is ranked above FILL. Keeping this insertion at the left breath group-edge is CONTIGUITY, demanding contiguous parsing of the input and precluding insertion of closure breath group-internally because it is ranked above STRONG ONSET.

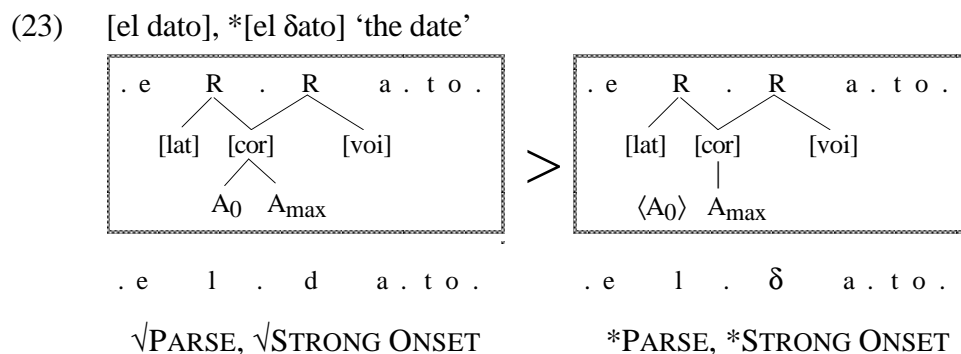
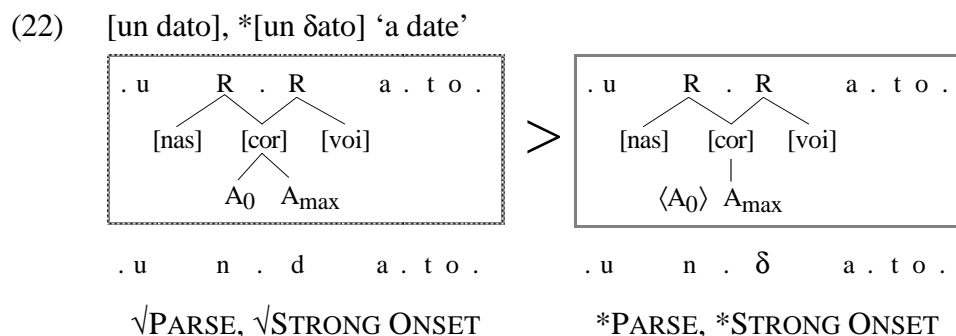
¹⁰ The relative ranking of PARSE in this system is more elusive. Another candidate for (20), with the /β/ left unparsed, would be independently ruled out by CONTIGUITY.

3.2.2 Post-homorganic nasal/lateral fortition

I claim that nasal and lateral segments are A_0 closures without plosive release, as in (21).¹¹ Unless prevocalic or breath group-final, nasals always assimilate to a following consonant and laterals always assimilate to a following coronal in Spanish (see fn. 6).



In feature-geometric representations, homorganic segments are Place-sharing segments. If Place dominates stricture as I have been assuming, then Place-sharing entails stricture-sharing. This explains fortition in the post-homorganic nasal/lateral environment. The diagrams below show the configurations for a nasal + coronal cluster (22) and for a lateral + coronal cluster (23).



Note that the constraints I deem relevant for (22) and (23), PARSE and STRONG ONSET, are both satisfied in the optimal candidates on the left and both violated in the nonoptimal ones on the right. It seems that the feature geometry assumed directly predicts the correct representations. However, a higher-ranked constraint in another language could decide in favor of a candidate other than the optimal one here.¹² In fact, Spanish itself has a case where a candidate more similar to the ones on the right in (22) and (23) wins over a candidate more similar to the ones on the left. This

¹¹ Perhaps this lack of release is related to the fact that the *release of air* in these segments is inherent in the features that characterize them. [nasal] indicates lowering of the velum, releasing the air through the nose. [lateral] indicates lowering of the side(s) of the tongue, releasing the air through the side(s) of the mouth.

This claim about nasal/lateral segments does not preclude the *features* [nasal] or [lateral] from being distinctively linked to the closures/releases of plosives (see Steriade 1993, who argues that such distinctive linking characterizes contour segment distinctions such as pre- vs. post-nasalized/lateralized segments; see fn. 2).

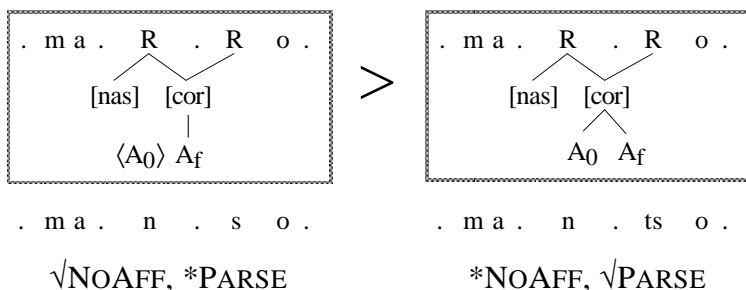
¹² See Padgett (1994) for a comprehensive survey of a variety of cases of nasal place assimilation and the different outputs (≈ possible candidate analyses) that different languages have for nasal + continuant (nonplosive) inputs.

is the case of nasal assimilation to a voiceless fricative. Briefly, the situation is this: nasals assimilate to, but do not harden, a following voiceless fricative. Examples are given in (24), from Padgett (1994:493). (Note: [M] denotes a labiodental nasal.)

- (24) triu[Mf]o ‘triumph’
 ma[ns]o ‘gentle’
 aje[ɲx]o ‘wormwood’

The fricatives [f], [s], and [x] have A_f aperture. Place-sharing between these fricatives and a preceding nasal would entail sharing the A_0 of the nasal and the A_f of the fricative. This would create the nasal + affricate clusters *[mpf], *[nts], and *[ɲkx]. This is not the correct output, presumably because (nonpalatal) affricates are disallowed in Spanish as they are in many languages. If we assume that a constraint (or set of constraints) NOAFF, disallowing non-palatal affricates,¹³ outranks PARSE, we obtain the desired result: the A_0 of the nasal is left unparsed and we are left with a nasal + fricative cluster, as shown in (25).^{14,15}

- (25) [manso], *[mantso] ‘gentle’



Ranking NOAFF above STRONG ONSET, we ensure that nonpalatal affricates will never be created, not even breath group-initially, to satisfy STRONG ONSET.

To summarize: assuming that Place dominates aperture, Place-sharing (homorganic) clusters necessarily share aperture under compulsion of both PARSE and STRONG ONSET, unless underparsing of the closure is forced by a dominant constraint such as NOAFF, independently needed in Spanish to account for the complete lack of (nonpalatal) affricates.

4 Unification with the Distribution of the Tap and Trill

As pointed out in §2, the distribution of the tap [r] and trill [rr] in Spanish is strikingly similar to the stop~approximant alternation. In this section I argue for a unified approach. Any such approach must account for two important differences between the two phenomena. First, as pointed out by Harris (1983:144, note 16), taps are strictly excluded *word*-initially while approximants are excluded *breath group*-initially. This difference is significant in casual styles and at faster rates of speech; a breath group may span as many words as the speaker has breath for. Second, the tap and trill contrast intervocally, while stops and approximants do not contrast in

¹³ See Itô & Mester (1995:13), especially their fn. 13 (appropriately enough!), for discussion of this constraint in Japanese, which they name NO-AFFRIC.

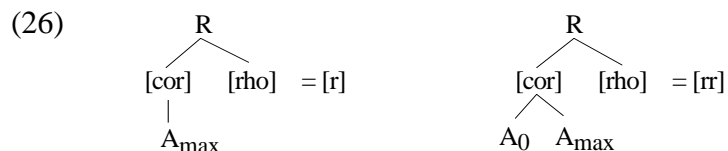
¹⁴ For explicitness, it must be assumed that PARSE is broken up into (at least) PARSE- A_0 and PARSE- A_f , and that the latter outranks the former (at least in Spanish). If this weren't assumed, then another possible candidate in (25) is one in which the A_0 is parsed and the A_f is left unparsed, an undesired result.

¹⁵ Like Padgett's (1994:494) account of these data, this account "predicts a reduced constriction degree in nasals" that assimilate to fricatives. I must again echo Padgett in saying that "[n]o articulatory studies illuminating the issue exist, to the best of my knowledge," but see his footnote 36 for comfort.

any environment. Below I argue that these two differences reduce to one: a reranking of two constraints from the word-level to the breath group-level.

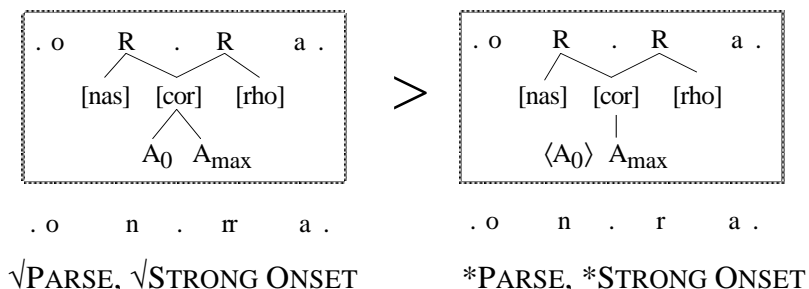
4.1 The Representations and post-nasal/lateral trilling

I assume the tap to be a rhotic approximant. The trill, being articulatorily more complex, is a rhotic stop. The aperture-theoretic representations of these segments are given in (26).¹⁶

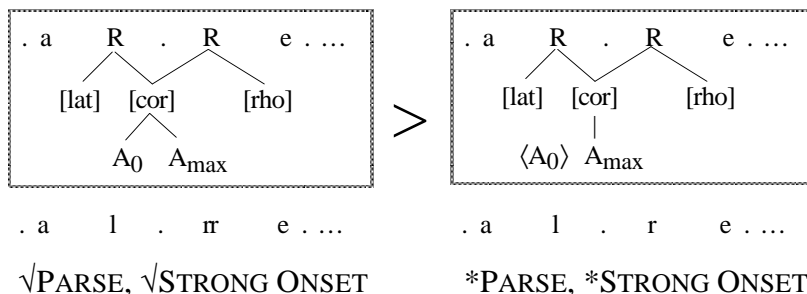


Given these representations, if a tap is posited in the post-homorganic nasal/lateral environment, it will be invariably hardened to a trill, as shown in (27) and (28).

(27) [onrra], *[onra] ‘honor’



(28) [alrreðeðor], *[alreðeðor] ‘around’



This part of the unified account alone amply justifies the postulation of the representational difference in (26) between the tap and the trill. In the following subsection I show how this difference, coupled with an OT account of the intervocalic contrast between the tap and trill and the lack of contrast between stops and approximants, can derive the remaining difference between the two phenomena under consideration.

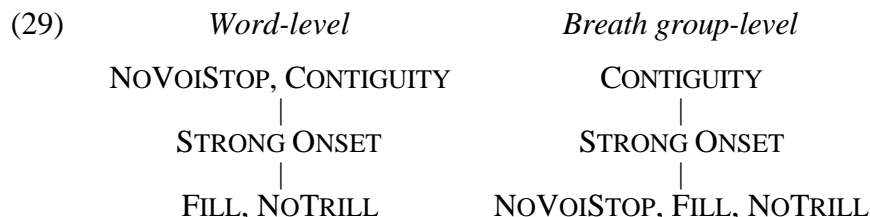
4.2 The Contrast and word-initial trilling

The fundamental difference (previously believed to be two differences) between the two phenomena under consideration is simply that the tap and trill contrast, and thus both must be available in underlying representations. This is the result of a constraint against trills (NOTRILL) being *ranked low* at the word-level, allowing the trill to be underlying and derived at this level. In

¹⁶ Harris (1969:68) has shown that Spanish stress assignment is sensitive to the distinction between the tap and the trill. A trill behaves as though it closes a penultimate syllable, precluding antepenultimate stress; a tap does not. An adaptation of Harris’ excellent account of this fact would take us too far afield here.

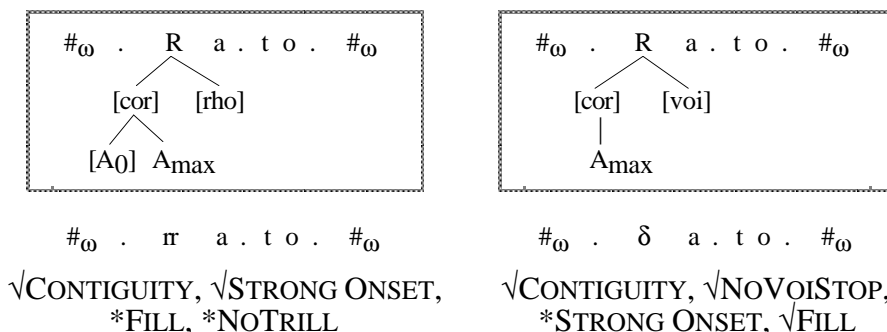
contrast, the fact that voiced stops do not contrast with approximants and are not available in underlying representations is the result of a constraint against voiced stops (NOVOISTOP) being ranked high at the word-level, completely precluding voiced stops at this level.

The previously misunderstood second difference, that only trills appear word-initially while only stops appear breath group-initially, is derived as a consequence: at the breath group-level, NOVOISTOP must be properly subordinated to allow derivation of voiced stops breath group-initially and post-nasally/laterally.



This distinction between the word- and breath group-levels achieves the following: at the word-level, insertion of an A₀ word-initially does not violate contiguity of the input parse. Trills *can* (and *must*) be created in this environment, due to the low ranking of NOTRILL, but voiced stops *cannot* be, due to the high ranking of NOVOISTOP. Compare the following word-level pair, where a word-initial trill and a word-initial nonrhotic approximant are both predicted by the word-level constraint ranking in (29), under the additional assumption that underlying approximants are posited for both.

(30) Word-level [rrato] ‘while’ vs. [ɔato] ‘date’



In (31) and (32) I provide the tableaux evaluating each of the representations in (30) with its relevant opponent. In (31), /rato/ becomes [rrato] at the word-level, because *[rato] violates STRONG ONSET, crucially ranked above NOTRILL. In (32), /ɔato/ becomes [ɔato] at the word-level, because *[dato] violates NOVOISTOP, crucially ranked above STRONG ONSET.

(31)	/rato/ ‘while’	CONTIGUITY	STRONG ONSET	FILL	NOTRILL
☞	a. . [r]ra . to .			*	*
	b. . ra . to .		*!		

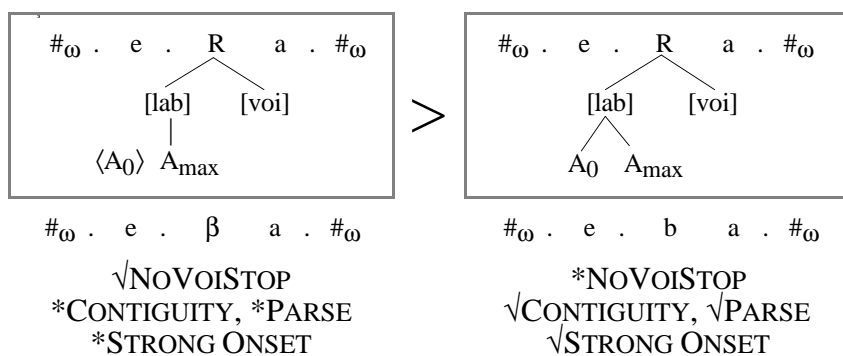
(32)	/ðato/ 'date'	CONTIGUITY	NOVOISTOP	STRONG ONSET	FILL
☞ a.	. δa . to .			*	
b.	. [d]a . to .		*!		*

In conclusion, I have argued that the stop~approximant alternation in Spanish is fortition of underlying approximants, assuming a small set of ranked and violable constraints on representations with aperture nodes representing oral closure and release. The fortition account encompasses the distribution of the tap and trill by positing two phonological levels, which are independently motivated in Spanish: the word-level, at which trills may be distinctive, and the breath group-level, at which voiced stops may be nondistinctively derived.

5 The Underlying Repertory Issue

What if, instead of underlying approximants, underlying stops were posited? This is a possibility that must be contended with, since OT's mechanisms do not directly constrain underlying representations in the form of phonemic inventory stipulation.¹⁷ A further crucial word-level ranking must be made clear: NOVOISTOP is ranked above CONTIGUITY and PARSE as well as STRONG ONSET at the word-level. The posited A₀ is underparsed to avoid violation of NOVOISTOP. This also disrupts the contiguity of the string if word-internal, as shown in (33).

(33) Word-level [eβa], *[eba]: NOVOISTOP » { PARSE } » STRONG ONSET
CONTIGUITY



Of course, at the breath group-level, NOVOISTOP is subordinated and voiced stops can be derived freely. However, because the input to the breath group-level is the output of the word-level (minus unparsed elements, presumably), voiced stops can never be “posited” at the breath group-level, and this is the sense in which the alternants in question here are “underlyingly” approximants.¹⁸

But, this line of reasoning now poses a problem. NOTRILL, unlike NOVOISTOP, is ranked low at both the word- and breath group-levels. If trills can be randomly posited at the word-level, what prevents them from surfacing in the strictly tap-only environments, repeated here?

¹⁷ I am indirectly indebted to Robert Kirchner, who indirectly brought the relevance of this fact about OT to my attention with Kirchner (1994). Alan Prince helped directly with the details of the argumentation found herein.

¹⁸ An objection that may be raised here is that the closures of nasals and laterals that have assimilated to following approximants at the word-level will also be deleted when this output becomes the input to the breath group-level. To dispel this objection, I claim that nasal and lateral assimilation are entirely breath group-level phenomena.

- (34) a. C__ kreo 'I believe' aβre 'it opens'
 b. __C martes 'Tuesday' marso 'March'
 c. __#_ω par 'pair' ir 'to go'

The beauty of Harris' (1983:62-71) account of the distribution of the tap and trill is that he does not posit an underlying trill. The intervocalic contrast is derived from the distinction between a single tap and a cluster of two taps, accounting for the sensitivity of stress to the distinction (see fn. 16). A battery of independent rules changes underlying [r] to [rr] in the relevant environments, with the intervocalic [rr] being derived by two rules: one trilling the second of the posited cluster of taps, the other subsequently deleting the first.

The beauty of that analysis is not afforded us here, since we cannot stipulate that the trill is not a possible underlying segment in OT. A full account of these facts in this context requires a more complete understanding of the syllable structure constraints of Spanish within the OT framework. In the absence of this understanding, I sketch below what I believe to be an explanation aimed in the right direction. There are (at least) three relevant facts about Spanish syllable structure:

- (i) Complex onsets are of the form obstruent + liquid ([l] or [r]).¹⁹
- (ii) Word-internal codas are restricted to [r], [l], [s], and nasals homorganic with the following consonant.²⁰
- (iii) Word-final codas are restricted to [r], [l], [s], [δ], and [n].

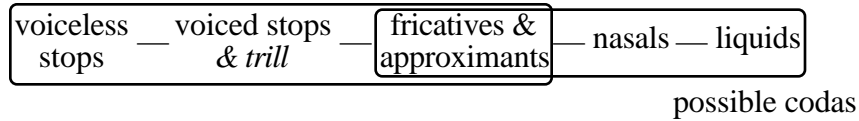
The environment C__ in (34a) is a complex onset environment, as elaborated on in (i). Harris (1983:20-22) has argued that complex onsets in Spanish are governed by sonority considerations: obstruents and liquids are not adjacent on the universal sonority scale because nasals intervene, and so a leap from an obstruent to a liquid is big enough to constitute a well-formed onset cluster. This sort of explanation is undoubtedly correct, and so a possible explanation for the exclusion of [rr] in this environment is that it is not as sonorous, in the sense of the phonological universal sonority scale, as the liquids [l] and [r]. The constraint or interacting constraints that define possible onsets based on relative sonority in Spanish should thus be ranked high enough to exclude [rr] from this position, presumably having the effect of reducing it to [r] by underparsing the posited A₀.

The environments __C and __#_ω in (34b) and (34c) are the coda environments, as elaborated on in (ii) and (iii), respectively. Excluding [rr] in these environments obviously cannot involve constraints on possible onset clusters. However, an analogous treatment to that proposed above is possible, if we assume that the trill is not only less sonorous than liquids, but also less sonorous than [s] and [δ]. The sonority scale I envision is this:

¹⁹ A few "filters" account for the few missing but logically possible combinations; see (Harris 1983:31-34).

²⁰ This generalization crucially abstracts away from consonant clusters like [kt], [pt], and [mn], which are not uncommon and in fact prompted Harris (1983:18) to "see no reason not to consider the rhymes in question as fully well formed." These types of clusters have restrictions of their own, though I will not pursue an analysis here; see Yip (1991) and Lamontagne (1993) for insightful analyses.

(35) obstruents



As indicated, the small box in (35) highlights the segments that can be possible codas in Spanish.²¹ The constraint or constraints that define the borders of this box, like the possible onset cluster constraint(s), must be ranked high enough to exclude [rr] from coda position.²²

It may seem that these apparently necessary additions to the account of the distribution of the tap and trill cast further doubt on the relationship between it and the stop~approximant alternation. I maintain that the evidence is overwhelmingly in favor of uniting the two phenomena as I have done. The evidence comes from both the empirical and theoretical sides. Empirically, the two phenomena are far too similar to attribute to chance. Theoretically, the slight differences between the two phenomena are accounted for by an independently motivated language-particular distinction between two phonological levels and an independent need to account for the contrast between the tap and trill and the lack of contrast between the voiced stops and the approximants.

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²¹ Again abstracting away from the further conditions mentioned in fn. 20.

²² I do not attempt to provide an account for the fact that optional “emphatic” trilling is possible only in coda position, not in onset position. It may be relevant that this fact is true not of the word-level, but of the breath group-level, in that it is sensitive to resyllabification of word-final taps as onsets (Harris 1983:70-71).

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