

STYLISTIC VARIATION IN SPANISH PHONOLOGY

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By

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ABSTRACT

This dissertation is an investigation of phonological variation occurring as a function of stylistic choice in Spanish. The main variable processes include glide formation, vowel coalescence, vowel deletion, nasal and lateral place assimilation, nasal neutralization, continuancy assimilation, obstruent devoicing, voicing assimilation, and aspiration. Optimality Theory (OT) is the theoretical framework.

Previous generative work on phonological variation in Spanish and other languages has been couched in discussions of “optional” or “variable” rules. More recently, a principle of “floating” constraints (FCs) has been applied to explain inter-speaker variation. The present study develops the FC theory of variation and applies it systematically to the analysis of stylistic data from several dialects of Spanish. It is argued that stylistic variation in Spanish - and indeed in all languages - is the result of variable dominance relations among ranked universal constraints. The primary advantage of the FC model is its ability to account for all speech processes, variable as well as categorical, within a single framework.

Under this model, constraints fall into two broadly-defined constraint families, MARKEDNESS and FAITHFULNESS. Data from a variety of Spanish dialects are given to show that when FAITHFULNESS constraints outrank MARKEDNESS constraints, maximally distinctive (careful speech) forms are optimized. When the reverse is true, maximally economical (casual speech) forms are optimized. Forms associated with intermediate speech styles are allowed by the interleaving of FAITHFULNESS and MARKEDNESS constraints, and often represent a “compromise” between careful and casual style.

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CHAPTER 1

INTRODUCTION

Phonological variation associated with speech style in Spanish has been well documented and analyzed (cf. Bowen 1956; Stockwell, Bowen, & Silva-Fuenzalida 1956; Navarro Tomás 1967; Harris 1969; Hutchinson 1974; Hooper 1976; Kaisse 1985; Penny 1986; Roca 1991; Hualde 1994; Colina 1995; and others). In this chapter, I review some of the original studies of variable rules in general (cf. Labov 1969; Cedergren 1973; Cedergren & Sankoff 1974) and discuss how such rules have been incorporated into the generative framework. I then propose an Optimality Theoretic (OT) model in which variable processes may be explained parametrically, using a device called the floating constraint (FC)(cf. Prince & Smolensky 1993; McCarthy & Prince 1995a, b; Reynolds 1994; Colina 1995; Jun 1996a, b; Rosenthal 1997; Nagy & Reynolds 1997).

1.1 Variability in Language

“Phonological variation is an inherent characteristic of continuous speech.” This observation, made by Neu (1980: 37), succinctly expresses a fact which has plagued phonologists for some time. Variation is a problem for phonology, because if it is truly inherent in speech - and it seems to be - then how can the facts of language ever be formalized into

“rules?” One early generative study, Cedergren (1973), analyzed the variability of /s/-deletion in Puerto Rican Spanish. The essential results of her study are given in (1).

(1) Acoustic realizations of /s/ in Puerto Rican Spanish (Cedergren 1973: 14)

<u>Variant</u>	<u>%</u>
s	11
h	41
Ø	48
N	22,167

The data in (1) show that in a sampling of 22,167 tokens, /s/ was most frequently deleted altogether, less frequently aspirated (/s/ → [h]), and still less frequently realized as [s]. This kind of variation poses a substantial problem for generative phonology. In traditional generative work, a rule either operates on an input in a given context or it does not. If an underlying segment has more than one phonetic realization in the same context, then one realization must be the product of a “variable” or “optional” rule, the difference between which will be discussed presently.

One of the earliest attempts to describe variability in language in a systematic way was Labov (1969). Labov argued that the study of variation in language is necessarily a *quantitative* endeavor. His approach to variation was a highly systematic one involving three basic steps (1969: 728-729): 1) Identify the total population in which the utterance occurs; 2) Decide on the number of variants which can be reliably identified; and 3) Identify all the sub-categories which would reasonably be relevant in determining the frequency with which the rule in question applies (e.g. the preceding or following segment).

Using the quantitative information retrieved in these three steps, facts of systematic variation could be incorporated into the structural description of the optional rules themselves. With Labov, Cedergren & Sankoff (1974) found that the distribution of variable events in the

speech of a community is “well-patterned” and therefore “reproducible.” If the frequency of a rule application is known from monitored elicitations, then the probability of its application in future elicitations may be estimated with a high degree of accuracy (345).

It is generally understood that the variable rules which are of interest to Cedergren (1973), Cedergren & Sankoff (1974), Wolfram (1975), Guy (1980), and others were to some extent correlated not only with social factors, but also with style. In a quantitative study of variable stop deletion in American English, Guy (1980) lists nine contextual factors which bear on the application or nonapplication of a variable rule. Six of these are linguistic in nature: grammatical category of the word, following segment, preceding segment, stress, length of cluster, and articulatory complexity. The remaining three are factors concerned not with the segment sequence itself but rather with the manner and circumstance of its delivery. These factors include rate of speech, style of speech, and “social” considerations. Although Guy states that the probability of stop deletion increases with rate of speech, he declines to factor speech rate into an overall equation on the grounds that “we have not yet developed a simple, reliable system for measuring and coding rate of speech in natural conversation” (9).

Other accounts of variability did develop systems of coding speech rate. Perhaps the most enduring approach was based on the assumption that although speech rates form a gradual continuum from slowest to fastest without any remarkable subdivisions, the number of rules associated with the continuum is finite. The speech rate continuum could therefore be subdivided into “speed styles” using discrete rules as signposts. Following this assumption, Harris (1969) identified four speed styles for Spanish. Although they are best described in relative rather than absolute terms, Harris does offer a prose description of each; he also gives a sample situation in which each style would most likely be preferred by speakers (1969: 7)¹ :

¹ Harris’ system of speed style categorization has been followed and developed in other significant studies of speech rate in Spanish and other languages, such as Hooper (1976), Rudes (1976), Kaisse (1985), Nespor (1987), and others. Other systems exist as well, and will be mentioned as the need arises.

Largo: very slow, deliberate, overprecise; typical of, for example, trying to communicate with a foreigner who has little competence in the language or correcting a misunderstanding over a bad telephone connection.

Andante: moderately slow, careful, but natural; typical of, for example, delivering a lecture or teaching a class in a large hall without electronic amplification.

Allegretto: moderately fast, casual, colloquial. In many situations one might easily alternate between Andante and Allegretto in mid-discourse or even mid-sentence.

Presto: very fast, completely unguarded.²

The most common speed styles for everyday speech are the two intermediate styles, Andante and Allegretto; indeed a speaker may fluctuate between the two within a single sentence.

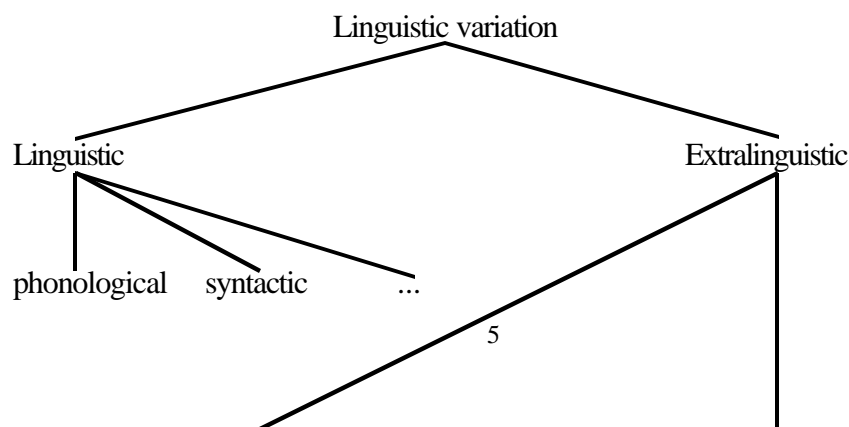
It is important to recognize that “speed” style is potentially misleading. Although speech style may correlate with speed on a probabilistic level - in that casual speech is generally fast and careful speech is generally slow - such a correlation is far from absolute. In traditional sociolinguistic studies (primarily those modeled after Labov 1969), “style” is typically described as the measure of attention a speaker gives to his own speech production. *Careful* style is therefore precisely that: speech in which the speaker pays *careful* attention to his own output. *Casual* style is speech not characterized by such attention. An interesting experiment serves as the basis for this definition of style. Mahl (1972) had subjects listen to their own voices through headphones during conversations. For brief periods, white noise was fed over the headphones so that speakers were unable to hear their own output. Other portions of the experiment were conducted with the speaker facing away from the listener. Interestingly and not too surprisingly, during the phases of white noise, when self-monitoring could not easily occur, subjects elicited stigmatized variants more often than they did when they were able to monitor themselves. Likewise when they were not directly facing the listener (see also Labov 1972).

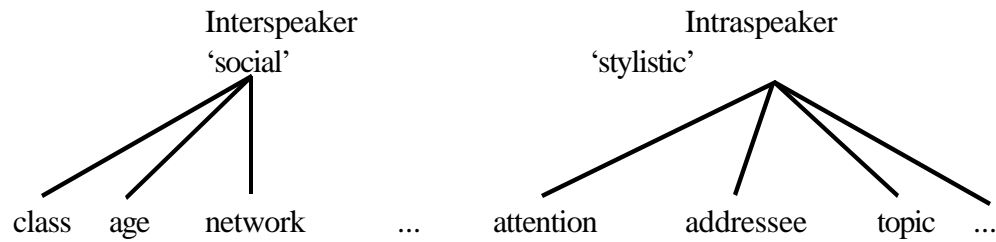
² Harris identifies Presto as a style but does not make use of it in any of his subsequent speed style discussion. It will be of no further interest here either.

In a reinterpretation of the results of Mahl's experiment, Bell (1984) observes that whether or not a subject was facing the listener had a *greater* effect on speech style than the interfering white noise. In Bell's view, this disproportion indicates that style is sensitive not so much to degree of attention, as claimed by Labov, but to the listener - specifically the communicative situation shared by the listener and speaker.

Traditional sociolinguistic studies also recognize social and stylistic axes of variation. The social axis encompasses the range of extralinguistic factors (cf. Guy 1980), including gender, age, economic background, etc., and accounts for differences between speakers. The stylistic axis, on the other hand, accounts for variation within the speech of a single speaker. Bell (1984) proposes a system of factors which contribute to language variation in general. Included within this system are "interspeaker" (social) factors as well as "intraspeaker" (stylistic) ones (see 2).

(2) Linguistic variation (Bell 1984: 146)





In his study, Bell relates intraspeaker factors to interspeaker factors; he maintains that intraspeaker variation models the variation observed in the surrounding dialect, and is therefore loosely derived from interspeaker variation (151). A speaker's individual mode of variation, modeled after the variation of the group, in turn contributes to the standard of variation for the group (cf. also Romaine 1980). In general, this and other studies relate style to social factors, without reference to *speed*.

Other studies, such as Hasegawa (1972), Ramsaran (1978), and Siptár (1979), argue that style is correlated more with level of formality (social demands of the speaker-listener situation) than with speed. In a discussion of data acquisition methods, Labov (1972) distinguishes between casual style, careful style, text reading, word list reading, and minimal pair reading. Each manner of acquisition tends to be associated with a certain style (or degree of self-attention in Labovian terms). Likewise, each style is associated with different rule probabilities. For example, in a study of /s/-aspiration in the Spanish of Cartagena, Colombia, Lafford (1982) finds an inversely proportional correlation between degree of speech formality and frequency of rule application. In his study, /s/ was realized one of three ways: [s], [h], or [Ø], depending on the level of formality. The percentages of occurrence of each realization are tabulated in figure (3).

- (3) Percentages of usages of variants of /s/ in Cartagena (Colombia) Spanish (Lafford 1982)

	<i>style</i>	[s]	[h]	[Ø]
<i>less formal</i>	casual	20	35	45
	careful	28	39	33
	reading	66	17	16
<i>more formal</i>	word list	87	5	8

Lafford's data show that the rules converting /s/ to [h] and /s/ to [Ø] are most likely to fail in most formal style; in this style the rule applies in only 5% and 8% of elicitations, respectively. In least formal style (casual), a preference for deleting or aspirating /s/ is evident; in this style, /s/ is realized as [s] only 20% of the times, compared to 35% for [h] and 45% for [Ø].

Building on the work of Labov and other sociolinguists, Silva-Corvalán (1989: 90) provides detailed descriptions of the three essential formality styles. I paraphrase these below:

Casual style. There are three basic identifying features: 1) Presence of paralinguistic factors: fast rate, change in rate, changes in intervals between high and low tones, changes in respiratory rhythm, laughing; 2) Digressions within the conversation which are spontaneously and enthusiastically introduced by the speaker; 3) Speech directed toward third persons such as family and/or friends of the speaker.

Careful style. Characteristic of recorded speech, when the speaker is aware of the data collection situation and (unconsciously) monitors the formality of his/her speech.

Formal style. Typical of a public lecture or job interview, reading aloud, or other activity requiring the speaker to pay especially careful attention to language. Silva-Corvalán observes that speakers may associate reading or similar focused language activities with schooling and the "notions of linguistic correctness" learned there.³

³ "Nociones de corrección lingüística" (p. 90).

It is not necessarily the case, however, that all speakers of a dialect recognize which activities are “formal” and which ones are “informal.” Labov (1994: 157-158) finds that there is a small number of speakers in any community who show little variation between formal and informal speech styles. Building on a similar observation, Guitart (1997) argues that formal speech is associated with *formal situations* as dictated by linguistically conservative education. Individuals with less educational background tend to lack the ability to speak formally; instead, they use informal speech in all social situations. Not surprisingly then, slow speech is not necessarily formal speech. Guitart points to instances in which individuals use informal speech patterns even at slow speeds. These same individuals seldom have the communicative experience necessary to gauge effectively the linguistic demands of different contact situations. In Guitart’s view, speakers master stylistic variation by learning to *control* competing internalized grammars. They develop such control by repeated exposure to the different circumstances in which these grammars are most operative, whether public lectures, informal chats, news broadcasts, etc. How much control a speaker develops depends on numerous environmental factors, not the least of which are educational background and personal experience.

It has been shown that in some languages formality styles and speed styles have similar but independent grammars. Hasegawa (1972) distinguishes between two such grammars, each with a distinct set of rules, in Tokyo Japanese. One set of rules is sensitive to speed, and the other is sensitive to formality. In general, fast speech rules are those which are more likely to apply as speed increases, such that given a high enough speed, they apply without exception. Casual speech rules apply across speed styles and do not tend to apply more frequently with increased rate. Japanese has this distinction probably because the language is by nature more sensitive to notions of formality.

Siptár (1979) is a study of speed and formality styles in Hungarian. In this study, three speed styles and three formality styles are identified. The three formality styles are intimate, neutral, and formal. The three speed styles are casual, colloquial, and guarded. Although

independent, the formality and speed styles frequently intersect, in which case they are given a third set of designations: casual, swift, and accelerated (29). These designations express the common but unrequired coincidence of casualness and speed.

In most languages, however, distinctions between speed and formality are not clear-cut. Speaking generally of all languages, Browman & Goldstein (1990) define casual speech as a “subset” of fast speech, and they do not rely on a distinction between the two in their discussion of gestural overlap in English. The typical sound changes they cite for casual speech are the same ones we will observe in this study: segmental deletion, insertion, substitution, and assimilation (359).⁴

For Spanish, no substantial argument has been made to date which differentiates formality rules and speed rules. In this study, it will be maintained that the intersection of fast speech with low formality and slow speech with high formality is the norm for Spanish. Situated in this way, fast speech is the often inevitable by-product of casual style.

1.2 Speed and style

As mentioned earlier, the first major attempt to delineate speed styles in Spanish was Harris (1969). Building on work begun by Navarro Tomás (1956), Bowen (1956), and Stockwell, Bowen, & Silva-Fuenzalida (1956), Harris selected several variable rules associated with “fast speech” - such as partial and total assimilation to voice and place - and cross-referenced each rule with one or more of four labeled speed styles: Largo, Andante, Allegretto, and Presto. The result was a phonological model which simultaneously accounts for speaker performance and competence, and which still today exemplifies the generative approach to issues of stylistic variation. It relied on the notion of the optional rule.

⁴ Browman & Goldstein (1990: 360) attribute casual-fast speech effects on the sound sequence to two factors: decreased gestural magnitude (in both time and space), and increased temporal overlap. They propose that gestures do not delete; rather, they lose magnitude and become acoustically obscured by gestures overlapping them. This argument will be reviewed later on.

In this section, the fundamental generative literature on speech style and optional (variable) rules is reviewed (cf. Harris 1969; Hooper 1976; Kaisse 1985; John Harris 1989; Silva-Corvalán 1989; and others). Various approaches to connected speech phonology will also be examined in detail (Poplack 1980; Browman & Goldstein 1990; Jun 1996a; Jun 1996b).

1.2.1 Optional and variable rules

In traditional generative theory, phonological variation has been explained many ways, two of which will be reviewed here. The first notion, that of the “optional rule,” was used by Harris (1969) and further developed in much of the subsequent Natural Generative Phonology literature on variation, such as Hooper (1976) and Bolozky (1977). The “variable rule” was used mainly in the field of sociolinguistics to express an uncategorical substitution whose frequency in speech was predictable on the basis of a large body of observed data (Labov 1969; Cedergren 1973, 1978; Cedergren & Sankoff 1974, 1975; and many others).

In a general study of sociolinguistic principles and methods, Silva-Corvalán (1989) distinguishes three different types of phonological rules: categorical, optional, and variable. A categorical rule is one which applies invariably in a certain phonological context. Optional rules and variable rules are used to describe processes which are not categorical. In traditional phonological theory, a rule which is not categorical produces what is commonly called “free variation,” or in sociolinguistics “conditioned variation.” Categorical, optional, and variable rules each have a separate schematic notation (see 4).

(4) Categorical, optional, and variable rules (see Silva-Corvalán 1989: 59)

- a. Categorical rule $X \rightarrow Y \quad / \left[\begin{array}{c} A \\ B \end{array} \right] _ C$
- b. Optional rule $X \rightarrow (Y) \quad / \left[\begin{array}{c} A \\ B \end{array} \right] _ C$

c. Variable rule $X \rightarrow \langle Y \rangle / \left\langle \begin{array}{c} A \\ B \end{array} \right\rangle _ C$

Rule (4a) rewrites X as Y in the environment A__C or B__C without exception. Rule (4b) rewrites X as Y in the environment A__C or B__C at the speaker's discretion. Rule (4c) rewrites X as Y variably in the environment A__C or B__C, with the context A__C being more likely than B__C to trigger application.

Zamora Munné & Guitart (1982: 51) offer morphophonological rules as an example of categorical rules in language. For example, Spanish contains a rule of diphthongization which changes /e/ to [je] in the third person of some lexically marked verb forms, creating alternations of the type *pensar* ~ *piensa*. One does not hear an alternation between *piensa* and **pensa*; therefore the rule (at least in the case of *pensar*) is a categorical one.

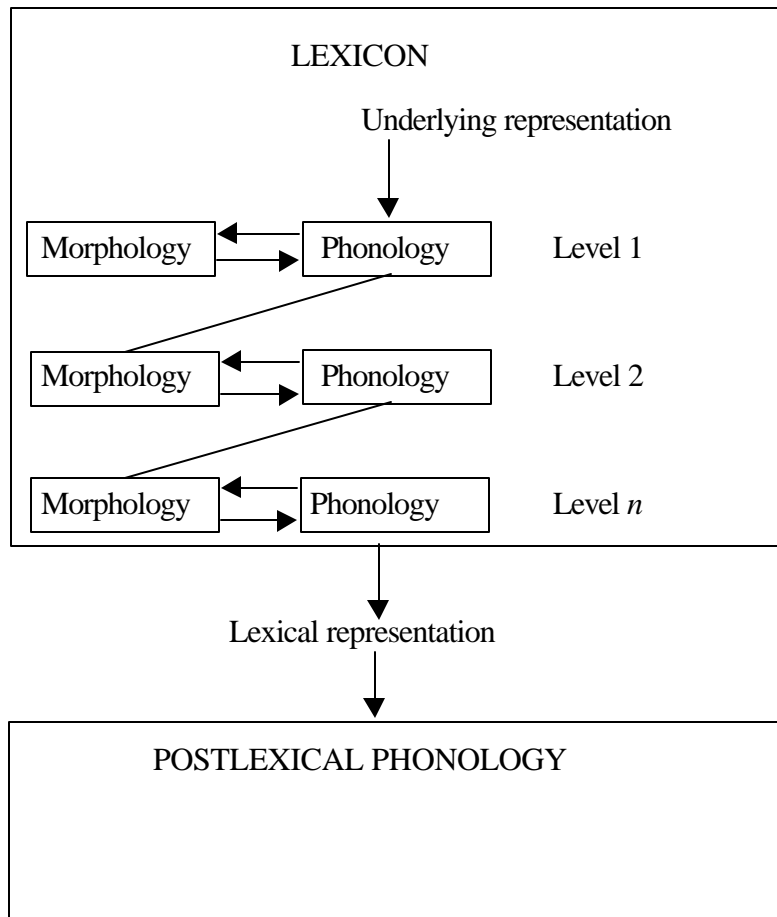
Optional and variable rules can refer to the same types of phonological operations.⁵ In general, an optional rule carries less information than a variable rule with regard to the exact context of application. An optional rule is one which is *not categorical* in a certain phonological context (i.e. A__C). Non-linguistic factors in the application of the rule are not incorporated into the rule in any way. Instead, application is simplistically attributed to “optionality” or even “randomness.”

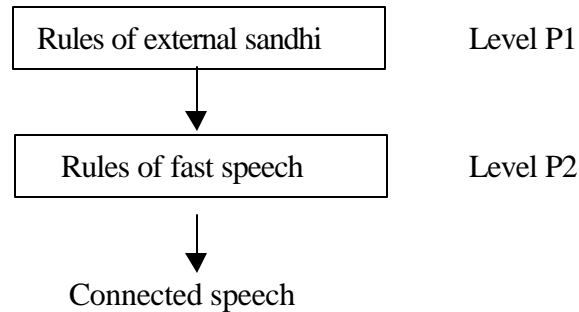
Most optional rules operate across the board, as it were, without reference to morpheme- or word-boundary information. For this reason, lexical phonological models generally situate them late in the phonology, in the postlexical stratum. Kaisse (1985) argues for two sequential postlexical rule modules P1 and P2, the first of which contains external sandhi

⁵ The variable rule is, however, first and foremost a generalization based on quantitative data. Because the variable rule is handled in primarily sociolinguistic studies, its phonological triggers are considered integrally with its social triggers. If the linguist's goal is to study language variability in a social context, the mere labeling of rules as “optional” is inadequate. The reader is referred to Cedergren (1973; 1978), Cedergren & Sankoff (1974), Neu (1980); López Morales (1981), Terrell (1981), and Silva-Corvalán (1989) for thorough quantitative studies on variation in Spanish.

rules, and the second of which contains (optional) “fast speech” rules. Kaisse’s phonological model is presented in (5) in a somewhat simplified form.

(5) Speed rules in lexical phonology (Kaisse 1985: 20)





As shown in diagram (5), Kaisse's model situates fast speech rules in the postlexical stratum. The two types of postlexical rules she formulates - P1 and P2 - are similar except for the fact that P1 rules are sensitive to phonological *and syntactic* context and P2 rules are sensitive only to phonological context. An example of an external sandhi rule in Spanish is the deletion of word-final stressed [a] in a verb form whenever it precedes a mid vowel. This is common in Puerto Rican dialect.⁶ Kaisse argues that word-final stressed [a] may delete only if it is contained in a verb. This deletion rule is necessarily a sandhi rule because its structural description requires *syntactic* information, i.e. knowledge of the grammatical category "verb" (see figure 6).

(6) External sandhi: stressed [a] deletion rule (simplified from Kaisse 1985: 128)

$$a \rightarrow \emptyset / \text{_____}]_{\text{verb}} \left\{ \begin{array}{c} e \\ o \end{array} \right\}$$

The following data illustrate how the deletion rule applies in verbs, but fails in nouns and adverbs.

⁶ This deletion process must not be confused with a more general variety of /a/-deletion, which targets any *unstressed* /a/ before any vowel, across a word boundary, and is common in many Latin American dialects.

(7) External sandhi: stressed [a] deletion data (Kaisse 1985: 127-128)

<u>non-verbs</u>		<u>verbs</u>	
mamá entró	*mam' entró	podrá empezar	podr' empezar
sofá elegante	*sof' elegante	volverá enamorado	volver' enamorado
acá encontré	*ac' encontré	contará entre	contar' entre
allá olvidé	*all' olvidé	comprará ochenta	comprar' ochenta

Stressed [a] deletion is syntactically conditioned and must therefore be classified as a P1 rule. A different variety of /a/-deletion, which targets the *unstressed* vowel, may apply in any syntactic context and is therefore classified as a P2 rule.

The formal line between P1 rules and P2 rules is a thin one. In some cases, such as in very relaxed speech, a P1 rule may become syntactically unconstrained and apply in the P2 module. Likewise, a P2 rule may, over time, become sensitive to morphological or syntactic information and become a P1 rule. In this way, more productive processes become less productive as new productive processes are added late in the ordered rule system.

The development of a connected speech rule [external sandhi rule -- REM] from a fast speech rule is ... a movement upward [in the ordered rule system -- REM] that entrains the development of sensitivity to syntactic structure. Moreover it is occasionally noted that the syntactic conditions on some external sandhi rules may disappear as the speech rate increases. (...) A connected speech (P1) rule that "loses" its syntactic conditions is simply one that also has P2 as its domain (Kaisse 1985: 16).

In addition to partitioning lexical rules, sandhi rules, and optional speed rules in a lexical phonology, Kaisse's model makes a significant statement about the nature of rule evolution and language change, namely that language change begins at the postlexical level, i.e. in the domain of connected speech.

Stampe (1969), Hooper (1976), and other proponents of Natural Generative Phonology (NGP), held a view similar to Kaisse's regarding rule innovation and evolution. In NGP, a distinction is made between language-specific MP-rules (morpho-phonological rules) and language-general P-rules (phonological rules) (Hooper 1976: 16-17).

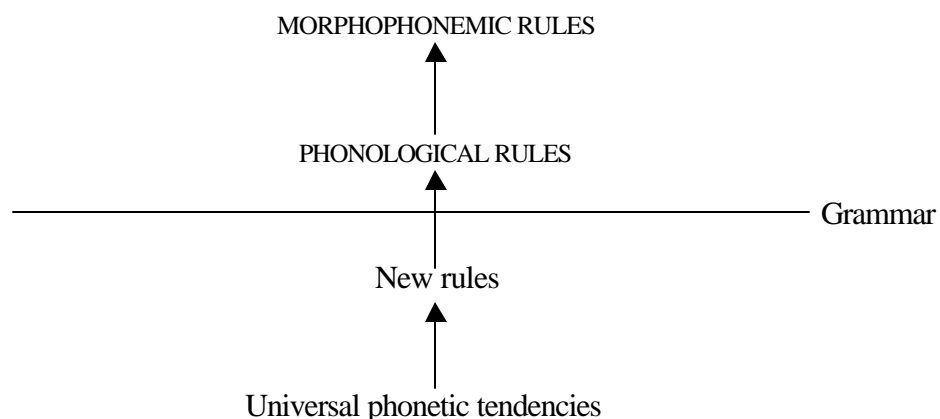
P-rules describe processes governed by the physical properties of the vocal tract. Obviously, these processes are not random and totally language-specific, but their form and content can be predicted on universal principles.

...

MP-rules ... take part in the sound-meaning correlation of a language and are therefore language-specific. They are apt to be quite arbitrary ..., and they are likely to have exceptions.

In Hooper's model, linguistic innovation is driven by universal phonetic principles. P-rules are expressions of these principles. Any rule added to the "bottom" of the rule inventory as an innovation is necessarily phonetically motivated. With time, and with the addition of subsequent innovations, each P-rule is literally pushed deeper into the grammar, and often becomes subject to morphological conditions which are language-specific. Thus language-specific phonological rules may be described as vestiges of language-general phonetic processes. A simplified version of Hooper's rule evolution diagram is shown in (8).

(8) Rule innovation and evolution in language (Hooper 1976: 86)



Universal phonetic tendencies, which are determined by the fundamental physiological and acoustic limitations of the articulating organs, find their way into the grammar of a language as variable rules. With the addition of new variable rules describing other processes, older variable rules become embedded in the lexicon, and often become morphologically conditioned, as is the case with stressed /a/ deletion in Puerto Rican Spanish.

John Harris⁷ (1989) argued for a characterization of language change very similar to Hooper's. In a discussion of rule morphologization in several English dialects, he maintained that the lexical phonology model, with its layered strata (recall figure 5), allows elegant formalization of the gradual incorporation of new rules - as well as the morphologization of old ones. I cite his two principles of new rule incorporation in (9).

- (9) New rule incorporation in lexical phonology (John Harris 1989: 38-39)
- a. Gradient patterns of variation are controlled by rules which apply post-lexically. Any rule operating within the lexicon necessarily involves categorical distinctions.
 - b. Only post-lexical rules may introduce 'novel' structure, i.e. feature values that are not marked in underlying representation.

In John Harris' study, various phonological rules in English (such as coronal dentalization or /æ/-tensing) are shown to be morphologically conditioned in some dialects but not others. It is understood that rules which are so conditioned represent a more advanced stage in linguistic innovation, whereas rules which are not conditioned represent the initial stages of change.

⁷ John Harris (1989) is identified here by first and last name to avoid confusion with *James* Harris (1989), a study on Spanish verb stress.

The initial stage of a sound change may take the form of an intrinsic phonetic contrast undergoing phonologization, becoming controlled by a low-level rule operating in the post-lexical stratum. Over time the original phoneticity of the change may become obscured by a number of factors. The rule may acquire lexical exceptions, or it may, as a result of analogical pressures, become implicated in morphological structure. Either of these developments involves the rule making a transition into the lexicon (John Harris 1989: 54).

If, as Stampe (1969), Hooper (1976), and John Harris (1989) claim, optional rules reflect universal phonetic tendencies, then variable (stylistic) processes reflect universal tendencies to some degree as well. We will take for example nasal place assimilation. This is arguably a general phonetic tendency of languages; most languages place-assimilate nasals to following stops sporadically if not categorically. Consider the Spanish data in (10), in which the overties indicate coarticulated, or gesturally overlapped, segments.

(10) Nasal assimilation: basic data (cf. Harris 1969: 8-18; also Harris 1984a, b)

	<i>banco</i>	<i>in+menso</i>	<i>un#beso</i>
Largo	[baŋ.ko.]	[in.men.so.]	[un.be.so.]
Andante	[baŋ.ko.]	[in̄m.men.so.]	[un̄m.be.so.]
Allegretto	[baŋ.ko.]	[im.men.so.]	[um.be.so.]

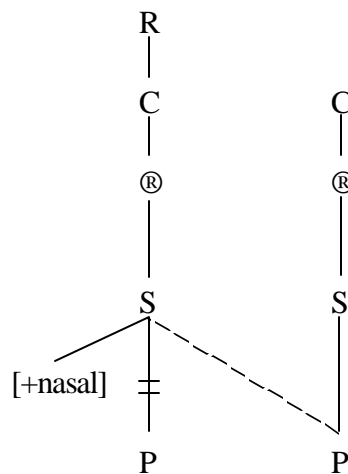
The data in (10) are based on Harris' (1969) general discussion of nasal place assimilation and its relationship to speed. Following Navarro Tomás (1967), Harris observes that nasal place assimilation occurs variably depending on the position of the nasal within the segment sequence. For example, nasals seem always to place-assimilate totally to a following stop found in the same morpheme.⁸ This fact is illustrated by forms like *banco*, realized with

⁸ Harris (1984b) identifies only one commonly-used word containing identical tautomorphic nasals: *perenne* 'perennial', but he specifies that [nn] sequences in this and other less common words (such as *pinnipípedo* 'pinniped'), are generally realized short in conversational speech, i.e. as [n].

total place assimilation regardless of speed or level of formality: [baŋko].⁹ Before a stop in a different morpheme, however, nasals place assimilate totally only in very casual speech. For example, the underlying /n/ in *un beso* is unassimilated [n] in Largo speech, partially assimilated (coarticulated) [nm̩] in Andante, and totally assimilated [m] in Allegretto.

Hualde (1989a) contains a typical autosegmental expression of place assimilation. In his formulation of the rule, he gives the feature [+nasal] as a dependent of the root node itself. Total assimilation includes concomitant delinking of the nasal segment's original place node structure, whereas partial assimilation allows the original place node to be retained.

(11) Nasal place assimilation (Hualde 1989a: 21)



As already stated, nasal place assimilation (rule 11) applies *obligatorily* within a morpheme, and *variably* between morphemes. In addition, the variable version of the rule may apply partially (without subsequent delinking) or totally (with subsequent delinking). The

⁹ In this study, we follow Clements (1985: 231) in distinguishing three types of assimilation: total, partial, and single-feature. Each type involves the same fundamental process of node “spreading.” In total assimilation, the spread argument is the root node. Partial assimilation is achieved by spreading of a class node (such as supralaryngeal or laryngeal). Single feature spreading is the spreading of a terminal feature node, such as [coronal].

result in the former case is an overlapped segment such as $[\widehat{nm}]$ or $[\widehat{m}]$, as is found in medium-speed utterances like *un beso* $[\widehat{unm}.be.so.]$ and *un cacto* $[\widehat{un}\eta.kak.to.]$.

Navarro Tomás (1967: 113) describes the partially assimilated segment found in Andante style as a coarticulation, or overlap, of the bilabial and coronal gestures:

En el grupo *nm* la articulación de la primera consonante, en la conversación ordinaria [i.e. casual speech -- REM], va generalmente cubierta por la de la *m*: la lengua realiza, de manera más o menos completa, el contacto alveolar de la *n*; pero al mismo tiempo la *m* forma su oclusión bilabial, siendo en realidad el sonido de esta última el único que acústicamente resulta perceptible: inmóvil..., conmigo [each with \widehat{nm} -- REM].¹⁰

Navarro Tomás's account of the data is consistent with actual X-ray pellet trajectory studies carried out in the study of speech rates. The findings of one of these studies is briefly reviewed in the section 1.2.2.

1.2.2 Gestural overlap and gestural reduction

Articulatory Phonology, originally developed by Browman & Goldstein (1990) and further elaborated by Zsiga (1994), Byrd & Tan (1996), Byrd (1996), and others, correlates phonological processes with a set of articulators whose movements are independent and therefore independently measurable. Such studies have found that when speech rate increases, the articulators (lips, tongue tip, tongue body) move more quickly and the resulting gestures become temporally and spatially compressed. However, the speed at which articulators are able to move is limited physiologically. In very fast speech, these limitations force gestures to overlap - at least partially - across one or more tiers. To illustrate the effect of fast speech on the sound sequence, two “gestural scores” for the English phrase *must be* are shown in figure (12). Figure (12a) represents the canonical score, in which each gesture is proportionally timed

¹⁰ Hualde (1989) concurs with Navarro Tomás, but claims that total place assimilation between nasals is not unheard of, just infrequent. Thus the coarticulated form $co[\widehat{nm}]migo$ seems to be preferred to the assimilated form $co[m]migo$ (19).

and therefore not overlapped. In (12b), the fluent speech score, the gestures are compressed, and as a result, the tongue tip and lip gesture [tb] is overlapped, thus $\widehat{[tb]}$.

(12) Gestural shortening and overlap: English *must be* (Browman & Goldstein 1990: 18)

a. canonical score

Tier	Gestures				
Tongue Body		Λ			i
Tongue Tip			s	t	
Lips	m			b	

b. fluent speech score

Tier	Gestures				
Tongue Body		Λ			i
Tongue Tip			s	t	
Lips	m			b	

In (12b), the tongue tip gesture is still physically present; acoustically, however, it is “hidden” by the lip gesture overlapping it and is therefore virtually imperceptible. These data led Browman & Goldstein (1990: 26) to state a general principle of overlapping in casual speech:

...[C]asual speech processes may not introduce units (gestures), or alter units except by reducing their magnitude. This means that all gestures in the surface realization of an item are present in their lexical representation; casual speech processes serve only to modify these gestures, in terms of diminution or deletion of the gestures themselves, or in terms of changes in overlap. Phonological rules of the usual sort, on the other hand, can introduce arbitrary segments, and can change segments in arbitrary ways.

This principle bans intrusion of nonunderlying material in the output sequence, attributing surface discrepancies instead to changes in the phasing of the underlying gestures. In the Articulatory Phonology framework, it is not the case that the canonical tongue tip gesture /t/ in *must be* has been deleted from the fast speech [masbi]; rather, the gesture is physically present but not acoustically salient. This principle concurs with Navarro Tomás's observation for Spanish that although [nm] sequences may be coarticulated [\widehat{nm}], it is only the bilabial gesture which is perceptible.

Jun (1996a) is a study of how listeners perceive consonant gestures in Korean and English. Four gestures combinations were examined in the study: non-overlapped, overlapped, reduced, and deleted. Jun found that listeners perceive overlapped labial and velar gestures as overlapped, and reduced gestures are perceived as deleted. In other words, /pk/ is perceived as two gestures [pk] whether the gestures are sequential [pk] or overlapped [\widehat{pk}]. Only when the labial gesture is reduced or geminated is this gesture no longer perceived. This observation holds true across two articulation styles, casual and formal, for both English and Korean.

Jun's conclusion, that "the boundary between perceptual assimilation and non-assimilation can be characterised by gestural reduction, not by gestural overlap" (393), clearly challenges Browman & Goldstein's claim that gestural overlap causes the perception of place assimilation.

1.2.3 Fast speech and control

A secondary claim made by Jun (1996a: 378) is that gestural overlap is not strictly the result of physiological restrictions on speech mechanisms, as argued by Browman & Goldstein. Rather, overlap and reduction are speaker controlled (cf. also Barry 1992: 399). Because of this basic control, the incidence of overlap and reduction are variable in fast speech and therefore do not necessarily correlate with speech rate. Zsiga (1994: 139) made a comparable observation: increased speech rate does not necessarily result in increased gestural overlap; however, where overlap is present, it is usually in fast speech. These observations suggest that speakers have enough control over the various speech organs to prevent gestural overlap (i.e. the perceived loss of a segment) in accelerated speech.

If, as Zsiga (1994) and Jun (1996a) suggest, speakers are able to control both overlap and reduction, why do they not opt for the most effortless style in every speech situation? Flege (1988: 99), a study of gestural timing and overlap correlated with speech rate, sheds light on the matter.

[A] balance of two countervailing forces influences how phonetic segments are articulated: the need to maintain sufficient distinctiveness between segments to ensure that words are recognized correctly, and the need to minimize effort while rapidly interleaving the multistructural movements that characterize successive phonetic segments.

NíChiosáin & Padgett (1997: 20) make a similar observation:

There is a tendency to maximise the perceptual distinctiveness (dispersion) of contrasts; however, there is also a need for articulations to be minimally complex.

Casual or highly compressed speech involves substitutions of the type $X \rightarrow Y$ (cf. /n/ \rightarrow [m] in *un beso*). Any substitution potentially neutralizes a meaningful contrast in the

language; thus such substitutions may be at a cost. It is in precisely those contexts where a meaningful contrast is at stake that casual speech substitutions are most likely to fail. For example, studies of optional coda /s/ deletion in various dialects, such as Puerto Rican, have shown that aspiration is likely to be avoided if the resulting form is ambiguous (see 13).

(13) /s/ deletion resulting in loss of meaningful contrast (Poplack 1980: 61)

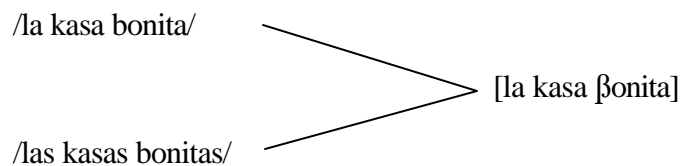


Figure (13) shows how deletion of Puerto Rican coda /s/ in the phrase *las casas bonitas* ‘the pretty houses’ results in a potential confusion with the phrase *la casa bonita* ‘the pretty house.’ It is not always the case, however, that /s/ deletion results in ambiguity with singular forms, as shown by the examples in (14).

(14) /s/ deletion which does not result in loss of meaningful contrast (Poplack 1980: 59)

- a. arroz con habichuela(s)
- b. un par de cosa(s)
- c. hablan con muerto(s)

In (14), each parenthetical /s/ is a plural morpheme. Its deletion, therefore, constitutes a loss of morphological information. In these instances, however, /s/ may be deleted because the plurality of the noun in question is recoverable from context. In (14a), deletion does not result in ambiguity because of “cultural or shared knowledge;” it is generally understood that rice is accompanied by more than just one bean. (14b) is not ambiguous because the phrase *un par* indicates plurality. Likewise, it is understood in (14c) that *muerto(s)* is plural because it is not

preceded by a definite or indefinite article, as would be the case if it were singular: *hablan con un/el muerto*.¹¹

The speaker's need for articulatory economy is therefore counterbalanced by the need to be unambiguously understood by listeners (cf. Flege 1988; Ní Chiosáin & Padgett 1997). These needs are in direct competition. From a generative viewpoint, one could say that there is a rivalry between the lexical word-formation rules, one effect of which is the generation of contrasts, and the phonological processes, which potentially neutralize them.

Faced with these two competing communicative goals (to speak economically yet still be understood unambiguously), a speaker weighs the relative importance of each on a situation-by-situation basis.

(15) Inversely proportional factors in speech rate

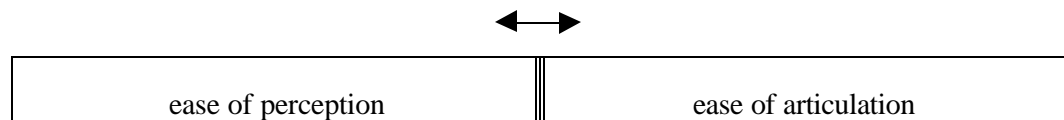


Figure (15) is a graphic representation of a speech rate “continuum” along which “effort” is held constant, whether articulatory or perceptual, between speaker and listener. Articulatory ease seldom correlates with perceptual ease; here, the two are considered to be in direct opposition. As the task of articulation becomes easier - whether by deletions, reductions, or substitutions - the task of perception becomes more difficult, because the listener must do more to “reconstruct” the speaker’s intended utterance. In a discussion of perceptual cues in /s/-aspirating dialects, Widdison (1997: 253) makes the following statement, which summarizes the perceptual challenges faced by listeners in reconstructing casual speech:¹²

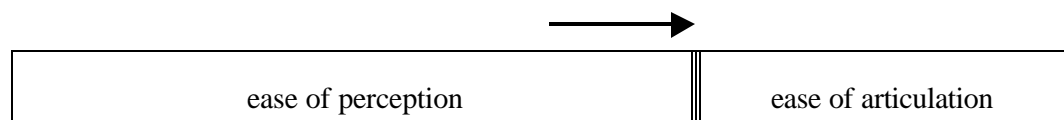
¹¹ The reader is referred to Cedergren (1973), Poplack (1980), Terrell (1981) for complete analysis of /s/ deletion and restrictions on it in various dialects. For examples of ambiguity resulting from other fast speech processes, please see Bowen (1956) and Stockwell, Bowen, & Silva-Fuenzalida (1956).

¹² For other discussions of speech processing, see Andersen (1973) and Fowler (1984).

Auditory processing of the speech signal involves a procedure that normalizes an utterance by factoring out distortions originating from gestural overlay and other sources in order to reconstruct the idealized symbolic form found in memory. ... Listeners must interpret the signal in order to discover the psychological intent of speakers.

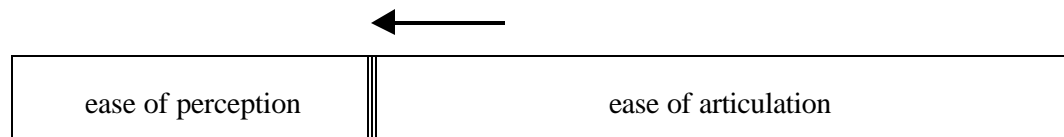
In a situation which - by the speaker's judgment - merits careful speech, the speaker represents the acoustic signal as faithfully to the underlying form as possible; this, in effect, makes the listener's processing task "easier" in that the listener does not have to exert great effort to reconstruct the intended form. For example, a foreign language teacher might over-articulate each sound in an utterance in order to be understood easily by students. The burden on the students to reconstruct the utterance in the unfamiliar language is taken over, as it were, by the teacher, who must exert great articulatory effort in order to keep the perceptibility level high. This speech mode is represented by a diagram in which the balance between ease of articulation and ease of perception has been skewed in favor of perception (see 16).

(16) Perception vs. articulation



Among native speakers of the same language, however, such careful attention to perceptibility is often unnecessary. Native speakers are accustomed to the sound substitutions, reductions, and deletions which characterize the casual, gesturally relaxed speech of their dialect, and they take these characteristics for granted both as speakers and listeners. The speaker is freer to organize the sound sequence so as to favor his or her own economy of articulation, rather than the ease of perception of the listener. In this mode, ease of articulation is given priority - at the expense of some ease of perception (see 17).

(17) Articulation vs. perception



Even in speech between two very familiar people, it is possible for speech to become so casual that it is - even if momentarily - incomprehensible. This is especially true if other contributory cues, such as facial expression or even body language, are absent, as on a telephone call. The solution in such instances, naturally, is for the misunderstood interlocutor to repeat the utterance - in a more careful style. Over time, speakers learn how much articulatory care is needed in which types of contact situations, and learn to temper their desire for articulatory simplicity with the need to be understood. It is by experiencing and engaging in a wide range of speaker-listener situations that speakers develop a sensitivity to notions of formality, and therefore to speech styles in general. These observations are consistent with Guitart's (1997), and will serve as a foundation for the discussion of intraspeaker variation throughout this study.

1.3 The Theoretical framework: Optimality Theory

Optimality Theory (OT) (Prince & Smolensky 1993; McCarthy & Prince 1995a, b; and others) is a theory based on ranking arguments. Competing linguistic constraints on surface structure have unequal force and therefore fall into an array of dominance relations. In the event that two constraints conflict, the lower-ranked one may be violated in order to satisfy the higher-ranked one. In this framework, the “competing” speech goals discussed in the last

section may be schematically represented and compared. In this section, two classes of constraints (MARK and FAITH) are presented and compared, and their relevance to speech variation is established. Next, a tentative OT discussions of variability in Spanish is reviewed (Colina 1995). Finally, an alternative approach is presented, following Reynolds 1994 and Nagy & Reynolds 1997, which enables a more comprehensive description of stylistic variation.

1.3.1 Preview of OT constraints

Two families of constraints are posited to comprehensively explain casual speech data in Spanish and in languages in general: FAITH(FULNESS) and MARK(EDNESS).¹³ FAITH constraints monitor the phonetic realization of underlying featural, segmental, and suprasegmental material. In this capacity, they ban deletion or addition of nonunderlying features, segments, and moras. In contrast, MARK constraints monitor macrosegmental details such as syllable and feature associations ranging across segments. It is understood that MARK constraints serve to make a sound sequence as unmarked as possible in that they favor the realization of natural linguistic processes (assimilations, reductions, etc.).

In (18), the primary constraints to be used in this study are summarized. Others will be introduced and discussed as the need arises. They are grouped by category: FAITH constraints are listed in (18a), and MARK constraints are listed in (18b).¹⁴

(18) Principal constraints used in the study

- a. FAITH category: underlying material is preserved

IDENT [place]: “Input place nodes are retained in the output.”

No place assimilation or deletion.

¹³ It is not necessarily the case that all constraints are either MARK and FAITH; no assertion one way or the other will be made here. These categories should be seen as “constraint families” not necessarily exclusive of other families.

¹⁴ The IDENT and MAX constraint families are presented in McCarthy & Prince (1996a: 370) and developed throughout OT literature. LICENSE is developed in Padgett (1996).

IDENT [feature]: “Input features are retained in the output.”

No segment raising, lowering, backing, fronting, etc.

MAX-IO: “Input segments have output correspondents.”

No segmental deletion.

MAX- μ : “Input moras must be parsed in the output.”

No glide formation (also constrains vowel deletion).

MAX- μ -WI: “Word-initial moras are retained in the output.”

No *word-initial* glide formation (or vowel deletion).

b. MARK category: minimize articulatory effort

HIGLIDE: “All glides are [+high].”

No mid glides.

LICENSE-X: “A coda consonant must be licensed by the X node of a syllable onset.”

X assimilation is mandatory. (LIC-X)

HNUC: “The syllable nucleus is also a sonority peak.”

ONSET: “Syllables have onsets.”

1.3.2 FAITHFULNESS vs. MARKEDNESS

FAITHFULNESS and MARKEDNESS constraints have been classified and defined in a variety of ways. Jun (1996b) refers to these same families as PRESERVATION and WEAKENING, respectively (see 19).

(19) PRESERVATION and WEAKENING constraint families (Jun 1996b)¹⁵

¹⁵ In an analysis of stylistic variation in French, Dutch, and Turkish, Van Oostendorp (1997: 209) makes a distinction between two constraints roughly equivalent to Jun’s:

The first subset consists of well-formedness requirements, such as the constraint against onsetless syllables ONSET.... The second subset consists of so-called faithfulness constraints requiring phonological output forms to be maximally faithful to the output.

- a. PRESERVATION (PRES)¹⁶
 Preserve underlying featural, segmental, and moraic information.
- b. WEAKENING (WEAK)
 Minimize articulatory effort.

Jun's PRESERVATION (FAITH) constraints ensure that underlying features are realized faithfully in the output. In general, these constraints monitor information internal to the segment, such as structural nodes and distinctive features. Most of them fall under either the MAX or IDENT sub-family, e.g. MAX- μ and IDENT [high]. MAX- μ requires that an underlying mora (μ) be "maximized" - realized phonetically - in the output. IDENT [high] states that the *value* of an underlying feature [high] must not change in the output. Hammond (1997: 36) sums up the function of FAITH constraints very succinctly: "Pronounce everything as is." In short, FAITH constraints command absolute identity between the input and the output.

On the other hand, WEAKENING (MARK¹⁷) constraints monitor information spanning more than one segment, i.e. at a level of representation higher than the segment, such as the syllable, morpheme, foot, or prosodic word. For example, ONSET is a MARK constraint because it examines a unit *larger* than the segment: the syllable. It is provisionally maintained that FAITH constraints monitor *intra*segmental information, whereas MARK constraints monitor information which is *inter*segmental: i.e. shared place nodes, syllable positions, relative sonority of segments, etc. It will also be maintained that feature complexes within segments - such as

¹⁶ In Jun's (1996b) analysis, PRESERVATION constraints take the form 'PRES (X)', where X is a perceptual feature. In his analysis, perceptual features are those with primarily acoustic, rather than articulatory, correlates; e.g. nasal, continuant, sonorant (note also that these are the "manner" features). In my analysis, FAITH is used as an abstract category heading rather than a multi-argumented constraint. My category FAITH contains all constraints which monitor a candidate's identity - structural, segmental, perceptual, or otherwise - to its underlying form.


¹⁷ Pulleyblank (1997: 64) refers to these constraints as "syntagmatic constraints," which "impose restrictions on *sequences of sounds*" (stress mine).

feature contours - are subject to simplification in casual speech and are therefore monitored by MARK constraints as well.


1.3.3 Colina (1995)

Colina (1995) is the first major study of Spanish syllabification undertaken in the OT framework. In her study, Colina posits that stylistic variation within a dialect may be achieved in the same way interdialectal variation is achieved: by constraint reranking. The only difference, of course, is that ranking relations between constraints must be left flexible. Colina shows how the ranking relation of the constraints ONSET and MAX- μ (she calls this constraint PARSE- μ), may be either ONSET \gg MAX- μ or MAX- μ \gg ONSET. Each ranking optimizes a different candidate. Two of her examples are shown in tableaux (20) and (21). Her constraint PARSE- μ is replaced with MAX- μ (which has the same function) for the sake of consistency.

(20) Slow speech: *maestro* (cf. Colina 1995: 154)

/maestro/	MAX- μ	ONSET
 a. ma.es.tro.		*
b. ma _̃ es.tro.	*!	

(21) Fast speech: *maestro* (cf. Colina 1995: 154)

/maestro/	ONSET	MAX- μ
a. ma.es.tro.	*!	
 b. ma _̃ es.tro.		*

The examples in (20) and (21) illustrate the effect of two constraints ONSET and MAX- μ on syllable merger. As defined, ONSET requires that syllables begin with a consonant. MAX- μ requires that an underlying mora be parsed by syllable structure on the surface. MAX- μ is violated when a nuclear segment becomes nonnuclear, as is the case in glide formation.

In (20) and (21), the (a) candidate [ma.es.tro.] contains one syllable that begins with a vowel; this syllable incurs a violation of ONSET. The (b) candidate [maɛs.tro.] contains syllable merger and therefore satisfies ONSET. When the syllables *ma* and *es* merge, however, /e/ becomes a mid glide. This means its underlying mora is unparsed in the surface form, thereby violating MAX- μ . In (20), the slow speech ranking, candidate (20a) is optimal. In (21), the ranking associated with fast speech, candidate (21b) is optimal. Thus two surface possibilities of *maestro*, one with a vowel and one with an offglide, are explained in terms of parametrization of the FAITH constraint MAX- μ and the MARK constraint ONSET.

In Colina's model, a speaker of a dialect in which both [ma.es.tro.] and [maɛs.tro.] are attested outputs of /maestro/ has internalized two parallel or "competing" categorical hierarchies, one in which MAX- μ » ONSET and another in which MAX- μ » ONSET.

Colina's argument that reranking is the operative mechanism in *intradialectal* (i.e. stylistic) variation is a significant one. It shows that it is possible, and even desirable, to incorporate variable processes into the "standard" grammar.

1.3.4 Partial ranking theories of variation

One of the central arguments of OT is that languages differ not in constraint inventory, but rather in constraint ranking. The sole differentiating factor between languages, then, is the ranking of universal constraints. Dialectal variation is typically explained as reversals of key constraints. In OT, dialectal differences are expressed in terms of constraint reranking.

The approach to *stylistic variation* has been somewhat different. Reynolds (1994) proposed a theory of "floating constraints," or FCs, to account for facts of variation within

speech communities (cf. also Nagy & Reynolds 1997; Kang 1997; Anttila 1997; Anttila & Cho 1998; and others). Like Colina’s model, the FC theory expresses variation in terms of the variable ranking of constraints. In this theory, however, the grammar is defined by a single constraint hierarchy in which some constraints, specifically those which monitor the effects of variation, are ranked relative to some constraints but not others. The result is a single hierarchy in which some constraints are partially ranked, rather than a number of “parallel” hierarchies in which constraints are categorically ranked. Whereas the parallel hierarchy approach requires that speakers have knowledge of multiple hierarchies, one for every attested output, the FC approach requires that speakers internalize only one hierarchy, in which a subset of the constraints are incompletely ranked relative to other constraints.

In traditional OT, it is maintained that every constraint in the hierarchy is explicitly ranked with respect to every other (cf. Anttila & Cho 1998: 36). In a partial ranking theory, however, some constraints are left unranked with respect to others. The result is what Reynolds (1994) terms “floating” constraints, or FCs.

... within a given language or dialect, it may be the case that a particular constraint X may be classified only as being ranked somewhere within a certain range lying between two constraints W and Z, without specifying its exact ranking relative to a certain other constraint Y (or constraints Y₁, Y₂, etc.) which also falls between W and Z. A graphic representation of such a variable constraint ordering is as follows:

.....CONX.....
 CONW » CONY₁ » CONY₂ » ... » CONY_n » CONZ

Here, the constraint (or constraints) which appears on the higher level in the representation is the FC, while those on the lower level are “hard-ordered” or “anchored” constraints. The range over which the FCs may extend is defined, not in terms of the constraints (W and Z) which the FC lies between, but rather in terms of the particular subset of fixed or anchored constraints (Y₁, Y₂, ... Y_n) with regard to which the FC is considered to be unranked. In other words, the FC may be allowed to fall in any position with respect to its anchored subset -- above Y₁, below Y_n, or at any point in between; this is the essence of the FC’s relationship with its anchored subset or range (Reynolds 1994: 116).

Reynolds' model allows a constraint to be unranked relative to one set of constraints ($CONY_1 \gg CONY_2 \gg \dots \gg CONY_n$), yet ranked relative to others; i.e. it must be dominated by CONW and must dominate CONZ. This incomplete ranking allows the constraint in question - CONX - to "float" along a specified range of the hierarchy. As an FC, it may "fall" into a categorical ranking relation with any of the fully-ranked constraints along the specified range.

An alternative approach which uses the same basic mechanism has been proposed by Anttila (1997) and Anttila & Cho (1998) to account for diachronic sound changes in Finnish. In this model, there is no reference to FCs, only to partial ranking (PR).

To illustrate how the PR model works, let us imagine that three constraints A, B, C are fully ranked - as required in traditional OT. Then the ranking relation of every possible constraint pair is expressed within the grammar. The ranking $A \gg B \gg C$ may be viewed as a combination of three separate pairwise rankings (see 22).

(22) Full ranking of A, B, C

A \gg B

B \gg C

A \gg C

one possible tableau, one possible output:

A	B	C
---	---	---

Because all rankings are total, only one constraint hierarchy is available, and likewise only one optimal candidate.

Let us now imagine that one of the three pair-wise rankings - $A \gg B$ - is neutralized. This means that A is now ranked only with respect to C. A is unranked relative to B, and vice-versa (see 23).

(23) Partial ranking of A, B, C

~~$A \gg B$~~

$B \gg C$

$A \gg C$

two possible tableaux, two possible outputs:

A	B	C
---	---	---

B	A	C
---	---	---

With the relation $A \gg B$ neutralized, A and B may now be ranked either of two ways: $A \gg B$ or $B \gg A$, but only as long as both A and B still dominate C. Each ranking has an associated tableau and optimal form. Thus the partial pairwise ranking in (23) permits the existence of not one but *two* tableaux, and therefore two optimal forms.

Additional variants may be accounted for by removing additional pair-wise rankings, such that if no rankings exist, i.e. if A, B, and C are unranked relative to each other, then six variants ($3 \text{ factorial} = 6$) are indicated. It is not *necessarily* the case that each ranking is associated with a distinct output candidate, because not all constraints apply to all inputs.

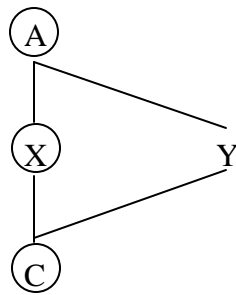
Anttila argues that this reanalysis of OT ranking allows a larger body of data to be accommodated. On the one hand, relations between fully ranked constraints determine

categorical, or nonalternating outputs. On the other, partially ranked constraints admit a range of output alternants.

Although Anttila's PR method and Reynolds' FC method both describe variation using similar means, they are not identical. Note that Anttila's approach makes no reference to the FC, an important theoretical ingredient in Reynolds' variation model. Although both theories make the same basic predictions, the constraint rankings are defined differently. The two ranking methods are compared in (24).

(24) Two approaches to linguistic variation

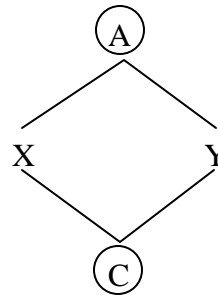
a. Reynolds (1994);
Nagy & Reynolds (1997)



A » X » C
A » Y » C

thus: A » X » Y » C *OR*
A » Y » X » C

b. Anttila (1997);
Anttila & Cho (1998)



A » X » C
A » Y » C

thus: A » X » Y » C *OR*
A » Y » X » C

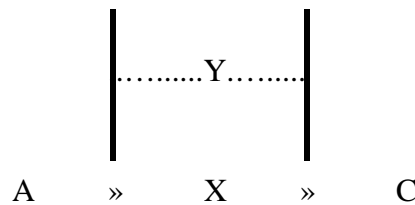
In (24), A, B, X, and Y represent constraints. Downward lines denote hierarchical dominance. Totally ranked constraints are circled. In (24a), X is part of the ranked hierarchy

A » X » C, and Y is part of the hierarchy A » Y » C. In (24b), both rankings A » X » C and A » Y » C are partially ranked.

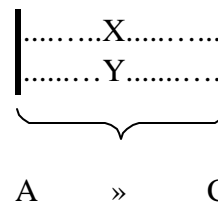
If the subhierarchies predicted are combined into one hierarchical representation, it becomes obvious that two ranking relations are possible: A » X » Y » C and A » Y » X » C. This prediction is made by both models. The FC model (24a), however, goes one step further by identifying one of the intervening constraints, either X or Y, as totally ranked, and the other one as floating, an FC (see 25).

(25) FCs versus PRs

a. FCs



b. PRs



In (25), fully ranked constraints are shown in the bottom line. Partially ranked constraints are shown above the diagram, between vertical bars. These bars represent the upper and lower boundaries for partial ranking. For example, in (25a), Y is a partially ranked constraint and may rank either above or below X, but not above A or below C. In (25b), both X and Y are partially ranked constraints. They may fall into any ranking relation relative to each other, but neither may rank above A or below C.

For the set of ranking relations shown in (25), it is unclear which analysis is more parsimonious, because both make identical predictions. As there are no variable Spanish data

available to motivate preference of one model over the other, further examination of the two approaches will not be taken up here. In this study, the FC model of Reynolds (1994) and Nagy & Reynolds (1997) is maintained.

1.3.5 Constraining FCs? Some acquisitional evidence

Gnanadesikan (1995) provides evidence that children initially rank all MARK constraints above all FAITH constraints, as a requirement of innate grammar. According to Gnanadesikan, children over time promote the FAITH constraints into dominant positions (by listening to and imitating adult speech), thereby enforcing greater feature faithfulness on their own output.¹⁸ Gnanadesikan maintains that when a very young child says [su] instead of [ʃu] (for English *shoe*), it is because the MARKedness constraint against [ʃ] dominates the FAITHfulness constraint for /ʃ/. This ranking must consequently be unlearned so that, by the time acquisition is complete, the child has inverted the ranking, and /ʃu/ is realized faithfully as [ʃu].¹⁹

¹⁸ Gnanadesikan's argument concurs with Stampe (1969: 444), who makes the following assertion about the initial state of the grammar (i.e. the grammar before language acquisition actually begins):

...[I]n its language-innocent state, the innate psychological system expresses the full system of restrictions on speech: a full set of phonological processes, unlimited and unordered.

The key term in Stampe's statement is "phonological processes," which in NGP (recall discussion of Hooper (1976) above) refer to universal tendencies. Intriguingly, many of the data Stampe observed as predominant in child speech are typical of *adult casual speech*, e.g. the tendency to maintain CV as the optimal syllable shape; to simplify consonant clusters; to simplify consonant coarticulations; to delete unstressed syllables, etc.

¹⁹ See also Boersma (1997b) for a similar explanation of ranking

Hale & Reiss (1996) argue against this position on the basis that it fails to factor in the immaturity of the child's production system. Interestingly, children who hear adult [ʃu] yet say [su] are able to differentiate the two, because they reject adult mispronunciations (cf. Hale & Reiss 1996: 7). This perceptual acuity suggests that the child has posited both an underlying /s/ and /ʃ/. That both /s/ and /ʃ/ are realized [s] is not a fault of the child's grammar, but rather a fault of the child's production ("body," in Hale & Reiss's explanation). If the child's pronunciation of /ʃ/ as [s] is the result of an innate MARK » FAITH ranking relation, then it is a bit of a mystery why the child does not simply rerank the constraints FAITH » MARK, in order to better emulate adult speech, especially if the distinction between /s/ and /ʃ/ is recognized. According to Hale & Reiss, these facts can only be explained if FAITHfulness constraints are ranked high in the child's hierarchy. They provide further illustration with a different example:

A child who hears [k^hæt] posits this form as the target output for his or her grammar, and stores this as his or her underlying form has - through that act - posited high-ranking for faithfulness to all the features of [k^hæt]. Put another way, only if UG had high-ranking for faithfulness constraints could the child ... posit /k^hæt/ as the underlying form for a perceived target of the shape [k^hæt] (14).

Having posited the underlying form /k^hæt/, the child will soon learn from other heard forms that syllable-initial stop aspiration is predictable and may be omitted from the underlying representation. If omitted, it will have to be accounted for by demotion of the relevant faithfulness constraint, e.g. one banning the insertion of aspiration.

Hale's & Reiss's (1996) observations suggest that the high ranking of FAITH optimizes learning; with FAITH constraints ranked below MARK constraints, underlying representations would be impossible to reconstruct. If the grammar is to be acquirable, then it must be the case that UG dictates the ranking of all FAITH constraints above all MARK constraints (i.e. FAITH » MARK).

These same observations have a direct bearing on the designation of floating constraints. If the initial state of the grammar is maximally FAITHful, then the constraint reordering required to define the grammar of any particular language can be achieved by *elevating* MARK constraints relative to specific FAITH constraints. It will be provisionally maintained here that variable ranking is the result of *ambivalent reranking* of MARK constraints from their innately-determined position below all FAITH constraints. It follows then, that all FCs belong to the MARK constraint family.

1.3.6 Probabilistic prediction in the FC theory

Another maintained advantage of the partial ranking theory is clearly enunciated by Reynolds (1994), Nagy & Reynolds (1997), as well as Anttila & Cho (1998). All three argue that partial ranking enables the *quantitative* prediction of outputs. For example, if partial ranking defines a system in which 20 distinct constraint rankings are possible, then the statistical probability of each hierarchy applying in the language is 1/20. It may be the case, however, that these 20 rankings select only three distinct outputs. Let us assume that four of the 20 rankings predict output #1, seven rankings predict output #2, and nine rankings predict output #3. Because the total number of rankings which predict each output is different for each output, the probability of each output is different as well, even though the probability of each ranking remains equal. In the case of this thought experiment, output #1 would be predicted to occur in 4/20 (20%) of elicitations, output #2 would be predicted in 7/20 (35%) of elicitations, and output #3 would be predicted in 9/20 (45%) of elicitations. Anttila & Cho state this principle formally (see 26).

- (26) Output probability in partially ordered grammars (Anttila & Cho 1998: 39)
- a. A candidate is predicted by the grammar iff it wins in some tableau.

- b. If a candidate wins in n tableaux and t is the total number of tableaux, then the candidate's probability of occurrence is n/t .

Although some of the data observed by Nagy & Reynolds (1997) for Faetar and by Anttila & Cho (1998) for English and Finnish appear to support this probabilistic analysis of partial ranking, the proposal itself makes a hazardous assertion. The probability of any output is determined by the percentage of total rankings in which it is the optimal candidate. Extralinguistic factors - such as speaker age, gender, education, and *control* - have no bearing on the probability of a particular output.

Nagy & Reynolds (1997: 47) recognize the potential error of the this prediction and discuss it briefly:

We posit that social factors affect the relative likelihood of the various rankings possible for an FC. For example, older speakers may tend to posit a particular FC at the high end of the set of constraints within which it is anchored, whereas younger speakers may tend to position that same FC at the low end of the set of constraints.

In other words, in the final analysis, the correlation of variation with at least some degree of speaker control is inescapable.

Zubritskaya (1997), too, questions the assumption of the FC theory that frequency of variants is determined by the number of actual rankings expressed as a percentage of the total. In her opinion, it is not necessary for the theory even to ponder specious assertions regarding the frequency of outputs, because speaker control ("grammar selection") must be factored into the variability equation regardless:

...[I]n a grammar competition model, the choice of a particular outcome simply means the choice of a particular grammar, and any frequencies of data distribution are therefore possible in principle. Thus, although fixed ranking offers some help in

modeling variation in a grammar competition model, it does not change the model's dependence on the extragrammatical mechanism of grammar choice in production (141).

In this study, I adopt the FC model of the partial ranking theory to account for variation across speech styles in Spanish. However, I will not seek to substantiate the assertion that the FC model makes quantifiable predictions with regard to frequency of rankings or individual outputs. Instead I leave this area to future investigation.

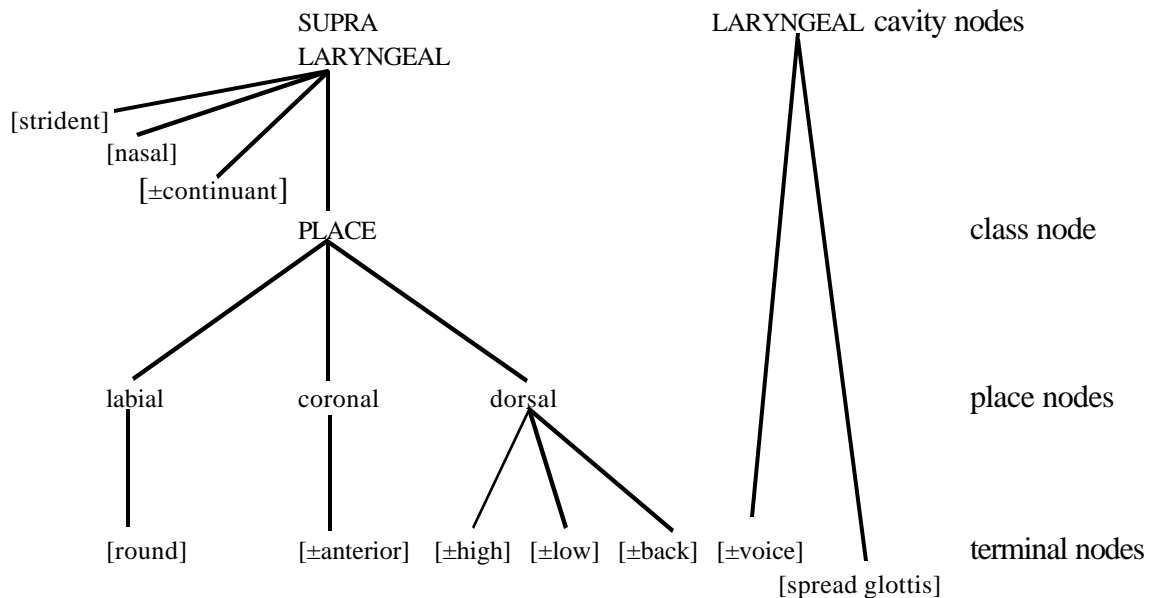
To summarize the primary theoretical claims made in this study: First, two types of variation are accounted for within the same grammar: categorical processes, determined by fully-ranked constraints, and variable processes, determined by partially ranked (floating) constraints (FCs). Second, the grammar itself does not distinguish types of variation; it merely accommodates facts of variation, whether social or stylistic.

1.4 Distinctive feature structure

Stylistic variation involves the alteration of distinctive features; therefore feature structure merits special presentation early on in the study. Previous work on the organization of features in Spanish generally follows the analyses of Clements (1985), Sagey (1986), and others (cf. Harris 1986; Hualde 1989). In this study, I adopt the following feature geometric structure based largely on Sagey (1986) and Hualde (1989), shown in (27).

(27) Distinctive feature geometry





In Spanish, phonological rules recognize distinctions between continuant and noncontinuant stops (/p~f/, /t~s/, /k~x/, etc.), voiced and voiceless stops ([b~p], [d~t], [g~k]), high and mid vowels ([i~e], [u~o]), and also between back and nonback vowels ([i]~[u], [e]~[o]), and bring about surface distinctions between stops and continuants ([b~β], [d~ð], [g~ɣ]). However, rules do not generally refer to a minus value of nasal or round; therefore these features are usually classed as monovalent.

Recent studies of feature structure provide evidence which suggests that front vowels are dependents of the “V-PLACE” coronal node rather than a dorsal node (Hume 1994; Clements & Hume 1995). This solution dispenses with the feature [±back] for vowels, since in this particular theory [+back] vowels are considered dorsal, and [-back] vowels are reclassified as coronal. This model is advantageous in the discussion of assimilation-type processes in which coronal consonants and [-back] vowels appear to form a natural class. Because processes of this type will not be encountered in the present study, however, and also in the interest of representational simplicity, a more traditional feature geometry (32) will be maintained.

1.5 Preliminary conclusions and organization of the study

Phonological operations associated with speech rate may be expressed in terms of ranking arguments between two or more constraints. Optional and variable rules are therefore dispensed with altogether. Operations traditionally expressed as optional additions to the generative rule system are deemed well-formed (optimal) depending on the relative ranking of key FAITH and MARK constraints. Hypothetically, ranking all FAITH constraints above all MARK constraints requires that the phonetic form be identical to the underlying form without exception. Conversely, ranking all MARK constraints above all FAITH constraints requires that articulatory economy must prevail over all featural, segmental, or suprasegmental faithfulness. In Spanish, and arguably in all languages, it is not the case that all MARK constraints dominate all FAITH constraints or vice-versa. Interleaving these constraints, and allowing some to be partially ranked (floating, in Reynolds' 1994 terminology), brings about differing degrees of competition between FAITH and MARK considerations, and therefore an impressive range of variable effects.

In chapter 2 of this dissertation, I present and analyze, in the present Ranking Control Theory model, variable processes which apply to vowels. These include syllable merger, raising and gliding, shortening, and deletion. Discussion of deletion focuses primarily on a corpus of data from Chicano Spanish, with frequent comparison to Peninsular dialects. The effect of stress on these processes is also systematically accounted for.

Chapter 3 analyzes the variable processes which apply to consonants. The focus of this chapter is on types of assimilation, such as nasal and lateral place assimilation, and voicing assimilation; as well as continuancy spreading, obstruent devoicing, and aspiration. The principal data are drawn from Peninsular Spanish and also from Havana Cuban Spanish.

Chapter 4 summarizes the general principles laid out in the study and reviews some of the implications of the study.

CHAPTER 2

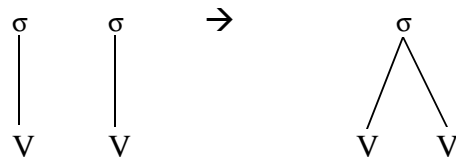
FEATURAL, SEGMENTAL, AND MORAIC FAITHFULNESS IN SYLLABLE MERGER

In this chapter, the interaction of prosodic constraints in a number of connected speech processes is examined. These processes include syllable merger of different and identical vowels, merger of stressed vowels, vowel deletion, and vowel shortening. Each section contains a brief review of the central issues, followed by an OT analysis. Because of the richness of available data, discussion will focus primarily on merger across word boundaries (also called synalepha).

2.1 Syllable merger

In connected speech in Spanish, vowel sequences merge into a single syllable following special rules (cf. Morgan 1984, Roca 1991, Hualde 1994, Martínez-Gil in press, and others).¹ Syllable merger is expressed autosegmentally in (28).

(28) Syllable Merger (cf. Roca 1991: 609)



¹ See Schane (1987) for a general discussion of syllable merger in an autosegmental framework.

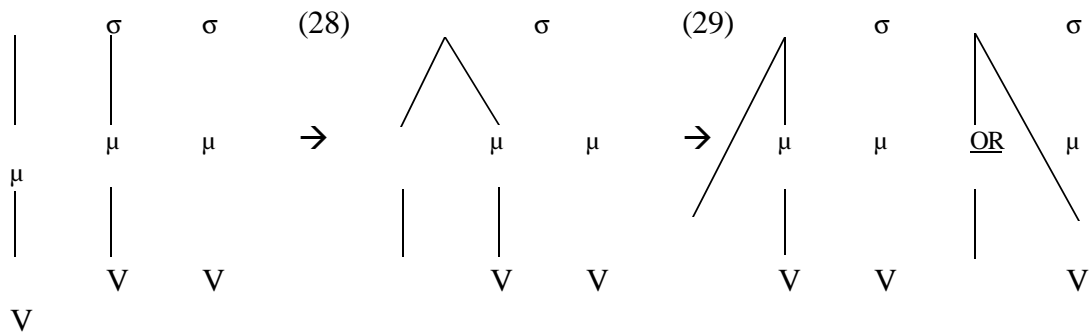
According to Navarro Tomás (1967: 148), Spanish syllable merger reflects a general articulatory tendency:

Nuestra pronunciación tiende, preferentemente, a convertir, siempre que es posible, todo conjunto de vocales en un grupo monosilábico; pero diversas circunstancias históricas, analógicas o eruditas suelen oponerse en muchos casos a dicha tendencia, dando lugar, fuera del caso de los diptongos y triptongos etimológicos, a vacilaciones que a veces hacen posible en una misma palabra una doble forma de pronunciación.

In other words, vowel merger is subject to both stylistic and categorical restrictions. In this section, I will begin to investigate and substantiate Navarro Tomás's claim regarding the tendency of vowel sequences to undergo merger.

2.1.1 Previous treatments of syllable merger

In an analysis of syllable merger in Castilian Spanish, Navarro Tomás (1967) observes that in slow speech, vowels are usually realized in hiatus, while in faster speech, they undergo merger. The more “open,” or sonorous, vowel in the pair becomes the nucleus of the merged syllable. In cases of equal sonority, however, the second segment becomes the nucleus. This dialect-specific stipulation follows from observations that Spanish generally prefers onglides to offglides (Holt 1984; Harris 1989), as shown by the realizations of syllable nuclearity in words containing sonority plateaus, such as *trinfo* tr[ju]nfo and *cuidado* c[wi]dado. These observations are further supported by evidence from diphthongization (Harris 1985). We restate Holt's (1984) sonority rule in (29).



(depending on relative sonority.)

In (30), two vowels in separate syllables merge per rule (28). Because the merged syllable can have only one nucleus, one segment must be realized as a glide. Rule (29) involves the delinking of the mora of the less sonorous segment. The result is either an onglide or an offglide.

In Peninsular Spanish, whether an onglide or offglide is formed is determined by the relative sonorities of the two vowels in question. As long as the sonorities of the merged syllable nuclei are unlike, either onglides or offglides may be formed, with the more sonorous vowel always forming the peak of the new syllable.³

(31) Merged syllable adjustments in Peninsular Spanish: onglides with sonority slopes (Hualde 1994: 635)

- a. *mi abuelo* m[ja]buelo
- b. *tu abuelo* t[wa]buelo
- c. *traigo alhajas* traig[ɔ̃a]lhajas

³ See also Roca (1991) for discussion of syllable merger in the same dialect. Stockwell, Bowen, & Silva-Fuenzalida (1956) is an analysis of syllable merger in Chilean Spanish. Hutchinson (1974), Goldsmith (1979), and Martínez-Gil (in press) treat Chicano Spanish.

(32) Merged syllable adjustments in Peninsular Spanish: offglides with sonority slopes (Hualde 1994: 635)

- a. *toda España* tod[ae̞]spana
- b. *tengo usados* teng[ow]sados
- c. *toda Italia* tod[aj]talia

In (31) and (32), syllable merger data from Peninsular Spanish are given. In each example, the less sonorous vowel in the merged syllable is made nonnuclear; thus /i/ → [j], /u/ → [w], /o/ → [ɔ], and /e/ → [e̞], per rule (34a). Also in each example, the type of glide is determined by the relative sonority of the two vocoids. The syllable nucleus is the most sonorous vocoid.

The output syllable is therefore entirely predictable based on sonority considerations (29a). If, however, both vowels are of the same sonority ranking, then rule (29b) applies, forming an onglide by default. Examples of like-sonority mergers, all of which contain onglides, follow in figure (33).

(33) Merged syllable adjustments in Peninsular Spanish: onglides with sonority plateaus (Hualde 1994: 635-636)

- a. *tribu indígena* trib[wi]ndígena
- b. *mili urgente* mil[ju]rgente
- c. *tengo enchufes* teng[œ]nchufes
- d. *vende orugas* vend[œo]rugas

The vowel sequences in (33) each contains a sonority plateau. Following rule (29b), the first vowel in each pair is glided. In (33a) and (33b), the outcome is the high glides [w] and [j], respectively. Examples (33c) and (33d) contain mid vowels. In these examples, the first vowel is made a mid glide: [e̞] or [ɔ]. This type of gliding is characteristic of casual speech.

The Peninsular variety of merger described by Navarro Tomás and Hualde is not the only one observed for Spanish. In American dialects, merger is formulated differently. In many of these

varieties, merger favors the formation of onglides to offglides, even if sonority sequencing is disregarded, e.g. *come uvitas* in American Spanish is typically realized com[eu]vitas, with an onglide (cf. Stockwell & Bowen 1965: 111; Harris 1970: 131). In Peninsular Spanish, this same sequence is realized with an offglide, thereby honoring sonority sequencing: com[ew]vitas (cf. Hualde's 1994: 635 example *te utiliza* → t[ew]tiliza).

In standard Mexican Spanish, stress on the first vowel, if it is less sonorous than the second, blocks glide formation altogether (e.g. *papá imita* → pap[áj]mita, but *comí alguno* → com[í.a]lguno). Consequently, offglides may be formed in this dialect, but only if they follow a stressed vowel of greater sonority (compare *sé inglés* → s[éj]nglés but *come y toma* → com[ɛi]toma). In Chicano Spanish, a variety of Mexican Spanish spoken mostly among immigrants to the United States, merger exhibits yet a different flavor. All three varieties - Peninsular, Mexican, and Chicano Spanish - will be considered in turn in the OT analysis later in this section.

Another connected speech development which American Spanish dialects display but which standard Peninsular varieties do not is mid vocoid raising.⁴ In Peninsular dialects, vowel sequences resolve into glide-vowel or vowel-glide sequences. The same is true in American Spanish dialects. In American dialects, however, it is common to hear the glide component of a merged syllable realized [+high] in casual style (cf. Stockwell, Bowen, & Silva-Fuenzalida 1956, Bowen 1956, Stockwell & Bowen 1965, and many others). The examples in (39) are borrowed from Martínez-Gil (in press), a study of Chicano Spanish. Note that in these sequences, neither vowel is stressed.

(34) Mid glide raising in Chicano Spanish (Martínez-Gil in press, 4)

<i>te humilló</i>	t[ju]milló
<i>lo hirió</i>	l[wi]rió
<i>porque Adán</i>	porqu[ja]dán

⁴ Navarro Tomás (1967: 68) points out that although mid vocoid raising occurs only in popular Peninsular speech (habla vulgar), it is common, even widespread in American Spanish.

El habla popular hace en muchos de estos casos *ea* > ja, *oa* > wa: *teatro* tjátro, *pasear* pasjár, *Joaquín* xwakín ... etc. La evolución de *ea* > ja, con j más o menos cerrada, se da también abundantemente en América hasta en la pronunciación de las personas cultas.

- a) *Vivo en la cuarta avenida.*
- b) *Vivo en la calle veinte.*
- c) *Vivo en la última casa.*

In these sentences, the point of interest was the cross-boundary vowel sequence *oe* in “Vivoen.”

Cloward had the subject read the first sentence in the set, then cued the remaining elicitation in the manner shown in (37).

(37) Experimental procedure (Cloward 1984: 153)

FC (reading from the page):	<i>Vivo en la cuarta avenida.</i>
Cloward (reading cue from the page):	<i>la calle veinte</i>
FC (still looking at the page):	<i>Vivo en la calle veinte.</i>
Cloward (cuing):	<i>la última casa</i>
FC:	<i>Vivo en la última casa.</i>

(and so on for each sentence triad)

Cloward had predicted that within each triad, FC would first read slowly/formally, and then accelerate his speech with each subsequent elicitation, as familiarity with the frame sentence increased. This prediction was born out by virtually all of the subject’s elicitation. The “Vivo en...” sentence set yielded vowel hiatus in the first utterance, a mid glide in the second, and a high glide in the third (155). The sound spectrograms in (38) illustrate these findings.

(38) Cloward’s findings: ‘Vivo en...’ at slow, medium, and fast speed (1984: 160)

- a. *Vivo en la cuarta avenida (slow).*

b. *Vivo en la calle veinte* (medium)

c. *Vivo en la última casa* (fast).

Tracings of the formants of the “o-e” transitions shown in (38) are provided in (39). These tracings show that the vowel qualities in each elicitation were distinct. In (39a), the F2 transition from about 750 Hz to about 1250 Hz is gradual, exactly the type of transition one would expect with tongue

raising from neutral to high position. In this tracing, the first gesture is acoustically [o].⁵ Figure (39b) shows not only a more abrupt transition between the first and second gestures, but the first gesture also has a slightly higher locus, about 1000 Hz (compared to 750 Hz in 39a). Finally, (39c) shows that the locus of the first gesture is higher than 1000 Hz, acoustically equivalent to [u].

(39) Formant tracings: Set 1 (Cloward 1984: 164)

a b c

The slightly higher F2 in (39b) is articulatorily consistent with a raised tongue position somewhere between that of [o] and [u], and is phonetically consistent with [ʊ], although Cloward identifies it phonetically as (nonnuclear) [o] (155). This distinction is not relevant in Spanish, however, because Spanish does not distinguish [o] and [ʊ]. Therefore, the phonetic [ʊ] may be recognized as an allophone of [o] without further comment. The occurrence of the raised gestures [ʊ] and [u] in Cloward's findings supports Harris' (1985) claim that it is [+high] glides which are favored in Spanish casual speech.

⁵ The acoustical observations in this section are my own, based on comparison to a chart in Ladefoged (1993: 194).

2.1.3 Preliminaries to an OT analysis

In this study, the primary effects of syllable merger are determined by the interaction of seven constraints: HNUC, MAX-IO, MAX- μ , IDENT [X], HIGLIDE, ONSET, and MAX-WI- μ . Brief explanations of these constraints are presented in (40). Other constraints will be presented in due course. Most of the constraints may also be found in Prince & Smolensky (1993) and McCarthy & Prince (1995a, 1995b), and throughout the OT literature.

(40) Constraints involved in syllable merger

HNUC: “The syllable peak is a sonority peak.”

In the syllables *pie* [pje] and *rey* [rej], the sonority peak is [e], and [e] is also the syllable peak; therefore this constraint is satisfied (cf. Clements 1990; Hualde 1994).

MAX-IO: “No segmental deletion.”

MAX- μ : “No moraic deletion.”

An input mora may be left unparsed in the output to form an onglide, as is the case for the *i* in *pie* [pje] or the *y* in *rey* [rej].

MAX-WI- μ : “No word-initial moraic deletion.”

IDENT [high]: “The value (+ or -) of input feature [high] may not change.”

This constraint is violated whenever the input value (+ or -) for the feature [high] of a non-low vowel (i,u,e,o) is changed to the opposite value in the output. IDENT [high] bans vowel raising and lowering, and also vowel deletion.

HIGLIDE: “Nonnuclear vocoids are [+high.]

Ensures that all glides are [+high], i.e. either [j] or [w]. It bans mid glides [ɘ] and [ɔ̞] and also the illicit low glide [ɶ] (cf. Casali 1996: 56).

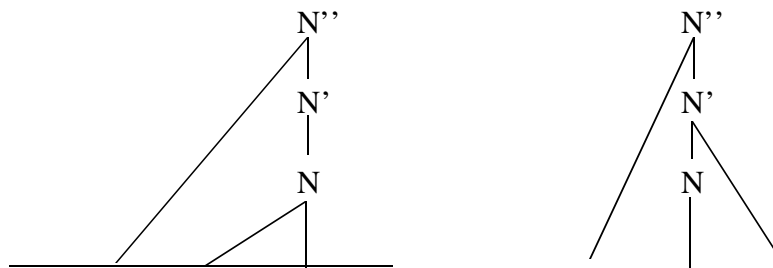
ONSET: “Syllables have onsets.”

In her analysis of Spanish syllable structures, Colina (1995) argues that the constraint ONSET is active in a wide range of fast speech processes. As defined throughout the OT literature, ONSET requires that syllables begin with a consonant. Colina explains: “In general, the faster the speech the

more necessary to satisfy ONSET; in other words, the more highly ranked ONSET will be” (147). Referring back to our data, we note that an instance of vowel hiatus in careful style violates ONSET yet satisfies MAX- μ . In casual style, ONSET is satisfied but MAX- μ is violated. Thus the [e]~[ɛ] alternation may be explained in terms of the relative ranking of ONSET and MAX- μ .

It was shown in chapter 1 that Colina uses two constraints, ONSET and PARSE- μ , to account for the facts of syllable merger as well as vowel hiatus. In her discussion, PARSE- μ is used as an all-purpose constraint to ban all glide formation, whether rising or falling. Hualde (1991b), a well-accepted analysis of onglide and offglide structure in Spanish, makes a structural distinction between the two types of glides. In his analysis, a prenuclear vocoid is associated directly to the syllable nucleus to form a complex nucleus. Such is the case in a word like *pie* [pje]. In this word, nonnuclear /i/ forms a complex nucleus with /e/, and the latter segment, being more sonorous, is the syllable peak. However, a postnuclear vocoid, such as the [j] in *rey*, is associated with syllable structure at a different level of representation.⁶ The two structures are compared in figure (41).

(41) Onglides and offglides in N-projection theory (cf. Hualde 1991b)

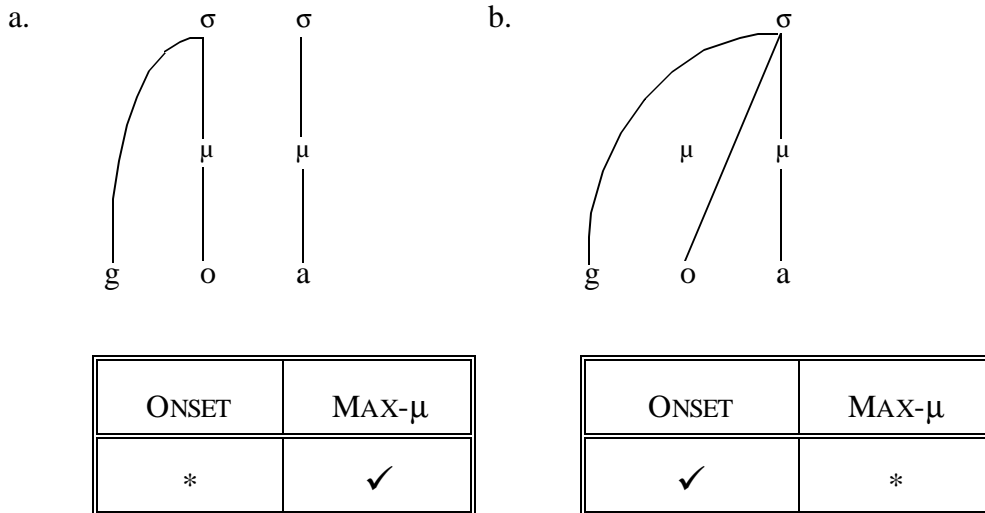


⁶ In Asturian, onglides trigger anticipatory vowel harmony, whereas offglides do not. Compare *cogiera* [ku.xjé.ra.] ‘get-3RD-PAST-SUBJ’ to *aflojáis* [a.flo.xájs.] ‘you-PL loosen.’ Onglides therefore form a nuclear satellite at node N, whereas offglides (and coda consonants) form a satellite at node N’. The reader is referred to Hualde (1991) for the detailed arguments in favor of this analysis.

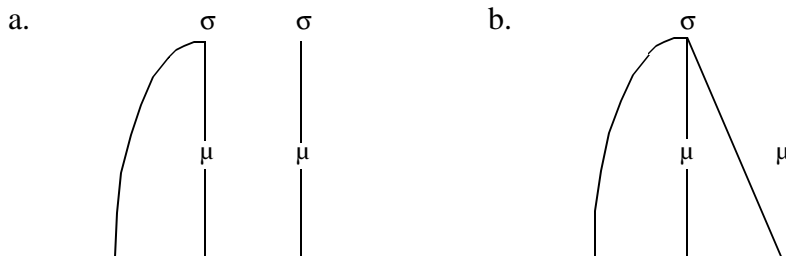
p i e r e i

In (41), the prenuclear high vocoid /i/ in /pie/ forms part of the syllable nucleus and is linked to the structural node N. The postnuclear high vocoid /i/ in /rei/ however, is linked to intermediate node N'. In my analysis of Spanish syllable merger, I employ the individual constraint MAX- μ to constrain both types of glides, i.e. those linked to either N or N'. Some examples of MAX- μ violation follow in figures (42) and (43)

(42) Onglide formation from underlying vowels: *traigo alhajas*



(43) Offglide formation from underlying vowels: *toda España*



d a e (s)

ONSET	MAX- μ
*	✓

d a e (s)

ONSET	MAX- μ
✓	*

The mora/syllable structure in (42a) satisfies MAX- μ because all underlying moras are retained in the output (i.e. no onglides are formed). However, ONSET is violated because the second syllable is vowel-initial. In (42b), MAX- μ is violated, but ONSET is satisfied. By merging the two vowels into a single syllable, hiatus is resolved. In the process, however, the first vowel is made nonnuclear.

Figure (43) shows that offglide formation, like onglide formation, causes MAX- μ violation. In both (42a) and (43a), MAX- μ is satisfied, because no vowel is realized as a glide. In both cases, ONSET is violated because of vowel hiatus. In (42b) and (43b), hiatus is resolved and ONSET is therefore satisfied. However, MAX- μ is now violated, because in each instance a glide has been formed.

2.1.4 MAX- μ and MAX-WI- μ

In Peninsular Spanish, syllable merger produces either onglides or offglides across word boundaries, depending on the relative sonority of both vowels. In Chicano Spanish, syllable merger occurs only if the result is an onglide; indeed in this dialect there are no offglides spanning word boundaries.

(44) Offglide formation across word boundaries

	<u>Peninsular Spanish</u>	<u>Chicano Spanish</u>
a. <i>te humilló</i>	t[ew]milló	t[ju]milló
b. <i>lo hirió</i>	l[oj]rió	l[wi]rió
c. <i>carta urgente</i>	cart[aw]rgente	cart[Øu]rgente

The data in (44) show that in Chicano Spanish, offglides are avoided one of two ways. The first way is to alter the height identities of the vowels so that relative sonority requires the formation of an onglide instead of an offglide. If this cannot be done, i.e. if the first member of the sequence is unglidable /a/, then vowel deletion occurs.

These data also suggest that the offglide restriction observed for Chicano Spanish does not hold in Peninsular Spanish. However, sonority plateau data reveal that it does. For example, if the two vowels to be merged form a sonority plateau, then the merger is *invariably* an onglide, regardless of dialect. In Peninsular Spanish, this restriction is witnessed only in cases of sonority plateaus, because it is only in these cases that relative sonority is irrelevant.

To address this asymmetry which underlies *both* dialect varieties, we turn to some of the basic principles of vowel identity enumerated by Casali (1997). In a study of vowel deletion in some 68 Niger-Congo and 19 non-Niger-Congo languages, Casali found a clear pattern: if deletion of one vowel in a sequence of different vowels (V_1V_2) occurs, it is almost always the first. In addition, the overwhelming majority of languages with V_2 deletion also feature V_1 deletion, a fact which suggests that V_1 deletion is universally unmarked and represents a clear cross-linguistic preference.

Casali argues that the productivity of deletion rules varies depending on a number of factors. Between two lexical words, *all* the surveyed languages deleted the first vowel in the sequence, rather than the second. Casali maintains that V_1 deletion is the standard at word boundaries because of the importance of preserving word-initial information - and therefore of retaining V_2 . This important generalization motivated the formulation of his constraint MAXWI (“Max-word-initial”), which requires that “every word-initial segment in the input must have a corresponding segment in the output” (500). A similar constraint, used throughout Casali (1996), is PARSE(F)-_[w]. Like MAXWI, this constraint monitors the faithfulness of word-initial material. Unlike MAXWI, however, it monitors not whole segments but rather individual features.

Martínez-Gil (1998) proposes a positional faithfulness constraint modeled after PARSE(F)-_[w] which is sensitive not to feature faithfulness, but rather to moraic faithfulness: MAX-WI- μ . This constraint requires that any word-initial vowel must be realized as a syllable nucleus. It is motivated by

data from various dialects of American Spanish which suggest that glide formation from underlying vowels is subject to special restrictions word-initially. For example, in Chicano Spanish, there are no instances of word-initial glides, even though glides do occur freely word-medially and -finally. Mid vowels in syllables with falling sonority are routinely raised to justify the formation of an onglide rather than an offglide. These facts suggest that in Chicano Spanish, MAX-WI- μ is ranked above HIGLIDE.

In Peninsular dialects, by contrast, MAX-WI- μ ranks *below* HIGLIDE, and therefore serves only to resolve ties left undecided by the dominant constraint H_{NUC} - i.e. if the vowels form a sonority plateau (e.g. *toda España* → tod[aɛ]spaña but *tengo enchufes* → teng[ɔe]nchufes).

2.1.5 The Data

Unstressed syllable merger data from Peninsular, Mexican, and Chicano Spanish are provided in (45)-(47). As shown in (45), rising sonority mergers are handled the same way in all three dialects; the resulting syllable invariably contains an onglide. Likewise, sonority plateaus (46) yield onglides regardless of dialect. The three dialects diverge in their treatment of falling sonority mergers. In Peninsular Spanish (46a), such mergers are permitted, provided that they respect sonority sequencing. In Mexican Spanish and Chicano Spanish (46b and 46c), such mergers are disallowed. In Mexican Spanish, onglides are enforced even if sonority sequencing is disrespected. In Chicano, the solution in such cases is to delete the first vowel.⁷

(45) Rising sonority (onglides in all three dialects) (Hualde 1994: 635-636)

a. Peninsular Spanish (Hualde 1994: 635-636)

<i>mi abuelo</i>	m[ja]buelo
<i>tu abuelo</i>	t[wa]buelo
<i>traigo alhajas</i>	traig[ɔa]lhajas

⁷ This phenomenon will be examined in a later section.

- b. Mexican Spanish (Martínez-Gil 1996: 4)

<i>mi amigo</i>	m[ja]migo
<i>tu amigo</i>	t[wa]migo
<i>tengo amigos</i>	teng[ɔa]migos

- c. Chicano Spanish (Martínez-Gil 1998: 2; Hutchinson 1974: 185)

<i>casi acabó</i>	cas[ja]cabó
<i>su amante</i>	s[wa]mante
<i>tengo amigos</i>	teng[wa]migos

- (46) Sonority plateau (onglides in all three dialects) (Hualde 1994: 635-636)

- a. Peninsular Spanish (Hualde 1994: 635-636)

<i>tribu indígena</i>	trib[wi]ndígena
<i>tengo enchufes</i>	teng[ɔe]nchufes
<i>vende orugas</i>	vend[ɛo]rugas

- b. Mexican Spanish (Martínez-Gil 1996: 4; Harris 1970: 131)

<i>su historia</i>	s[wi]storia
<i>debo estar</i>	deb[ɔe]star
<i>pague ochenta</i>	pagu[ɛo]chenta

- c. Chicano Spanish (Martínez-Gil 1998: 2)

<i>tu imagen</i>	t[wi]magen
<i>no esperó</i>	n[we]speró
<i>se olvidó</i>	s[jo]lvidó

- (47) Falling sonority

a. Peninsular Spanish (offglides) (Hualde 1994: 635-636)

<i>toda España</i>	tod[æ̞]spaña
<i>tengo usados</i>	teng[ow]sados
<i>toda Italia</i>	tod[aj]talia

b. Mexican Spanish (Harris 1970: 131)

<i>paga Evita</i>	pag[æ̞]vita
<i>como uvitas</i>	com[ou]vitas
<i>la iglesia</i>	l[ai]glesia

c. Chicano Spanish

Unattested.

In all three dialects, the preservation of vowel hiatus in connected speech depends on the dominance relation between ONSET and MAX- μ . It is argued that in all three dialects of Spanish, MAX- μ is a fully-ranked constraint, and ONSET is an FC (floating, partially ranked). As such, it may rank either above or below MAX- μ .

In Peninsular Spanish, merger invariably respects sonority sequencing, even if it entails the formation of a word-initial glide. These facts require the ranking HNUC » ONSET, MAX- μ » MAX-WI- μ . In Mexican Spanish, merger invariably forms onglides, even if sonority sequencing is disrespected. In this variety, MAX-WI- μ must dominate HNUC, but must itself be dominated by ONSET and MAX- μ . In Chicano Spanish as in Mexican, MAX-WI- μ ranks below ONSET and MAX- μ , but above HNUC. However, in Chicano, HIGLIDE dominates IDENT [high], requiring that all glides are [+high]. These three rankings are shown in (48). Other constraints will be added in due course.

(48) Constraint rankings (unstressed syllable merger)

a. Peninsular Spanish

$$\left| \dots \text{ONSET} \dots \right|$$
 HNUC » MAX- μ » MAX-WI- μ » IDENT [high] » HiGLIDE

b. Mexican Spanish

$$\left| \dots \text{ONSET} \dots \right|$$
 » MAX- μ » MAX-WI- μ » HNUC » IDENT [high] » HiGLIDE

c. Chicano Spanish

$$\left| \dots \text{ONSET} \dots \right|$$
 » MAX- μ » MAX-WI- μ » HNUC » HiGLIDE » IDENT [high]

The diagrams in (48) show the categorical rankings of HNUC, MAX-WI- μ , MAX- μ , HiGLIDE, and IDENT [high] in the three dialects under consideration. In addition, the FC ONSET is also shown.

2.1.6 An OT account

As shown in (45), unstressed rising sonority mergers are permitted in Peninsular, Mexican, and Chicano Spanish. Such mergers are permitted because they fortuitously satisfy MAX-WI- μ in all three varieties. In the following tableaux, I will use *traigo alhajas* as an example (recall Hualde 1994: 635-636). This form is realized with an onglide in all three dialects (see 49). Note that the ranking MAX- μ » ONSET enforces vowel hiatus, which is characteristic of Largo style. For the sake of simplicity, only the relevant segmental sequence is included in the candidate list.

(49) Largo (careful): *traigo alhajas*


/...go # a.../	MAX- μ	ONSET
a. go.a.		*

b. g _{o̞} a.	*!	
c. go _{a̞} .	*!	
d. g<o> a.	*!	
e. go<a>.	*!	

The partial tableau in (49) shows that the ranking MAX- μ » ONSET enforces hiatus regardless of dialect. Any attempt to create a glide or delete a vowel fatally violates MAX- μ . Deleted output segments are shown in angular brackets per OT custom. In all three dialects, hiatus is enforced by this ranking.


In Allegretto speech, merger is determined by the reverse ranking: ONSET » MAX- μ , and its interaction with other constraints.⁸ In all dialects, rising sonority mergers are permitted (see 50-51). For now, only Peninsular and Mexican Spanish will be considered. Chicano Spanish will be discussed presently.

(50) Peninsular Spanish Allegretto: *traigo aljahas*

/...go # a.../	HNUC	ONSET	MAX- μ	MAX-WI- μ
a. go.a.		*!		
 b. g _{o̞} a.			*	
c. go _{a̞} .	*!		*	*


(51) Mexican Spanish Allegretto: *tengo amigos*

⁸ In this study, Largo refers to careful speech, i.e. speech which is maximally faithful to the input. Allegretto will refer to casual or conversational (connected) speech in general. The label Andante will be used only if an intermediate style is clearly attested. In Peninsular syllable merger of different vowels, this is not the case.


/...go # a.../	ONSET	MAX-μ	MAX-WI-μ	HNUC
a. ɣo.a.	*!			
 b. ɣo̞a.		*		
c. ɣo̞̞a.		*	*!	*

In the case of a sonority plateau, the result in all dialects is an onglide. Because sonority plateaus pose no problem for HNUC, the offglide is dispreferred in both Peninsular and Mexican Spanish by MAX-WI-μ, which acts as a tiebreaker regardless of its position in the ranking (see 52 and 53).

(52) Peninsular Spanish Allegretto: *tengo enchufes*

/...go # en.../	HNUC	ONSET	MAX-μ	MAX-WI-μ
a. go.en.		*!		
 b. go̞en.			*	
c. go̞̞en.			*	*!


(53) Mexican Spanish Allegretto: *debo estar*

/...bo # es.../	ONSET	MAX-μ	MAX-WI-μ	HNUC
a. βo.es.	*!			
 b. βo̞es.		*		


c. βo̞es.		*	*!	
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As stated earlier, Peninsular and Mexican Spanish diverge primarily in their treatment of falling sonority mergers. In Peninsular Spanish, such mergers are realized as offglides because HNUC outranks MAX-WI-μ. In Mexican Spanish, with MAX-WI-μ ranked above HNUC, these mergers are invariably onglides which defy sonority sequencing (see 54-55).

(54) Peninsular Spanish Allegretto: *toda España*

/...da # es.../	HNUC	ONSET	MAX-μ	MAX-WI-μ
a. ða.es.		*!		
b. ð̞æs.	*!		*	
 c. ð̞æs.			*	*

(55) Mexican Spanish Allegretto: *paga Evita*

/...ga # e.../	ONSET	MAX-μ	MAX-WI-μ	HNUC
a. γa.e.	*!			
 b. γ̞æ.		*		*
c. γ̞æ.		*	*!	

Chicano Spanish resembles Mexican Spanish in its satisfaction of MAX-WI-μ. In Chicano, MAX-WI-μ violations are resolved by deletion of the first vowel; thus *paga Evita* would be realized with deletion of the first vowel, thus pag[Øe]vita (cf. Martínez-Gil's 1998:2 comparable example *una*


hermana, which is realized un[Øe]rmana). This optimal candidate satisfies MAX-WI- μ , yet violates MAX-IO. In Chicano Spanish, MAX-IO is ranked below MAX-WI- μ (cf. Martínez-Gil 1998). Chicano deletion will be examined in a later section.

There is another peculiarity of Chicano Spanish which merits consideration at this point. In this dialect, all glides are uniformly realized [+high]. This change potentially violates the input-output correspondence, or identity, of the parameter in question, in this case the value of the binary feature [high]. In Chicano, two additional constraints are active on the candidate set in unstressed syllable mergers in which the first vowel in the sequence is [-high]. These are IDENT [high] and HIGLIDE.


We will consider IDENT [high] first. IDENT [high] is part of a family of constraints which monitor the input-output correspondence of values for individual binary features. For example, it is generally accepted that the tongue-height feature [high] has two values, [+high] and [-high]. When the value of a feature [high] in the input changes in the output, then the identity constraint IDENT [high] is violated. Therefore, when input /e/ is realized as [j] in Allegretto style, IDENT [high] is violated because the underlying value of [high] for /e/ has changed from [-] to [+]. High gliding incurs a violation of IDENT [high].

That mid glide raising is unattested in Peninsular Spanish suggests that IDENT [high] is ranked above HIGLIDE in this dialect. The ranking IDENT [high] » HIGLIDE disprefers glide raising in favor of vowel height identity. The Peninsular ranking HNUC » ONSET, MAX- μ » IDENT [high] » HIGLIDE bans mid vocoid raising. It also specifies that syllable merger is possible only if it 1) obeys sonority sequencing; and 2) respects underlying height features. Because ONSET is the only FC, only two rankings - and therefore two outputs - are possible: one with hiatus, and one with merger. The Allegretto tableau for *traigo alhajas* is shown for Peninsular Spanish in (56), and for Chicano Spanish in (57).

(56) Peninsular Spanish Allegretto (IDENT [high] » HIGLIDE): *traigo alhajas*

/...go # a.../	HNUC	ONSET	MAX- μ	MAX-WI- μ	IDENT [high]	HIGLIDE
a. γ o.a.		*!				
 b. γ o $\underset{\cdot}{a}$.			*			*
c. γ o $\underset{\cdot}{a}$.	*!		*	*		
d. γ wa			*		*!	
e. γ oj.			*	*!	*	

(57) Chicano Spanish Allegretto (HIGLIDE » IDENT [high]): *traigo alhajas*

/...go # a.../	ONSET	MAX- μ	MAX-WI- μ	HNUC	HIGLIDE	IDENT [high]
a. γ o.a.	*!					
b. γ o $\underset{\cdot}{a}$.		*			*!	
c. γ o $\underset{\cdot}{a}$.		*	*!	*	*	
 d. γ wa		*				*
e. γ oj.		*	*!			*

As in Peninsular and Mexican varieties, Chicano Spanish resolves sonority plateaus as onglides, albeit with a [+high] nonnuclear element (see 58).

(58) Chicano Spanish Allegretto: *no espero*

/no # es.../	ONSET	MAX- μ	MAX-WI- μ	HNUC	HIGLIDE	IDENT [high]
a. no.es.	*!					
b. no $\underset{\cdot}{e}$ s.		*			*!	

c. noes.		*	*!		*	
d. n ^h wes.		*				*
e. nojs.		*	*!			*

In this section, unstressed syllable merger in Peninsular, Mexican, and Chicano Spanish is accounted for using five categorically ranked constraints: H_{NUC}, MAX-WI- μ , MAX- μ , H_IGLIDE, and IDENT [high]; and one FC: ONSET. Stipulations on merger types emerge directly from the interaction of ONSET and MAX- μ (which in combination drive syllable merger) with the other constraints.

So far in this section, discussion of merger has been limited to unstressed vowels across words boundaries (synalepha). Because merger of unstressed syllables within words seems to occur as freely as it does between words (cf. Navarro Tomás 1967: §140), examples of the former merger type will not be presented here. Instead, I will now explore the merger of stressed syllables.

2.2 Stressed syllable merger

In numerous accounts of stress assignment in Spanish, it has been demonstrated that primary word stress must fall on one of the last three syllables in a word, hence the well-used term “Three Syllable Window” (cf. Harris 1983). In general, words which end in a vowel are stressed on the next-to-last syllable. Words ending in a consonant are stressed on the last syllable.

In Spanish, as in many languages, coda consonants are typically assigned a mora by virtue of their position in the syllable. This assignment is generally referred to as Weight By Position (WBP) (cf. Hayes 1989: 258), and will not be examined in detail here because it does not bear directly on the data at hand.

Unmarked stress in Spanish is simple: vowel-final words are stressed on the next-to-last syllable (paroxytone), and consonant-final words are stressed on the last syllable (oxytone)(cf. Harris 1983:

85). Examples of the unmarked stress types are given in (59). In (59)-(61), all stresses are shown, whether orthographic or not.

(59) Unmarked stress (cf. Harris 1983: §4)

a.	V-final words: paroxytonic stress	b.	C-final words: oxytonic stress
	<i>pistóla</i>		<i>civíl</i>
	<i>perdída</i>		<i>mercéd</i>
	<i>sabána</i>		<i>altár</i>

Exceptions to the unmarked patterns are numerous, but statistically in the minority. In no case, however, is it possible for a Spanish word to be stressed outside the Three Syllable Window. All uncliticized words, regardless of markedness, display oxytonic, paroxytonic, or proparoxytonic stress. Examples of marked stress, which respects the Three Syllable Window, are presented in (60).

(60) Marked stress (cf. Harris 1983: §4)

a.	V-final words: oxytonic	b.	V-final words proparoxytonic	c.	C-final words: paroxytonic
	<i>paletó</i>		<i>sábana</i>		<i>móvil</i>
	<i>Panamá</i>		<i>nómada</i>		<i>césped</i>

In Harris' (1983) account, final vowels are typically invisible to stress computation. This assignment of "extrametricality" follows from a series of observations about the morphological affiliation

of this vowel. First, Harris observes that words ending in a vowel are made up of two morphological components, a “derivational stem” and a “terminal element” (91). In many cases, including virtually all productive cases (e.g. hypocoristics, truncations, and foreign borrowings), stress lodges on the penultimate syllable (cf. the examples in 59a), suggesting that stress applies at the level of the derivational stem, rather than the word. This way, the terminal element remains “invisible” to stress. Harris argues that stress assignment is determined by a right-headed foot structure built from the right edge of the word, ignoring any extrametrical elements.⁹ Harris’ explanation made extensive use of the extrametricality mechanism, applying it to final consonants as well as nonfinal vowels.

Harris (1989) contains substantial revisions to the earlier theory. In this more recent approach, Harris relates exceptionality to a lexically marked foot structure. The unmarked foot structure, he argues, is right-headed (iambic), whereas marked structure is left-headed (trochaic). As in the earlier theory, terminal elements are extrametrical. In (61), stress computation is given for two words: *sabána* ‘savanna’ and *sábana* ‘bedsheet.’ The word *sabána* has unmarked (paroxytonic) stress, because its dominant foot is iambic (cf. 61a). The word *sábana*, however, has marked proparoxytonic stress, because its dominant foot is trochaic (cf. 61b).

(61) Stress assignment in Spanish (Harris 1989: 251)

a.	unmarked: <i>sabána</i>	b.	marked: <i>sábana</i>
	sa.ba.na		sa.ba.na.
	(* *)<*> line 0		(* *)<*> line 0
	(*) line 1		(*) line 1
	* line 2		* line 2

⁹ Harris (1983: 96) uses a system of *s* and *w* nodes, for “strong” and “weak,” respectively.

The diagrams in (61) are interpreted as follows. In line 0, potential stress bearers (vowels) in each word are marked with an asterisk. The rightmost vowel is extrametrical, meaning that it is not computed in the calculation of stress. This vowel is isolated in angled brackets.

Also in line 0, potential stress bearers are grouped into metrical constituents (feet). In Spanish, the dominant foot is the rightmost one.¹⁰ In unmarked foot formation (61a), the dominant foot is right-headed (iambic); this fact is shown by augmenting the right-hand element of the dominant foot in line 0 with an asterisk in line 1. In marked foot formation (61b), the dominant foot is left-headed (trochaic); in this case, the left head of the foot is therefore marked on line 1. Line 1 marks are augmented in line 2, the line representing word stress.

In the above analysis, marked and unmarked stress are accounted for parametrically. Extrametricality and foot formation are the same for both *sabána* and *sábana*; the crucial difference lies in the headedness of the dominant foot (trochaic or iambic).

These same parameters account also for unmarked and marked stress in consonant-final words.

(62) Unmarked and marked stress computation in consonant-final words

a.	unmarked: <i>esquimál</i>	b.	marked: <i>caníbal</i>
	es.ki.mal.		ka.ni.bal.
	(*) (* *) line 0		(*) (* *) line 0
	(*) line 1		(*) line 1
	* line 2		* line 2

In the examples *esquimál* and *caníbal* in (62), no terminal element is present. It is therefore possible for the rightmost foot to be built abutting the right edge of both words. In unmarked stress assignment, the dominant foot is iambic, giving final stress: [es.ki.mál.]. In marked assignment, the dominant foot is trochaic, giving penultimate stress: [ka.ní.bal.]. Antepenultimate stress requires the

¹⁰ Note that only one foot can be built in these examples. See Harris (1986) for examples of footing of longer words.

presence of a terminal element, which must be a vowel; therefore no consonant-final words with antepenultimate stress are possible.

Vowel-final words with final stress may be counted among those with unmarked stress if the rightmost element is identified as a potential stress bearer, rather than a terminal element. Recent studies generally concur that all vowel-final words stressed on the oxytone have no terminal element and are therefore monomorphemic, i.e. the final vowel is part of the stem itself, rather than a terminal element (cf. Inkelas 1989: 227; Lipski 1997: 566). If the assignment of extrametricality is limited to vowels which are terminal elements, then the final vowel in words like *dominó*, *café*, and *maní* remains visible in stress computation. These words follow the unmarked foot formation pattern: right-headed (see 63).

(63) Unmarked stress computation in vowel-final words with no class marker

paletó

pa.le.to.

(*)(* *) line 0

(*) line 1

* line 2

In OT analyses, Spanish foot formation and stress assignment have been accounted for by the ranking of constraints. Rosenthal (1997) invokes three constraints to restrict word stress to the last three syllables in the word: FOOTFORM, NON-FINAL, and ALIGN. The ranking FOOTFORM, NON-FINAL » ALIGN enforces unmarked stress assignment. FOOTFORM and NON-FINAL require that metrical feet are built upon moras and are trochaic (i.e. left-headed), and that the rightmost element is unfooted, or extrametrical.¹¹ ALIGN requires that the right edge of the dominant foot coincides with the right edge of

¹¹ Trochaic footing is maintained for Spanish on the basis of syllable weight, as determined by mora count within syllables. The reader is referred to McCarthy & Prince (1986), Hayes (1987), and Dunlap (1991) for further justification of the trochaic foot for Spanish.

the word. ALIGN is gradiently violable, meaning that all things being equal, the optimal candidate is the one in which the dominant foot is closest to the right edge of the word.¹²

Rosenthal distinguishes between two stress stypes for Spanish, each determined by a different constraint ranking. The ranking FOOTFORM, ALIGN » NONFINAL is the unmarked ranking. FOOTFORM, NONFINAL » ALIGN is the marked ranking; words with exceptional stress are lexically marked to be stressed under this ranking (see 64 and 65).

(64) Unmarked stress assignment in Spanish: Type A (cf. Rosenthal 1997: 172-173)¹³

FOOTFORM, ALIGN » NON-FINALITY

a. V-final: *podadera*


/podadera/	FOOTFORM	ALIGN	NONFINAL
☞ a. po.đa.(đé.ra.)			*
b. po.(đá.đe.)ra.		*!	
c. (pó.đa.)đe.ra.		*!*	
d. (po.đá.)đe.ra.	*!	***	

b. C-final: *remolón*

/remolon/	FOOTFORM	NONFINAL	ALIGN
a. re.(mó.lon.)		*!	

¹² Morales-Front (1994: 232) takes a somewhat different approach, in which foot form is not stipulatively trochaic, but rather whatever form is necessary to bring the stressed syllable head as far to the right as possible. This observation is akin to one made earlier by Harris (1991: 452): “Place stress as far to the right as possible....”


¹³ I have taken the (perhaps unwarranted) liberty of adding an additional candidate (d) to each tableau in (64) and (65), to illustrate a type of FOOTFORM violation not shown in Rosenthal’s examples. In Rosenthal’s tableaux, no candidates are given which violate FOOTFORM by presenting an iambic rather than trochaic foot. The candidates I have added contain an iambic foot, and therefore violate FOOTFORM. FOOTFORM may also be violated if the foot contains more than two moras (cf. 64b, candidate a).

 b. re.mo.(lón.)			*
c. (ré.mo.)lon.			**!
d. (re.mó.)lon.	*!		*


(65) Marked stress assignment in Spanish: Type B (cf. Rosenthal 1997: 172-173)

FOOTFORM, NONFINAL » ALIGN

a. V-final: *antílope*

/antílope/	FOOTFORM	NONFINAL	ALIGN
a. an.ti.(lón.pe.)		*!	
 b. an.(tí.lo.)pe.			*
c. (án.ti.)lo.pe.			**!
d. an.(ti.lón).pe.	*!		*

b. C-final: *fusil*

/fusil/	FOOTFORM	NONFINAL	ALIGN
 a. (fú.si)l.			*
b. (fú.sil.)	*!	*	
c. fu.(síl.)		*!	
d. (fu.sí)l.	*!		*

Rosenthal's approach maintains a single foot type (trochaic), and accounts for exceptions by the relative ranking of two violable constraints, NONFINAL and ALIGN. This approach is quite different

from Harris' (1989) metrical approach, in which exceptionality was attributed to lexically marked foot form. The final predictions are, however, the same.¹⁴

Because the focus of this chapter is on syllable merger at word boundaries (synalepha), the type of stress which will be of interest is specifically that which is word-initial or word-final. Word-final stress is invariably exceptional, and must be marked lexically (e.g. *tabú*). Word-initial stress is not necessarily exceptional (cf. regular *una* to exceptional *ético*). In any case, syllable merger at word boundaries commonly entails either stress shift or stress merger, depending on the dialect. In some dialects of Spanish, such as Standard Mexican, the merger of stressed syllables is blocked altogether.

In this section, stressed syllable merger data from three varieties of Spanish - Peninsular, Mexican, and Chicano - are presented and discussed. Principal sources include Navarro Tomás (1967), Roca (1991), and Hualde (1994) for Peninsular Spanish, Stockwell & Bowen (1965), Harris (1970), and Martínez-Gil (1996) for Mexican Spanish, and Hutchinson (1974), Reyes (1976), and Martínez-Gil (1996, 1998) for Chicano Spanish. All three merger varieties will be accounted for in the OT framework.¹⁵

2.2.1 The Data

It has been foreshadowed in the previous section that syllable merger is sensitive to and often constrained by primary word stress. The presence of stress in a vowel sequence is handled differently by different dialects. For example, in Peninsular Spanish, syllable merger occurs freely in Andante and Allegretto styles, regardless of the presence of word stress. In this variety, either stressed onglides or offglides may be formed. In Mexican Spanish, however, syllable merger is constrained by the presence of stress on either of the vowels; indeed a stressed vowel may never be glided. In Chicano Spanish as

¹⁴ It is beyond the scope of this dissertation to discuss all the issues surrounding stress assignment in Spanish. For such information, the reader is referred to Harris (1983; 1989; 1991b), Roca (1986; 1990; 1991), Inkelas (1989), Dunlap (1991), and Lipski (1997). For analysis of Spanish stress within the OT framework, see Morales-Front (1994), Rosenthal (1997), and Roca (1997). Hammond (1995) presents a unique OT perspective on Spanish stress assignment issues.

¹⁵ In my discussion, I sidestep the complex issue of primary stress as an effect of metrical footing. My description of the interaction between syllable merger and stress does not entail reference to feet or metrical structure, so footing will not be discussed in detail here.

in Peninsular Spanish, stress does not constrain syllable merger; as shown before, however, only onglides are formed in this dialect.

(66) Stressed syllable merger: Peninsular Spanish (Navarro Tomás 1967: 156; Roca 1991: 606-608; Hualde 1994: 638; Martínez-Gil 1996: 5)¹⁶

a. ǎ + ǎ

<i>mili esta</i>	mil[jé]sta
<i>de otra cosa</i>	d[ǝó]tra cosa
<i>vendo esto</i>	vend[ǝé]sto
<i>de ambos</i>	d[ǝá]mbos
<i>este humo</i>	est[éw]mo
<i>la otra</i>	l[áǝ]tra
<i>la hija</i>	l[áj]ja

b. ǎ + ǎ

<i>menú antiguo</i>	men[wá]ntiguo
<i>bisturí afilado</i>	bistur[já]filado
<i>café amargo</i>	caf[ǝá]margo
<i>abrigó en su seno</i>	abrig[ǝé]n su seno

¹⁶ Fernando Martínez-Gil, a native speaker of Peninsular Spanish, points out to me that of the three stressed syllable merger types in (66), those which have both rising sonority *and* stress on the second vowel are most “natural” (e.g. *de ambos* [dǝámbos]). Note that in such cases, stress has not shifted in order to satisfy sonority requirements. In cases requiring stress shift in order to satisfy sonority, such as *busca una* busc[áw]na or *menú antiguo* men[wá]ntiguo, merger is possible yet less natural to Martínez-Gil as well as to other native speakers (note that Hualde 1994: 638 finds busc[áw]na unacceptable). Martínez-Gil indicates that merger of two stressed vowels is the least natural-sounding merger type, and characteristic only of very fast speech (e.g. *tabú ético* tab[wé]tico, claimed by Roca 1991: 608 to be an unacceptable merger).

Martínez-Gil’s observations regarding the feasibility of stressed syllable mergers are consistent with those of Navarro Tomás (1967: 156). In light of these observations regarding naturalness of merger types, I maintain here that all three types of stressed syllable merger are possible in Peninsular Spanish and therefore must be accounted for (cf. also Navarro Tomás 1967: 156). However, because “degree of naturalness” is not an easy factor to formalize, I will avoid incorporating notions of “more naturalness” or “less naturalness” into my analysis.

<i>acné inoportuno</i>	ac[néj]noportuno
<i>medité un momento</i>	medit[éw]n momento
<i>vendrá en seguida</i>	vendr[áɛ]n seguida

c. $\acute{v} + \acute{v}$

<i>tabú ético</i>	tab[wé]tico
<i>frenesí hondo</i>	frenes[jó]ndo
<i>capó único</i>	cap[ów]nico
<i>chimpancé indio</i>	chmpanc[éj]ndio

(67) Stressed syllable merger: Mexican Spanish (Stockwell & Bowen 1965: 114; Harris 1970: 131)¹⁷

a. $\check{v} + \acute{v}$

<i>su hijo</i>	s[wí]jo
<i>le hinca</i>	l[ɛí]nca
<i>como Eva</i>	com[ɔé]va
<i>como uvas</i>	com[ɔú]vas
<i>la uva</i>	l[ɔú]va
<i>la época</i>	l[ɛé]poca
<i>le habla</i>	l[ɛá]bla

b. $\acute{v} + \check{v}$

<i>tú imitas</i>	t[új]mitas
<i>está Elena</i>	est[áɛ]lena
<i>habló Elena</i>	habl[óɛ]lena
<i>está Orlando</i>	est[áo]rlando

¹⁷ Due to the unavailability of data for sequences of two stressed vowels in Mexican Spanish, data for this category will not be given.

habló Alicia habl[óǎ]licia

(68) Stressed syllable merger: Chicano Spanish (Hutchinson 1974: 186-189; Martínez-Gil 1998: 2-4)

a. $\check{v} + \acute{v}$

mi último m[jú]ltimo

tu alma t[wá]lma

te odian t[jó]dian

lo hablan l[wá]blan

tengo hipo teng[wí]po

b. $\acute{v} + \check{v}$

comí uvas com[jú]vitas

vi elotes v[jé]lotes

habló Adán habl[wá]dán

pagué ochenta pagu[jó]chenta

habló Evita habl[wé]vita

tomó inglés tom[wí]nglés

c. $\acute{v} + \acute{v}$

perdí uno perd[jú]no

Cantú iba Cant[wí]ba

compré uvas compr[jú]vas

pasé años pas[já]ños

compró agua compr[wá]gua

The data in (66) show that in Peninsular Spanish, merger of stressed syllables is allowed across word boundaries without restriction. Note that both onglides and offglides may be formed, as long as the nucleus of the merged syllable is a sonority peak. If the stressed vowel is the less sonorous in the pair, then stress invariably shifts to the more sonorous vowel.

In Mexican Spanish (67), a stressed vowel may never be made nonnuclear in syllable merger. Offglides may only be formed if the first vowel is stressed, regardless of relative sonority (e.g. est[áɛ]lana and habl[óɑ]llicia). If the second vowel is stressed, then the result is invariably an onglide. In Mexican Spanish, therefore, the position of stress blocks glide formation, and stress shift is impossible.

Finally, in Chicano Spanish, merger of stressed vowels invariably results in an onglide, regardless of stress and relative sonority. Sonority requirements are satisfied, however, because the initial nonnuclear element in the onglide is always [+high], so that sonority rises across the merged syllable, rather than falls (e.g. t[jó]dian). As in Peninsular Spanish, stress shift is permitted. In Chicano Spanish, however, if stress shift occurs, it is only from the first vowel to the second, not from the second to the first (e.g. habl[wá]dán).

2.2.2 An OT account

In Optimality Theory, when any two words are evaluated together (as connected speech inputs), they are monitored by constraints which ensure their identity to their respective “bases.” The base is the word as it is realized optimally in isolation. It is an output form. In the evaluation of stressed syllable merger, each base - or individual word - must be examined for stress faithfulness to its base. In this study, I will combine the stress-assignment constraint relation FOOTFORM, ALIGN » NONFINAL into a blanket constraint *STRESS*.¹⁸ The realization of lexically marked stress (however one chooses to represent it), will be monitored by the constraint *MAX-STRESS*. These constraints are listed in (69), along with an additional constraint *VOWEL-TO-HEAD*, to be discussed presently.

¹⁸ Alderete (1995: 8) introduces the constraint *STRESS* to refer abstractly to the set of constraints which interactively assign words stress. Like Alderete, I use this blanket constraint primarily as a space-saver, and also because issues involving the metrical footing of words do not play a major role in the discussion.

(69) Constraints involved in stressed syllable merger

STRESS “Apply unmarked stress.” (cf. Alderete 1995: 8)

MAX STRESS “Lexically marked stress must be represented faithfully.”(MAX-S)

VOWEL-TO-HEAD “A vowel parsed by a stressed syllable in the base must be parsed by a stressed syllable in the output.” (V-TO-HEAD)

In the proposed stress system, “unmarked” stress means that vowel-final words are stressed on the next-to-last syllable, and consonant-final words are stressed on the last syllable. Likewise, lexically marked stress is satisfied as long as it falls on the indicated syllable: last, next-to-last, or pre-next-to-last.

Stress is satisfied only if it is associated with a certain vowel of the prosodic word. Obviously, then, stress shift of the type observed in Peninsular Spanish incurs violation of either STRESS or MAX-S. In Peninsular Spanish, these two constraints must be violable. However, it is not the case that any type of stress violation is acceptable; indeed, stress violation is acceptable only in the case of stress shift. In such cases, stress shifts to an immediately adjacent vowel. It never jumps across a vowel.

This observation provides the necessary motivation for V-TO-HEAD. This base-identity constraint ensures that a vowel parsed by a stressed syllable in the base (i.e. in the isolated output form) must be parsed by a stressed syllable in all its alternate outputs. Stress shift, provided it occurs only to satisfy sonority sequencing, satisfies V-TO-HEAD even though it violates stress assignment. The putative ranking V-TO-HEAD » STRESS, MAX-S, provisionally maintained for Peninsular Spanish, asserts that stress is inalienable in isolation forms, yet subject to possible shift in connected speech outputs. In order for stress to shift, HNUC and ONSET both must dominate STRESS and MAX-S.

In Mexican Spanish, by contrast, stress shift is absolutely blocked because STRESS and MAX-S dominate ONSET. This ranking stipulates that syllable merger may not entrain the shift of word stress. In Chicano, as in Peninsular Spanish, ONSET dominates STRESS and MAX-S.

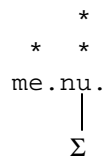
The relationship between stress and head-dominance is shown in (70). In (70a), the bases (output forms) *menú* and *antiguo* are shown. Each has independently assigned word stress, shown by the asterisks (the bottom line marks stressable units; the top line marks word stress). Head-dominance of the stressed vowel is shown by the symbol ‘Σ.’ This is the syllable head. In isolation forms (i.e. in the bases), the vowel targeted in stress assignment is, of course, contained in a stressed syllable.

In (70b), the bases *menú* and *antiguo* are brought into contact, yet are realized in hiatus in formal style. Because the stress pattern for each output still matches that of its base, MAX-S is satisfied. Likewise, V-TO-HEAD is satisfied.

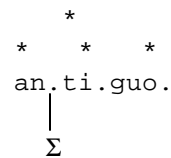
In (70c), the bases are brought into contact *and* merged. The sequence /ú-a/ is resolved such that /a/ is nuclear and /u/ forms an onglide: [wá]. Because nonnuclear vocoids are not legitimate stress-bearers, stress is shifted from /u/ to /a/. This shift forces stress misalignment, because the stress of *menú* does not conform to the base pattern enforced by MAX-S. However, because the base vowel /u/ is still parsed by a stressed syllable, V-TO-HEAD is satisfied.

(70) Bases and stress

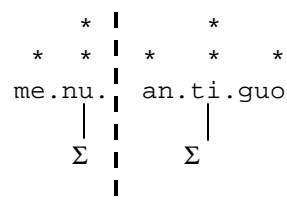
a. Bases: *menú*



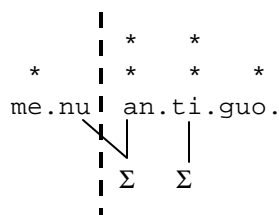
antiguo



b. Connected speech (hiatus): *menú antiguo*



c. Connected speech (merger): *menú antiguo*



In all three dialects, V-TO-HEAD is undominated, thereby ensuring that stress shift, if allowed, is local in nature, i.e. it moves only within the stressed syllable itself. The function of this constraint is illustrated in (71), for Peninsular Spanish *menú antiguo*.

(71) Peninsular Spanish Allegretto: *menú antiguo*

/menú # antiguo/	HNUC	V-TO-HEAD	ONSET	MAX-μ	MAX-S
a. me.nú.an.tí.γwo.			*!		
b. me.nwán.tí.γwo.				*	*
c. me.núan.tí.γwo.	*!			*	*
d. mé.nu.an.tí.γwo.		*!	*		*
e. mé.nwan.tí.γwo.		*!		*	*

As shown in (71), stress shift violates MAX-S (candidates 71b-71e). Those in which the base stress for *menú* is shifted to a syllable in which the vowel /u/ is not contained also (fatally) violate V-TO-HEAD. Those which do not violate V-TO-HEAD (71b and 71c) contain local stress shift; i.e. the /u/ in *menú* is still contained in a stressed syllable. Of these two candidates, (71c) is rejected because it violates HNUC, leaving (71b) as the optimal candidate. Note that in (71), candidates (b) and (e) would be tied in evaluation were it not for the intervention of V-TO-HEAD. In other words, on the basis of

STRESS and MAX-S alone, the grammar has no way of distinguishing stress shift for the sake of sonority sequencing, and stress shift which is purely gratuitous.

In Peninsular and Chicano Spanish, stressed syllable merger may involve local stress shift in order to satisfy higher-ranked constraints. In Peninsular Spanish, stress shift occurs to satisfy HNUC. In Chicano Spanish, it serves to satisfy MAX-WI- μ .

In Mexican Spanish, stress shift is banned by the ranking STRESS, MAX-S \gg MAX-WI- μ . As a result, no vowel which is stressed in the base may be glided in connected speech.

The proposed constraint rankings for Peninsular, Mexican, and Chicano Spanish are given in (72). As before, ONSET is the only FC.

(72) Constraint rankings (stressed syllable merger)

a. Peninsular Spanish

$$\begin{array}{ccccccc} & & \left| \dots \text{ONSET} \dots \right| & & & & \\ \text{V-TO-HEAD} & \gg & \text{MAX-}\mu & \gg & \text{MAX-WI-}\mu & \gg & \text{MAX-S} \\ \text{HNUC} & & & & & & \text{STRESS} \end{array}$$

b. Mexican Spanish

$$\begin{array}{ccccccc} & & \left| \dots \text{ONSET} \dots \right| & & & & \\ \text{V-TO-HEAD} & \gg & \text{MAX-}\mu & \gg & \text{STRESS} & \gg & \text{MAX-WI-}\mu & \gg & \text{HNUC} \\ & & & & \text{MAX-S} & & & & \end{array}$$

c. Chicano Spanish

$$\begin{array}{ccccccc} & & \left| \dots \text{ONSET} \dots \right| & & & & \\ \text{V-TO-HEAD} & \gg & \text{MAX-}\mu & \gg & \text{MAX-WI-}\mu & \gg & \text{MAX-S} & \gg & \text{HNUC} \\ & & & & & & \text{STRESS} & & \end{array}$$

It has already been shown that syllable merger is driven by the relative ranking of MAX- μ and the FC ONSET. In Allegretto speech, ONSET dominates MAX- μ . In Peninsular Spanish, the optimal merger is the one which satisfies both HNUC and V-TO-HEAD. MAX-S, STRESS, and MAX-WI- μ are low-ranked and therefore violable (see 73 and 74).

(73) Peninsular Spanish Allegretto: *café amargo*

/kafé # amargo/	HNUC	V-TO-HEAD	ONSET	MAX-μ	MAX-S	MAX-WI-μ
a. ka.fé.a.már.ɣo.			*!			
b. ka.ɸé.á.már.ɣo.				*	*	
c. ka.fé.á.már.ɣo.	*!			*		*
d. ká.ɸé.á.már.ɣo.		*!		*	*	
e. ká.ɸé.á.már.ɣo.	*!	*		*		*

(74) Peninsular Spanish Allegretto: *este humo*

/este # umo/	HNUC	V-TO-HEAD	ONSET	MAX-μ	STRESS	MAX-WI-μ
a. és.te.ú.mo.			*!			
b. és.téw.mo.				*	*	*
c. ésteú.mo.	*!			*		

Stressed syllable merger in Peninsular Spanish follows a pattern similar to that of unstressed syllable merger. For example, the vowel sequences *carta urgente* (V_1 and V_2 are unstressed), *quizá una* (V_1 and V_2 are stressed), *quizá humilde* (V_1 is stressed, V_2 is unstressed), and *carta útil* (V_1 is unstressed, V_2 is stressed) may all merge in Allegretto style. Merger is limited in all examples by the constraint HNUC, which ensures that syllable peaks and sonority peaks coincide. MAX-S and STRESS cooperatively ensure that marked and unmarked stress are correctly assigned, and are violable in this variety of Spanish. The constraint V-TO-HEAD ensures that stress shift, if any, is local; i.e. that it shifts only within the stressed syllable.

Stressed syllable merger in Mexican Spanish is subject to restrictions different from those of Peninsular Spanish, yet determined by the same set of ranked universal constraints. The main difference between stressed syllable merger in Mexican and Peninsular Spanish can be summed up in a sentence: Peninsular Spanish allows stress shift, whereas Mexican does not. Consequently, the second vowel in the sequence may be glided only if it is the first vowel which is stressed (e.g. pap[áj]mita). When it is the second vowel which is stressed, merger forms an onglide (e.g. com[ou]vas). Note that sonority requirements are met only trivially, i.e. if the second vowel happens to be more sonorous (e.g. l[eá]bla).


In the last section, the constraint MAX-S was used to ensure that lexically marked stress was realized in the output. At the same time, stress shift is permitted in Peninsular Spanish because MAX-S is ranked below HNUC. In Mexican Spanish, by contrast, MAX-S ranks above HNUC. This ranking stipulates that a stressed vowel may not be glided. We also know that MAX-S dominates MAX-WI-μ, because word-initial glides are permitted only when the first vowel in a sequence is stressed (see 75 and 76).

(75) Mexican Spanish Allegretto: *papá imita*

/papá # imita/	ONSET	MAX-μ	MAX-S	MAX-WI-μ	HNUC
a. pa.pá.i.mí.ta.	*!				
b. pa.páj.mí.ta.		*		*	
c. pa.paí.mí.ta.		*	*!		*


(76) Mexican Spanish Allegretto: *como uvas*

/komo # ubas/	ONSET	MAX-μ	MAX-S	MAX-WI-μ	HNUC

a. kó.mo.ú.βas.	*!				
b. kó.mów.βas.		*	*!	*	
 c. kó.moú.βas.		*			*

Chicano Spanish contrasts with Mexican Spanish in its ranking of MAX-S and STRESS relative to MAX-WI-μ as well as HGLIDE and IDENT [high]. In Chicano Spanish, unlike Peninsular and Mexican, HGLIDE ranks above IDENT [high], thereby enforcing the realization of all glides as [+high] (see 77 and 78) .

(77) Chicano Spanish Allegretto: *pagué ochenta*

/pagé # oçenta/	ONSET	MAX-μ	MAX-WI-μ	MAX-S	HIGLIDE	IDENT [high]
a. pa.γé.o.čén.ta.	*!					
b. pa.γeo.čén.ta.		*		*	*!	
c. pa.γéo.čén.ta.		*	*!		*	
 d. pa.γjó.čén.ta.		*		*		*
e. pa.géw.čén.ta.		*	*!			*

(78) Chicano Spanish Allegretto: *habló Evita*

/abló # ebíta/	ONSET	MAX-μ	MAX-WI-μ	MAX-S	HIGLIDE	IDENT [high]
----------------	-------	-------	----------	-------	---------	--------------

a.	a.βl _o .e.βí.ta.	*!					
b.	a.βl _o é.βí.ta.		*		*	*!	
c.	a.βl _o ε.βí.ta.		*	*!		*	
d.	a.βlwé.βí.ta.		*		*		*
e.	a.βl _o j.βí.ta.		*	*!			*

The Chicano data in (68) reveal that in this dialect, no offglides are formed. Offglides are banned by the constraint MAX-WI-μ. In Chicano, MAX-WI-μ dominates MAX-S (and STRESS), thereby allowing stress shift from the first vowel in a sequence to the second, in order to satisfy MAX-WI-μ. In Mexican Spanish, however, offglides do occur, but *only* when the first vowel in the sequence is stressed (cf. tableaux 75 and 76). In Mexican Spanish, the optimal Allegretto output for *habló Evita* would be habl[_oé]vita.

In this section, three varieties of stressed syllable merger are attributed to the ranking of the constraints V-TO-HEAD, ONSET, MAX-S/STRESS, HNUC, MAX-WI-μ, HGLIDE, and IDENT [high]. Stress shift upsets the stress pattern of a lexical word and violates either MAX-S or STRESS. It additionally violates V-TO-HEAD if it is shifted outside the stressed syllable. In Peninsular Spanish, merger of stressed syllables is possible (in most dialects) regardless of stress, as long as sonority requirements are respected. Peninsular Spanish is characterized by the ranking ONSET » MAX-S, STRESS, MAX-WI-μ. In Mexican Spanish, stressed syllable merger is more sensitive to the presence of stress than to the relative sonority of the merged vowels. Stressed vowels are *always* nuclear; i.e., stress may not shift, even within the same syllable. Onglides are preferred unless the first member in the sequence is stressed, in which case an offglide may be formed (e.g. com[_oú]vas, pap[_áj]mita). These facts are consistent with the ranking ONSET » MAX-S, STRESS » MAX-WI-μ » HNUC.

The Chicano data in (68) reveal a merger pattern similar to that of Peninsular Spanish. In Chicano Spanish, local stress shift is permitted as in Peninsular Spanish. However, another process is at

work in this dialect which is absent in both Peninsular and Mexican Spanish merger varieties. This process, vowel deletion, applies in two different contexts.

Referring back to the Chicano Spanish data, we find only examples of rising sonority or sonority plateau mergers. Whereas rising sonority mergers may contain vowels with the same value for the feature [back] (e.g. com[wé]va, v[jé]lotes), in sonority plateau mergers, the vowels invariably have opposite values for this feature (e.g. com[jú]vitas, Cant[wí]ba). Sequences of vocoids with the same value for [back] are systematically non-occurring, i.e. *se iba* *s[jí]ba, *compró uvas* *compr[wú]vas. These sequences are realized instead with a deleted vowel, i.e. as s[í]ba and compr[ú]vas, respectively.

Also systematically absent in Chicano Spanish is the vowel [a] as the first member of any merged sequence. Although [a] could conceivably be raised to form an onglide [j], such raising never occurs; instead, this vowel is deleted. Thus *la unión* is realized l[Øu]nión. Chicano Spanish vowel deletion, and its interaction with syllable merger, is the topic of the next section.

2.3 Vowel deletion in Chicano Spanish

In specific cases, Chicano Spanish prefers vowel deletion to syllable merger. Deletion always targets the first vowel (V_1) in a vowel sequence. In the first case for examination, V_1 deletion is mandatory in Allegretto speech if the two vowels in sequence have the same value for the feature [back] and falling sonority. In the second case, deletion is mandatory if V_1 in the sequence is /a/. Examples of both types of deletion are given in (79).

(79) V_1 deletion in Chicano Spanish (Martínez-Gil, in press)

- a. deletion before a vowel of same backness and higher sonority

<i>porque Italia</i>	porqu[i]talia
<i>como uniforme</i>	com[u]niforme
<i>compré higos</i>	compr[í]gos

compró uvas compr[ú]vas

b. deletion of /a/¹⁹

una india un[Øi]ndia

pasa e pisto pas[Øe]lpisto

lleva ochenta llev[Øo]chenta

la unión l[Øu]nión

In this section, both types of vowel deletion in Chicano Spanish are examined and accounted for in the OT framework. Principal sources for the Chicano data used include Hutchinson (1974) and Martínez-Gil (in press). See also Clements & Keyser (1983), Schane (1987), De Haas (1987), and Martínez-Gil (1996), for discussions of Chicano vowel deletion. Martínez-Gil (1998) is an analysis of Chicano merger/deletion in the OT framework.

2.3.1 Rule ordering and rule persistence

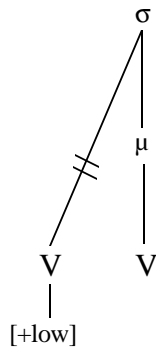
Before considering syllable merger in further detail, we return to the question of /a/ deletion (cf. the examples in 79b). In a detailed autosegmental study of syllable merger in Chicano Spanish, Martínez Gil (in press) attributes /a/-deletion to a rule which delinks any low vowel (i.e. any /a/) in prenuclear position. His rule is given in (80).

¹⁹ Other sources for discussion of /a/ deletion include Kaisse (1985) for Puerto Rican Spanish; and Stockwell, Bowen, & Silva-Fuenzalida (1956), Bowen (1956), and Contreras (1969) for Chilean Spanish.

Although primarily an American phenomenon, /a/-deletion is observed in some Peninsular dialects as well. Some dialects of Andalucía display an interesting alternative to /a/-deletion. In such dialects, aV sequences are resolved in favor of V₁ rather than V₂, e.g. *la encina* → l[aØ]ncina rather than l[Øe]ncina. Deletion of the lower sonority vowel (rather than of the higher sonority vowel [a]) is perhaps in keeping with the general Peninsular tendency to retain the most sonorous segment as the syllable nucleus (Hualde 1994).

See De Haas (1987) for a discussion of /a/-deletion in Portuguese, and Wheeler (1986) for a discussion of the same process in Catalán.

(80) /a/ deletion in Chicano Allegretto (Martínez Gil in press, 51)



In Chicano, non-low vowels are deleted as well, but only before a vowel of the same value for the feature [back], and of higher sonority (recall 79a). Rather than attributing this more restricted variety of deletion to a rule similar to (80), Martínez-Gil proposes that mid vowel deletion interacts with other more general phonological rules, enabling us to state the rule even more broadly. For example, sequences of identical vowels usually collapse into one (see 81).

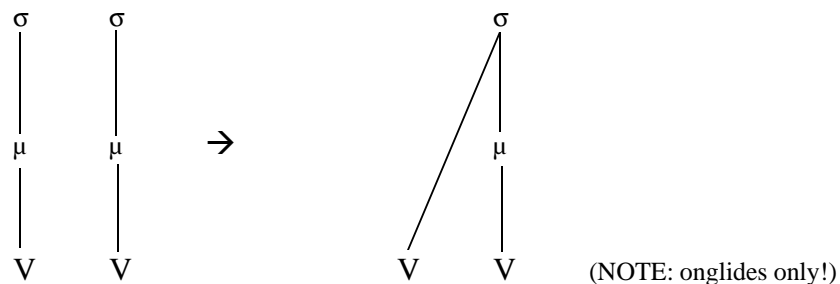
(81) Identical vowel coalescence in Chicano Allegretto (Martínez-Gil, in press)

<i>mi iglesia</i>	m[i]glesia
<i>se escapó</i>	s[e]scapó
<i>paga Adán</i>	pag[a]dán
<i>tu uniforme</i>	t[u]niforme
<i>como Homero</i>	com[o]mero

In the interest of descriptive simplicity, Clements & Keyser (1983), Martínez-Gil (in press), and others have taken the position that the same rule which collapses identical vowels (e.g. m[i]glesia) is also responsible for the deletion of mid vowels (e.g. porqu[i]talia). In the case of porqu[i]talia, the underlying mid vowel is raised by the same rule which is responsible for raising the onglide in merged syllables (e.g. pagu[jó]chenta).

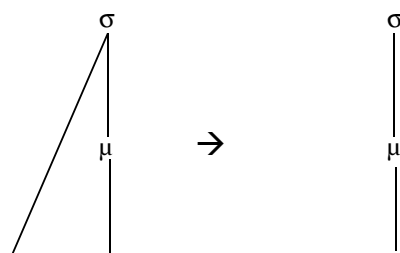
I will now review the basic *modus operandi* of Chicano vowel deletion as laid out by Martínez-Gil. First, Chicano vowel sequences undergo a rule of syllable merger not unlike the merger rule presented at the outset of this chapter. Recall that syllable merger in Chicano invariably favors the formation of onglides, without concern for relative sonority. Syllable merger in Chicano may therefore be achieved with a single rule (contrast Holt's 1984 Rhyme Nucleus Convention (29), which consists of two rules). This rule follows in (82).

(82) Syllable merger in Chicano (Martínez-Gil in press)



Second, identical vocoids (e.g. [aa], [ee], [ii], [oo], [uu]) collapse into a single prosodic (V) position (see 83).

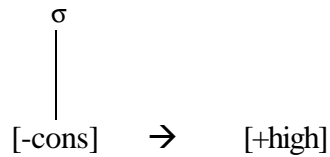
(83) Identical vowel degemination (Martínez-Gil, in press)



V₁ V₂ V (where V₁ = V₂)

Third, the sequences undergo a rule similar to Harris' (1985) High Glide redundancy rule (35), which makes all nonnuclear elements [+high] (see 84).

(84) Glide Raising (Martínez-Gil, in press)



The deletion of mid vowels before a higher vowel of like backness is achieved by the same rule which degeminates identical vowels (83). This way, a separate mid vowel deletion rule is not needed. The /a/-deletion rule (80) is, nevertheless, still required.

Although incisive, this rule module is faced with a rule ordering paradox. For some of the data, it is necessary for rule (83) to apply before rule (84), in order to bleed off possible inputs to the latter. For other data, rule (83) must apply after rule (84), because some outputs of rule (84) must be made available to rule (83). Two sample derivations illustrating this paradox are provided in diagram (85).

(85) Paradoxical rule ordering in Chicano

a. *se escapó* → s[e]scapó

b. *se iba* → s[i]ba

a.	s[e e]scapó	input	b.	s[e i]ba	input
	s[ɛ e]scapó	(82) Merger		s[ɛ i]ba	(82) Merger
	s[e]scapó	(83) Degem		--	(83) Degem
	--	(84) Raising		s[j i]ba	(84) Raising
	s[e]scapó	output		* s[ji]ba	output

a.	s[e e]scapó	input	b.	s[e i]ba	input
	s[ɛ e]scapó	(82) Merger		s[ɛ i]ba	(82) Merger
	s[j e]scapó	(84) Raising		s[j i]ba	(84) Raising
	--	(83) Degem		s[i]ba	(83) Degem
	* s[je]scapó	output		s[i]ba	output

The derivations in (85) show that the rule ordering required for one input, *se escapó*, is different from the one required for another input, *se iba*. Indeed, the ordering required for the correct derivation of one input produces an incorrect derivation for the other.

Martínez-Gil argues that the Degemination rule (83) is actually a language-specific process which applies whenever its structural description is met - a “persistent rule.” This way, Raising (84) may either feed or be fed by Degemination, and the ordering paradox is resolved (see 86).

(86) Ordering paradox resolved: “persistent” degemination

a.	se escapó	input	b.	se iba	input
	s[ɛ e]scapó	(82) Merger		s[ɛ i]ba	(82) Merger
	s[e]scapó	(83) Degem		s[j i]ba	(84) Raising
	--	(84) Raising		s[i]ba	(83) Degem
	s[e]scapó	output		s[i]ba	output

The focus of this section will be on providing an OT solution which allows the Chicano deletion data to be handled in a unified way, without the necessity for distinction between ordered and persistent rules.

2.3.2 An OT account

In section 2.1, I provided arguments for the utility of the constraint IDENT [high] in the selection of optimal outputs containing syllable merger. IDENT [high] monitors the binary value of the feature

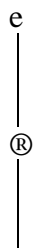
[high] in the output with reference to the input. Any change in this value - introduced by raising, for example - will effect an IDENT [high] violation. If a segment specified for [high] is deleted altogether from the output, then IDENT [high] is not violated, because this constraint monitors only feature identities, not whole segments. Deletion of a vowel satisfies IDENT [high], yet violates MAX-IO, the general constraint against segmental deletion.

The distinction between MAX-IO and IDENT [high] is illustrated in (87). This diagram shows that mid vowel deletion incurs a violation of MAX-IO, whereas feature value adjustment (i.e. raising) violates only IDENT [high].

(87) IDENT [high] versus MAX-IO violation

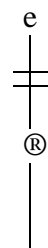
a. Vowel raising

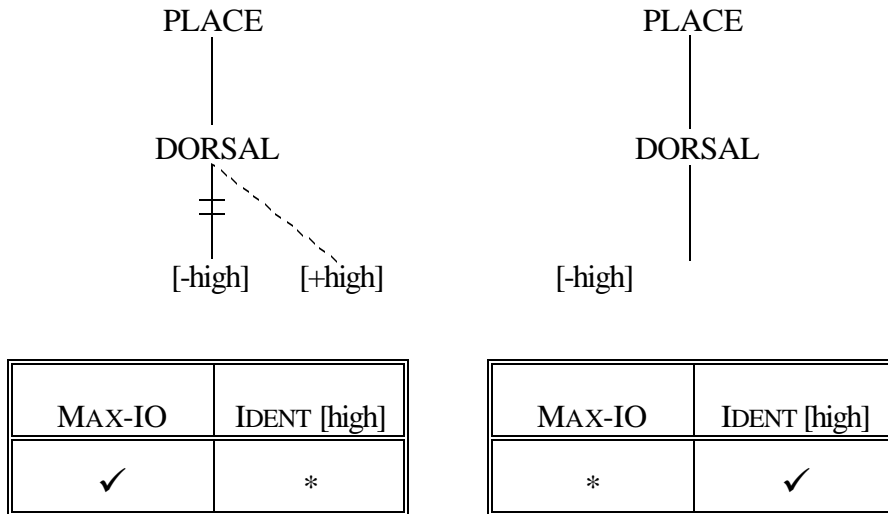
te humilló → t[ju]milló



b. Vowel deletion

se iba → s[Øi]ba





In (87), two types of structural changes are shown: vowel raising and vowel deletion. In Chicano Allegretto, the sequence *te humilló* is realized with the underlying mid vowel raised to a high glide. This feature change is represented in (87a), which notes one IDENT [high] violation. Because this operation does not involve segmental deletion, MAX-IO is satisfied.

In (87b), the root node of /e/ in the example *se iba* is delinked from higher structure (shown by the double bar above the root node ®). This delinking incurs a violation of MAX-IO because the root node is unparsed (not realized phonetically) in the output. IDENT [high], however, is satisfied.

In Chicano Spanish (and indeed in all Spanish dialects), /a/ never raises to [j] to form an onglide. The absence of such raising may be attributed to specific identity constraints, and their ranking relative to MAX-IO. Whereas the change from /e/ to [j] violates only IDENT [high], the change from /a/ to [j] violates both IDENT [high] and IDENT [low] (/a/ is [-high, +low] and [j] is [+high, -low]). Martínez-Gil (1998) accounts for this restriction on raising by the ranking IDENT [low] » MAX-IO » IDENT [high], which states that deletion is preferable to changing the underlying value of [low], but not preferable to changing the underlying value of [high]. This ranking ensures that /a/ is deleted rather than raised, but mid vowels /e, o/ are raised rather than deleted (see 88 and 89).

(88) Deletion vs. raising in Chicano Spanish (cf. Martínez-Gil 1998)²⁰

a. Deletion: *habla inglés* → hab[Øi]nglés

/...bla # in.../	ONSET	MAX-μ	MAX-WI-μ	HNUC	IDENT [low]	MAX-IO	IDENT [high]
a. βla.ɪŋ.	*!						
b. βlajŋ.		*	*!				
c. βla _̃ ɪŋ.		*		*!			
d. βleɪŋ.		*			*!		
e. βljɪŋ.		*			*!		*
f. βl<a>ɪŋ.		*				*	
g. βla<i>ɪŋ.		*	*!			*	

b. Raising: *me usó* → m[ju]só

/me # u.../	ONSET	MAX-μ	MAX-WI-μ	HNUC	IDENT [low]	MAX-IO	IDENT [high]
a. me.u.	*!						
b. mew.		*	*!				
c. me _̃ u.		*		*!			
d. mju.		*					*


²⁰ Martínez-Gil's OT analysis also maintains the Allegretto ranking ONSET » MAX-μ. In his analysis, however, MAX-WI-μ, the IDENT constraints, HIGLIDE, and MAX-IO intervene between ONSET and MAX-μ. Such ranking is not crucial, and in fact predicts a broader range of flotation for the FC ONSET. In my approach, ONSET either immediately dominates or is immediately dominated by MAX-μ, without intervening constraints.

In Martínez-Gil's tableaux, sonority requirements are enforced by the constraint HIGLIDE. In my tableaux, I employ HNUC as the decisive constraint, although my analysis uses HIGLIDE as well. Both Martínez-Gil's and my treatments make the same fundamental predictions.

e. m<e>u.		*				*!	
f. me<u>.		*	*!			*	

In Peninsular and Mexican Spanish, vowel deletion is banned in merger contexts because MAX-IO minimally dominates both IDENT [low] and IDENT [high]. Recall that in Peninsular Spanish, HNUC is top-ranked, and MAX-WI- μ is low-ranked. In Mexican Spanish, HNUC is low-ranked, as in Chicano. Peninsular and Mexican Spanish tableaux for Allegretto *habla inglés* are given in (89) and (90).

(89) Peninsular Spanish Allegretto: *habla inglés*

/...bla # in.../	HNUC	ONSET	MAX- μ	MAX-IO	IDENT [high]	IDENT [low]	MAX-WI- μ
a. β la.iŋ.		*!					
 b. β lajŋ.			*				*
c. β lajŋ.	*!		*				
d. β leŋ.			*			*!	
e. β ljŋ.			*		*!	*	

MAX- μ » MAX-WI- μ » HNUC
 ONSET MAX-IO
 IDENT [high]
 IDENT [low]

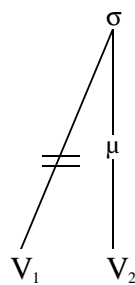
c. Chicano Spanish

MAX- μ » MAX-WI- μ » MAX-IO » IDENT [high]
 ONSET HNUC
 IDENT [low]

In this section, it has been shown that /a/ deletion occurs when IDENT [low] dominates MAX-IO under pressure from higher-ranked MAX-WI- μ . Mid vowels fail deletion in the same environment because they may be raised/glided without violating IDENT [low]; instead, they violate IDENT [high]. Such violation is preferable to deletion, because MAX-IO dominates IDENT [high].

The Chicano data show, however, that mid vowels *do* delete if they precede (across a word boundary) another vowel of same backness and like or greater height (i.e. equal or lesser sonority). Recall that in Martínez-Gil’s serial analysis, a mid vowel preceding another vowel is first raised, then deleted (“degeminated”) *if the resulting sequence is identical*. Martínez-Gil’s Degemination rule is repeated in (92) for convenience.

(92) Degemination



(where $V_1 = V_2$)

In (92), the construction of two identical vocoids in a single syllable triggers Degemination because it violates the Obligatory Contour Principle, or OCP. This principle, and its constraining effect on identical vocoid strings, will be the focus of the next section.

2.3.3 More about Chicano: the OCP

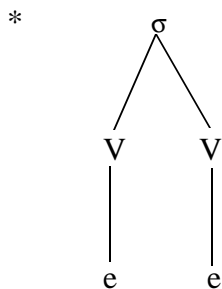
The OCP has been developed to account for the cross-linguistic tendency to avoid sequences of identical elements, whether tones, segments, or individual features. Primary discussions of the OCP and its role in phonology may be found in McCarthy (1986) and Odden (1986), and in many subsequent studies. I cite McCarthy's definition of the OCP in (93).

(93) Obligatory Contour Principle (OCP) (McCarthy 1986: 208)

“At the melodic level, adjacent identical elements are prohibited.”

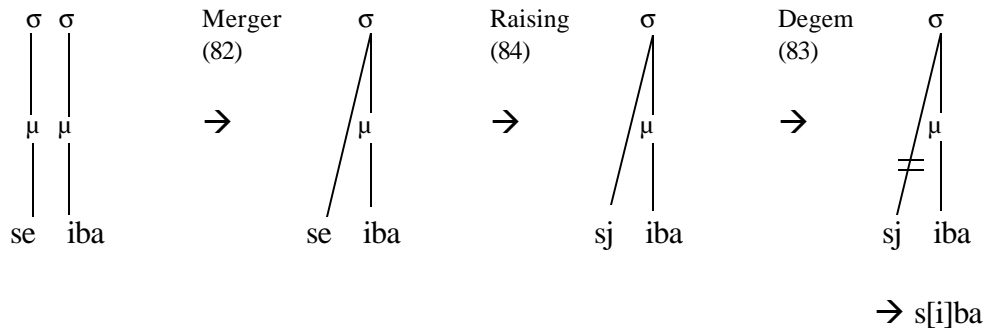
In a discussion of the OCP across identical vowel sequences, Schane (1987) gives an example of a vowel construction which violates the OCP. His example is reproduced in (94).

(94) The OCP and vowel sequences (Schane 1987: 280)



The structure illustrated in (94) violates the OCP because it contains two adjacent instances of the vowel /e/. This type of structure, Schane argues, is generally avoided if at all possible in language, usually by reparative rules which force melodic contours. Such strategies are referred to in the generative literature as degemination rules. Martínez-Gil's rule (93) is such a rule. In a serial analysis of the Chicano data, the segment sequence on which rule (93) operates is an intermediate representation, therefore any geminate sequence produced by Raising (84) is suppressed before it is allowed to surface (see 95).

(95) Identity avoidance in Chicano (cf. Martínez-Gil, in press)



To avoid accidental gemination of vowels in an OT analysis of vowel deletion, the OCP must be formalized as a constraint. It is maintained that OCP is inviolable in syllable merger in Spanish, and therefore ranked high, along with HNUC and STRESS. Ranked high in this manner, OCP bans *all* identical vocoid sequences from output forms. In (96), the sequence *se iba* is evaluated under the Chicano Allegretto ranking.

(96) Identity avoidance in Chicano Spanish Allegretto: *se iba*

/se # i.../	OCP	ONSET	MAX- μ	MAX-WI- μ	HIGLIDE	MAX-IO	IDENT [high]
a. se.i		*!					

b. se _j .			*	*!			
c. se _i .			*		*!		
d. s _j i.	*!		*				*
e. s _i j.	*!		*	*			*
f. s<e>i.			*			*	
g. se<i>.			*	*!		*	

In (97), evaluation of *lo hirió* shows that if onglide formation does not result in feature identity, then no OCP violation is incurred, and glide formation is permitted.

(97) Vowel non-identity in Chicano Spanish Allegretto: *lo hirió*

/lo # i.../	OCP	ONSET	MAX-μ	MAX-WI-μ	HIGLIDE	MAX-IO	IDENT [high]
a. lo _i .		*!					
b. lo _i .			*		*!		
c. lo _j .			*	*!			

☞	d. lwi.			*			*
	e. luj.			*	*!		*
	f. lo<i>.			*	*!	*	
	g. lo<o>i.			*		*!	

The ranking OCP » ONSET » MAX-μ requires glide formation, except if the resulting glide displays feature identity. As shown in tableaux (96) and (97), OCP constrains two candidates which contain vowel identity: (d) and (e). In (96), deletion is required, because only deletion allows OCP, HIGLIDE, and MAX-WI-μ to be satisfied. In (97), it is possible for these constraints to be satisfied without deletion, so raising is preferred.


In Peninsular and Mexican Spanish, OCP is high-ranked as well. However, because MAX-IO does not rank below MAX-WI-μ in either dialect, deletion is banned. In Peninsular Spanish, *se iba* is realized s[éj]ba. In Mexican Spanish, it is realized s[éi]ba (see 98-99).

(98) Peninsular Spanish Allegretto: *se iba*

/se # i.../	OCP	HNUC	ONSET	MAX-μ	MAX-IO	MAX-WI-μ
a. se.i.			*!			
☞ b. sej.				*		*
c. se̞i.		*!		*		

d. sji.	*!			*		
e. sij.	*!			*		*
f. s<e>i.				*	*!	
g. se<i>.				*	*!	*

(99) Mexican Spanish Allegretto: *se iba*

/se # i.../	OCP	ONSET	MAX- μ	MAX-IO	MAX-WI- μ	HNUC
a. se.i.		*!				
b. sej.			*		*!	
 c. se _i .			*			*
d. sji.	*!		*			
e. sij.	*!		*		*	
f. s<e>i.			*	*!		
g. se<i>.			*	*!	*	

2.4 Identical (long) vowels

It has been shown in the foregoing sections that syllable merger is characteristic of accelerated spoken Spanish, but not without restrictions. The breadth of its application is constrained by stipulations regarding relative sonority of the segments in question, the position of stress (if any), as well as the

overall “acceptability” of the new syllable. Syllable merger also applies to sequences of identical vowels, with a rather different set of restrictions than those already discussed.

Merger of identical vowels does not involve the rebalancing (and potential loss) of underlying information required in the merger of unlike vowels. Two adjacent vowels which are *different* are somewhat like puzzle pieces in that their merger requires a series of adjustments to their respective sonorities, tongue heights, and to the final syllable shape. These adjustments ensure the “best fit” of the two vowels in a new syllable. The merger of *identical* vowels is quite simple by comparison. Identical vowels, having all their features in common, are easily subsumed under a single syllable, without questions of relative sonority even arising.

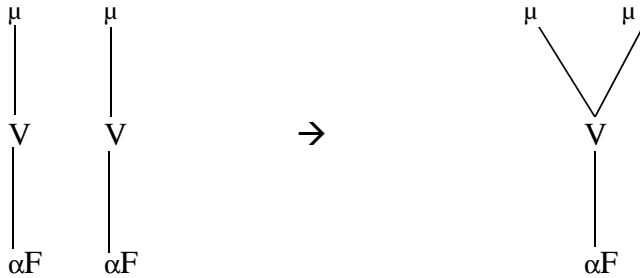
In this section, three basic claims will be reviewed and substantiated. First, in Largo speech, identical vowels are commonly realized in separate syllables. Second, in Andante speech, they tend to be realized as a tautosyllabic bimoraic (long) vowel. Third, in Allegretto speech, they are generally realized as a monomoraic (short) vowel. Following presentation and discussion of relevant data, an OT analysis will be proposed.

2.4.1 Structure fusion in V_1V_1 sequences

Navarro Tomás (1967), Hutchinson (1974), Sanz (1979), Zamora Munné & Guitart (1982), Roca (1991), Hualde (1994), and others concur that long vowels in Spanish are usually realized short in Allegretto style. Such vowel sequences, which I will call V_1V_1 sequences, are generally subject to the same constraints in connected speech as different vowels. Because of their identity, however, they invoke a rule of featural simplification called Identical Structure Fusion (ISF).²¹ The ISF rule, defined in (100), dispenses with redundant structure in order to avoid OCP violation.

²¹ A word of precaution to the reader: “structure fusion” and “syllable merger” do not refer to one and the same principle. “Structure fusion” is a persistent repair operation referred to here as ISF. ISF applies to any segment sequence in which its structural description is met, *regardless of speed style*, in order to prevent surface structures from containing violations of the OCP. “Syllable merger” is the stylistic process over which the speaker has control, and which usually varies depending on speed style.

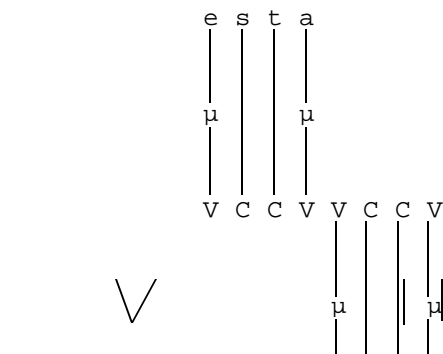
(100) Identical Structure Fusion (ISF) (cf. Clements 1985: 240)²²



ISF scans the segment sequence for pairs with matching feature structures. Upon finding such a pair, ISF collapses the identical material beneath a single root node. The only elements which do not collapse are the moras associated with each underlying segment; these are retained and doubly-linked to the newly fused segment. An illustrative example of the application of ISF is given in (101). This figure charts the stages involved in the concatenation of the words *esta* and *alma* into the connected speech string *esta alma*. Note that the last segment in *esta* and the first segment in *alma* are identical.

(101) Underlying moraic representations: *esta alma*

a. Basic representation

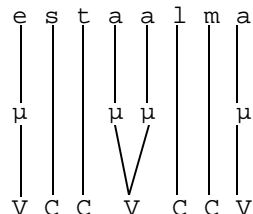


²² A corollary argument in McCarthy's (1986) discussion of the OCP is that languages generally prefer the simplest structure possible. For example, fused structures are generally favored over unfused structures. I cite McCarthy (1986: 255) below:

Grammars are highly valued to the extent that they use
 X X instead of X X
 α α

a l m a

b. Connected speech representation (with ISF)



In (101a), the words *esta* and *alma* have not yet been brought into contact. Note that each vowel is associated with a mora underlyingly. This is the way the words are represented in isolation, as with a pause in between.

In (101b), the tiers are conflated, bringing the final *-a* in *esta* and the initial *a-* in *alma* into contact. Because the identical vowel satisfies the structural description of ISF, this rule is automatically invoked to do away with redundant structure. The resulting structure is shown. Note that the underlying moras are retained, and the resulting vowel is long, i.e. bimoraic. In connected speech, there are only two options: a bimoraic vowel or a monomoraic vowel. In Largo speech, the tendency is to realize a V_1V_1 sequence in hiatus; in Andante, it is realized as a bimoraic tautosyllabic vowel, and in Allegretto it generally emerges as as a monomoraic vowel. These tendencies are additionally constrained by the presence of stress. The effect of stress on long vowels is the focus of the next subsection.

2.4.2 The Effect of stress on V_1V_1 sequences

The reduction of a bimoraic vowel to a monomoraic vowel will be referred to in this study as “shortening.” Navarro Tomás (1967: 152) describes shortening as an Allegretto speech process.

Tanto en el grupo fónico como en la palabra, dos o más vocales iguales, sucesivas, sin acento, se pronuncian corrientemente como si se tratase de una sola vocal inacentuada: *angulooscuro*, *implacable encono*, *acreedores*, *vehemencia*, *cooperar*, *preeminente*, *alcoholismo*, *zoología*.

He illustrates the generality of this Allegretto speech operation with various additional examples, provided in (102) below.

(102) V_1V_1 sequences across word boundaries (Navarro Tomás 1967: 152)

<i>única antorcha</i>	únic[a]ntorcha
<i>truéquese en</i>	truéques[e]n
<i>tiempo hollaba</i>	tiemp[o]llaba
<i>a adornar</i>	[a]dornar

In his definition, Navarro Tomás does not distinguish between structure fusion of unstressed vowels within words and within the “phonic group,” i.e. across word boundaries. In the present study, therefore, it is understood that vowel shortening is a postlexical process. As such, it applies to V_1V_1 sequences across the board.

Navarro Tomás (1967: 153) finds that the presence of word stress is generally an irrelevant factor in V_1V_1 shortening across word boundaries in Peninsular Spanish, i.e. it neither facilitates nor inhibits merger:

Aun cuando alguna de las vocales lleve acento fuerte, si el grupo resulta del enlace de palabras contiguas, dichas vocales se pronuncian también ordinariamente como si se tratase de una sola vocal inacentuada: *el aire entra silbando*, *la presa hace un ancho remanso*, *más ven cuatro ojos que dos*.

This general observation for Spanish is born out by specific Allegretto speech data from Chicano (see 103). In these data, all word stresses are shown for convenience, whether orthographic or not. The examples in (103) show that when a stressed V_1V_1 sequence shortens, word stress indicators merge as well.

(103) Merger of stressed V_1V_1 sequences in Chicano (Martínez-Gil, in press)

<i>aquí hizo frío</i>	aqu[í]zo frío
<i>tú úsas</i>	t[ú]sas
<i>será antes</i>	ser[á]ntes
<i>está alto</i>	est[á]lto

Navarro Tomás's suggestion that stress neither inhibits nor facilitates shortening across a word boundary does not hold word-internally. The presence of stress on one of the vowels in a word-internal V_1V_1 sequence *does* have an inhibitive effect on merger, and also tends to influence how the vowels are syllabified. To illustrate this effect, Navarro Tomás outlines a number of stress leveling processes which tend to inhibit V_1V_1 shortening word-internally. For example, finite forms in the paradigms of verbs with V_1V_1 sequences such as *leer* and *creer* tend to mimic the disyllabic pattern found in the infinitives [le.ér.], [kre.ér.]. According to Navarro Tomás (1967), Roca (1991), and others, stress inhibits syllable merger word-internally; the vowels are therefore commonly retained in separate syllables. One possible reason for the inhibition of shortening in such paradigms is that the stress contour itself hinders vowel merger. However, a stress contour does not *necessarily* hinder merger in other word categories, such as nouns (cf. *alcohol*, in which a stress contour does not hinder V_1V_1 shortening (e.g. /alkool/ → [al.ko.ól.], [al.kól.], [al.kól.])). Whatever the reason to block shortening, the pattern of hiatus modeled by the infinitives permeates the entire verb paradigm, extending even to finite forms in which stress falls away from the V_1V_1 sequence; for example, in the conditional *creerían* [kre.e.rí.an.] and *leerían*

[le.e.rí.an.]. Navarro Tomás argues that in such cases, hiatus is preferred to merger in order to regularize the syllable pattern of the entire paradigm. Additional examples follow in (104).²³

(104) Merger inhibited by paradigmatic stress leveling (Navarro Tomás 1967: §139; see also §141)

cr[e.é]r cr[e.é]ncia, cr[e.e]rían, acr[e.e]dóres

cr[i.á]r cr[i.a]dór, cr[i.a]túra

Navarro Tomás concedes that ease of shortening is also determined by the position of the word within the phrase. He cites *no es posible creerlo todo* as an example of a phrasal context in which the V_1V_1 in *creer* is more readily merged to give cr[e:]rlo (154). In this case, merger is facilitated because the phrasal stress shifts the focus away from the V_1V_1 sequence in *creer* to the phrase-final word *todo*. Both Navarro Tomás (1967) and Roca (1991) agree that when word stress and phrase stress coincide, shortening is generally prohibited. For example, the V_1V_1 sequence in *creer* *must* be realized in hiatus if it bears phrasal stress, as is the case in *no se puede creer*.²⁴

In other cases, particularly in words in which the V_1V_1 sequence is morpheme-internal, shortening occurs without restriction. For example, Penny (1986: 501) describes three stylistic variants for the word *alcool*. In Largo speech, he argues, *alcool* is customarily realized as three syllables: [al.ko.ól.], with stress on the final syllable.

Although the shortening of identical vowels word-internally is certainly relevant in a study of syllable merger, it is clearly subject to complex paradigmatic factors which are beyond the scope of this

²³ Navarro Tomás cites other examples of words in which shortening is impaired, including the adjective *mohoso* [mo.ó.so.] ‘rusty’ and the noun *loor* [lo.ór.] ‘praise.’ Although space prevents a lengthy discussion of the exceptionality of these and other forms, I offer that shortening is impaired in order to ensure the discrete phonetic realization of stem and suffix vowels. In the two afore-mentioned examples, the V_1V_1 sequence spans the boundary between a word stem and suffix: [[mo] oso], [[lo] or].

²⁴ Recall the discussion of *este hombre* and *tabú ético* in section 2.2.1. Incidentally, Hualde (1994: 638) cites [kre.ré.], with a short vowel, as a Allegretto speech form of *creeré* ‘I will believe,’ and [kre.e.ré.] as the corresponding Largo speech form (see also Hualde’s footnote 8). It is unclear whether Hualde agrees with Navarro Tomás’s observation regarding the influence of phrasal stress on merger, i.e. whether or not the form [kre.ré.] may bear phrasal stress.

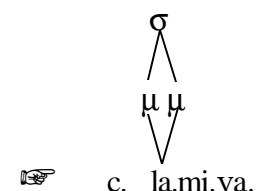
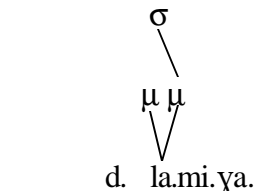
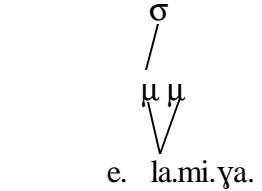
study. For this reason, the OT account will focus exclusively on identical vowels spanning word boundaries.

2.4.3 An OT account

If the ranking $OCP \gg MAX-\mu$, $ONSET$ is maintained categorically for Spanish, then Identical Structure Fusion (ISF, recall 100) is the only means of resolving V_1V_1 sequences. In Largo speech, the style characterized by the ranking $MAX-\mu \gg ONSET$, V_1V_1 sequences are realized in hiatus. Because ISF does not incur violation of $MAX-\mu$, both shortened and unshortened candidates satisfy $MAX-\mu$. Tableau (105) shows that this ranking falsely predicts shortened candidate (105c) $[a:]miga$ for Largo, when candidate (105c) $[a.a.]miga$ is the desired output.

(105) Largo: *la amiga*

	OCP	MAX- μ	ONSET
$\begin{array}{c} \mu \quad \mu \\ | \quad | \\ /la \# amiga/ \end{array}$			
$\begin{array}{c} \sigma \sigma \\ | \quad | \\ \mu \mu \\ | \quad | \\ \text{☹ a. la.a.mi.ɣa.} \end{array}$			*!
$\begin{array}{c} \sigma \\ / \quad \backslash \\ \mu \mu \\ | \quad | \\ \text{b. la a.mi.ɣa.} \end{array}$	*!		

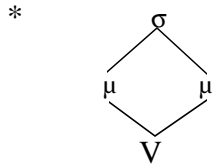
 <p>c. la.mi.ɣa.</p>			
 <p>d. la.mi.ɣa.</p>		*!	
 <p>e. la.mi.ɣa.</p>		*!	

In order to constrain V_1V_1 merger in Largo speech, we must invoke a constraint to ban its associated configurations, at least in this style. The undesirable configuration appears to be either a bimoraic vowel or a bimoraic syllable.

Rosenthal (1997), Hammond (1997a) and Borowsky & Harvey (1997) implement constraints banning long vowels. Hammond calls the constraint $*\mu\mu/V$, and uses it to capture fine distinctions between stress and tense vowels in English (9). In a discussion of Warray (a language of northern Australia, spoken near Darwin), Borowsky & Harvey constrain long vowels by a constraint called simply $*VV$ (165). In Warray, $*VV$ may be violated in order to satisfy the higher-ranked constraint $MINWD$, which requires that all words are minimally bimoraic. The ranking $MINWD \gg *VV$ expresses the generalization that long vowels are allowed in Warray only to satisfy minimum word length. The negative structure targeted by these constraints is any V linked to more than one μ .

To achieve the same type of result, Rosenthal (1997: 20) formulates his constraint NLV (“No long vowels”) to specifically ban bimoraic vowels contained in a single syllable. His version of the rule will be adopted here, and will be called NOLONG (see 106).

(106) NOLONG “No long vowels.” (cf. Rosenthal 1997: 20)

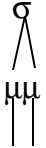

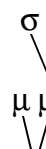



Because the configuration in (106) is not banned *categorically* in Spanish, it is maintained that NOLONG is an FC. If NOLONG is ranked above MAX-μ, then long vowels must either be realized in separate syllables (in hiatus), or shortened. If it is ranked below MAX-μ, then shortening is blocked. These relations account for all the stylistic outputs.

The Largo speech tableau for *la amiga* is shown in (107). In this tableau, NOLONG dominates both MAX-μ and ONSET, and the optimal candidate is (107a): l[a.a.]miga.

(107) Largo: *la amiga* (revised)

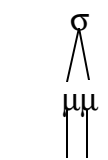

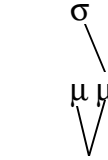
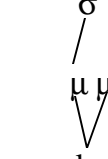
 /la # amiga/	OCP	NOLONG	MAX-μ	ONSET
 a. la.a.mi.ya.				*

 b. la a.mi.ya.	*!			
 c. la.mi.ya.		*!		
 d. la.mi.ya.			*!	
 e. la.mi.ya.			*!	

In casual speech styles, the dominance relation of ONSET and MAX- μ is reversed: ONSET \gg MAX- μ . The ranking of other constraints, such as HIGLIDE and IDENT [high] relative to these is not relevant, because in the case of V_1V_1 sequences, neither constraint need be violated in order to satisfy ONSET; indeed, violation of either would be gratuitous and incur negative marks in evaluation. In addition, NOLONG may rank in any position relative to MAX- μ and ONSET. The ranking ONSET \gg MAX- μ \gg NOLONG forces a bimoraic syllable in order to satisfy both ONSET and MAX- μ . This is the ranking relation required for Andante (see 108).


(108) Andante: *la amiga*

$\begin{array}{cc} \mu & \mu \\ | & | \\ /la \# amiga/ \end{array}$	OCP	ONSET	MAX- μ	NOLONG
$\begin{array}{cc} \sigma & \sigma \\ | & | \\ \mu & \mu \\ | & | \\ \text{a. } la.a.mi.ya. \end{array}$		*!		

 <p>b. la a.mi.ya.</p>	*!			
 <p>c. la.mi.ya.</p>				*
 <p>d. la.mi.ya.</p>			*!	
 <p>e. la.mi.ya.</p>			*!	

In Allegretto, underparsing of a mora can only be achieved if NOLONG and ONSET both dominate MAX- μ . The ranking NOLONG » ONSET » MAX- μ indicates that it is preferable to leave a mora unparsed rather than have vowel hiatus or a bimoraic syllable (see 109). Note that in (109), candidates (109d) and (109e) both delete exactly one mora, and are therefore both optimal. There is, however, no phonetic difference between (109d) and (109e); both are realized with a short vowel: [a]miga.

(109) Allegretto: *la amiga*

 <p>/la # amiga/</p>	OCP	ONSET	NOLONG	MAX- μ
---	-----	-------	--------	------------

$\begin{array}{c} \sigma\sigma \\ | \quad | \\ \mu\mu \\ | \quad | \\ \text{a. la.a.mi.}\gamma\text{a.} \end{array}$				
$\begin{array}{c} \sigma \\ / \quad \backslash \\ \mu\mu \\ | \quad | \\ \text{b. la a.mi.}\gamma\text{a.} \end{array}$	*!			
$\begin{array}{c} \sigma \\ / \quad \backslash \\ \mu \quad \mu \\ \backslash \quad / \\ \text{c. la.mi.}\gamma\text{a.} \end{array}$			*!	
$\begin{array}{c} \sigma \\ \backslash \\ \mu \quad \mu \\ \backslash \quad / \\ \text{d. la.mi.}\gamma\text{a.} \end{array}$				*
$\begin{array}{c} \sigma \\ / \\ \mu \quad \mu \\ \backslash \quad / \\ \text{e. la.mi.}\gamma\text{a.} \end{array}$				*

Constraint rankings for the three speech styles are summarized in (110). Because ONSET and NOLONG are both FCs, the total number of possible rankings of ONSET, NOLONG, and MAX- μ is 3-factorial (3!), or 6. However, these six rankings select only three distinct optimal candidates. For this reason, only one representative ranking is given for each style. ONSET and NOLONG are FCs, and belong to the MARK family of constraints. MAX- μ is a FAITH constraint.

(110) Putative rankings by style

a. Largo

NOLONG » MAX- μ » ONSET

Enforces vowel hiatus of V_1V_1 sequences.

b. Andante

ONSET » MAX- μ » NOLONG

Enforces tautosyllabicity of V_1V_1 sequences (with moraic faithfulness).

c. Allegretto

ONSET » NOLONG » MAX- μ

Enforces underparsing of one mora in V_1V_1 sequences.

2.5 Vowel super-sequences

As we have seen so far in this chapter, a VV sequence is typically subsumed under a single syllable head in Andante and Allegretto Spanish regardless of the identity or non-identity of its members. In sequences of different vowels, one of the vowels - generally the less sonorous one - is made nonnuclear, i.e. an onglide or offglide. There is another category of vowel sequences which adhere to the same principles. These are sequences of three, four, or even five vowels, spanning two or more words, which I will refer to here as “super sequences.” Some examples follow in (111).

(111) Vowel super-sequences (Navarro Tomás 1967: 71)

<i>aaa</i>	llega a adorar
<i>iea</i>	nadie acude
<i>aeu</i>	culta Europa
<i>ioaeu</i>	envidio a Eusebio

In this section, it will be shown that super-sequences such as those in (111) are readily accounted for by the present model, without special accommodation.

2.5.1 Sonority conditions on super-sequences

In his discussion of merger, Navarro Tomás (1967: 73) explains that a sequence of “several” (*varias*) vowels may be realized in a single syllable if certain conditions are met:

Cuando se reúnen varias vocales en una misma sílaba, todas ellas, con excepción de la más abierta de cada grupo, que es la que constituye el centro del núcleo silábico, se pronuncian con un rápido movimiento articulatorio, el cual tiende hacia la abertura o la estrechez, según se trate de la parte creciente o decreciente de dicho núcleo.

The “most open” vowel (*la más abierta*) is, of course, the most sonorous, as sonority correlates with vowel openness. In any vowel super-sequence, sonority peaks correspond to syllable peaks. Non-peak vowels are made nonnuclear. Vowels preceding the peak become onglides, and those following the peak become offglides.

All the vowel sequences in (111) above have in common the fact that they contain rising sonority approaching the syllable peak, and falling sonority following it. There are therefore four possible super-sequence syllable types, each characterized by a different type of sonority contour. They are: a) sonority plateau; b) rising sonority; c) falling sonority; and d) rising and falling sonority (see 112). Sonority contours are shown by lines; the peak on each line is indicated by a circle.

(112) Sonority contours in vowel super-sequences

a. plateau



a a a

llega a adorar

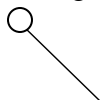
b. rising



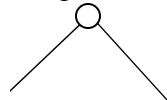
i e a

nadie acude

c. falling



d. rising and falling



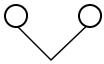
a e u
culta Europa

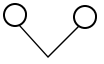
i o a e u
envidio a Eusebio


These diagrams illustrate the fact that any super-sequence, regardless of segmental length, which models one of the above sonority contour types also respects sonority sequencing and is therefore a viable syllable.


Navarro Tomás gives numerous counterexamples of super-sequences which *may not be merged* into a single syllable because they violate sonority sequencing. In each case, the sequence contains more than one sonority peak. Because each sonority peak must necessarily be the nucleus of a single syllable, total merger of such sequences is impossible. Merger of any of the sequences in (113) disobeys sonority sequencing, and is therefore illicit in any speech style.


(113) Vowel super-sequences: instances of blocked merger


a o a
esta o aquella


e u o
siete u ocho


a i u e
casa y huerta


o a i a
no hay ánimo


u a i a i
agua y aire

Each vowel sequence in (113) contains more than one sonority peak (each peak is circled). In accordance with sonority sequencing, each peak vowel must also be a syllable peak. Although merger in the above syllables is disallowed, it is still possible for non-peak vowels to be affiliated with one of the

peaks, provided that they obey the standard sonority sequencing procedure. In no case, however, is it possible to have fewer syllables than sonority peaks, in *any* speech style.

2.5.2 An OT account

Four sample mergers of vowel super-sequences from Peninsular Andante style are examined in this section. The sequence [iea] in *nadie acude* (114) contains an example of rising sonority across a sequence of three vowels. The sequence [aeu] in *culta Europa* (123) displays falling sonority, also across a sequence of three vowels. The sequence [ioi] in *ocioinútil* (124) displays rising and falling sonority. The [aia] sequence in *sangrienta y ancha* (125), however, contains two sonority peaks which may not be resolved into a single syllable.²⁵

²⁵ Due to a lack of hard data, the sonority plateau configuration will not be examined

(114) Peninsular Andante: nadie acude (rising sonority)

$\mu \mu \mu$ /...d i e # a .../	HNUC	ONSET	MAX- μ	MAX-WI- μ
$\sigma \sigma \sigma$ $\mu \mu$ μ a. d i e a.		*!*		
$\sigma \sigma$ $\mu \mu \mu$ b. d i e a.	*!	*	*	*
$\sigma \sigma$ $\mu \mu \mu$ c. d i e a.	*!	*	*	
$\sigma \sigma$ $\mu \mu \mu$ d. d j e a.		*!	*	
σ $\mu \mu$ μ e. d j e a.	*!		**	*
σ $\mu \mu \mu$ f. d j e a.			**	

In tableau (114), ONSET is ranked above MAX- μ , thereby minimizing the number of syllables to the extent permitted by HNUC. Crucially, the optimal candidate must satisfy both HNUC and ONSET. HNUC examines each of the proposed syllables to ensure that syllable peaks coincide with sonority peaks. ONSET militates against vowel hiatus. Because of the tight interaction between HNUC and ONSET, the only possible output for input string /diea/ with merger is (114f): [dʒea]. Note that sonority rises steadily across the syllable, with [a] being both the sonority peak and the syllable peak. All other candidates violate either HNUC for containing syllable peaks which do not coincide with sonority peaks, or ONSET for containing onsetless syllables, or both. Candidate (114f) violates MAX- μ twice - once for each onglide it contains - yet it satisfies both HNUC and ONSET and is therefore optimal.

The same ranking accurately predicts merger of a syllable with falling sonority, as illustrated in table (115) below.

(115) Peninsular Andante: culta Europa (falling sonority)

$\begin{array}{c} \mu \quad \mu \quad \mu \\ | \quad | \quad | \\ / \dots t \ a \ \# \ e \ u \dots / \end{array}$	HNUC	ONSET	MAX- μ	MAX-WI- μ
$\begin{array}{c} \sigma \quad \sigma \\ | \quad | \quad | \\ \mu \quad \mu \quad \mu \\ \text{a. } t \ a \ e \ u. \end{array}$		*!*		
$\begin{array}{c} \sigma \\ \curvearrowright \quad | \quad | \\ \mu \quad \mu \quad \mu \\ \text{b. } t \ \underset{\sim}{a} \ e \ u. \end{array}$	*!	*	*	
$\begin{array}{c} \sigma \\ \curvearrowright \quad | \quad | \\ \mu \quad \mu \quad \mu \\ \text{c. } t \ a \ \underset{\sim}{e} \ u. \end{array}$		*!	*	
$\begin{array}{c} \sigma \quad \sigma \\ \curvearrowright \quad \quad \\ \mu \quad \mu \quad \mu \\ \text{d. } t \ a \ e \ w. \end{array}$		*!	*	
$\begin{array}{c} \sigma \\ \curvearrowright \quad \quad \\ \mu \quad \mu \quad \mu \\ \text{e. } t \ \underset{\sim}{a} \ e \ w. \end{array}$	*!		**	
$\begin{array}{c} \sigma \\ \curvearrowright \quad \quad \\ \mu \quad \mu \quad \mu \end{array}$			**	*

f. t a e̞ w.				
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Again, HNUC and ONSET are decisive in evaluation. Only the candidate which maximally satisfies both these constraints is optimal; the winning candidate is (115f). Observe that the optimal syllable [ta̞uw] contains two offglides; each one violates MAX-μ. The second glide additionally violates MAX-WI-μ because it is word-initial. Because HNUC and ONSET are satisfied by candidate (115f), such violation is minimal, and the highly marked offglide structure is allowed to surface optimally.

(116) Peninsular Andante: ocio inútil (rising and falling sonority)

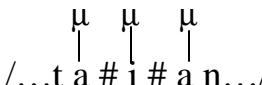
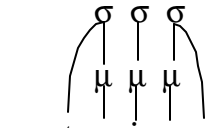
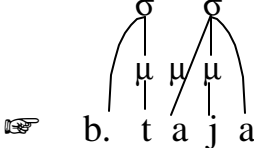
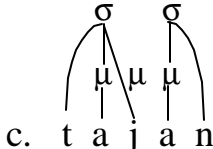
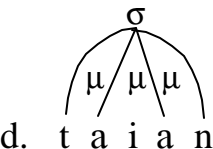
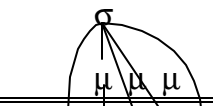
$\begin{array}{c} \mu \mu \mu \\ \downarrow \downarrow \downarrow \\ /...s i o \# i.../ \end{array}$	HNUC	ONSET	MAX-μ	MAX-WI-μ
$\begin{array}{c} \sigma \quad \sigma \quad \sigma \\ \swarrow \quad \downarrow \quad \downarrow \\ \mu \quad \mu \quad \mu \\ \downarrow \quad \downarrow \quad \downarrow \\ a. \quad s \quad i \quad o \quad i. \end{array}$		*!*		
$\begin{array}{c} \sigma \quad \sigma \\ \swarrow \quad \downarrow \quad \downarrow \\ \mu \quad \mu \quad \mu \\ \downarrow \quad \downarrow \quad \downarrow \\ b. \quad s \quad i \quad o \quad j. \end{array}$		*!	*	*
$\begin{array}{c} \sigma \quad \sigma \\ \swarrow \quad \downarrow \quad \downarrow \\ \mu \quad \mu \quad \mu \\ \downarrow \quad \downarrow \quad \downarrow \\ c. \quad s \quad j \quad o \quad i. \end{array}$		*!	*	
$\begin{array}{c} \sigma \quad \sigma \\ \swarrow \quad \downarrow \quad \downarrow \\ \mu \quad \mu \quad \mu \\ \downarrow \quad \downarrow \quad \downarrow \\ d. \quad s \quad i \quad o \quad i. \end{array}$	*!		*	

	*!		**	*
			**	*

A vowel sequence with steadily rising and falling sonority, such as the /ioi/ in *ocio inútil* (116), may be realized in a single syllable because it has only one sonority peak. The optimal syllable nucleus is realized phonetically: oc[joj]nútil, in which the syllable peak [o] is flanked on both sides by a high glide [j].

As Navarro Tomás indicates, some super-sequences cannot be merged into a single syllable because they contain more than one sonority peak. Evaluation of the trivocalic sequence /aia/ in *sangrienta y ancha* (117) shows that merged vowel sequences with fewer syllables than sonority peaks are systematically suppressed.

(117) Andante: sangrienta y ancha (two sonority peaks)

 /...t a # i # a n.../	HNUC	ONSET	MAX- μ	MAX-WI- μ
 a. t a i a n		*!*		
 b. t a j a n			*	*
 c. t a j a n		*!	*	*
 d. t a i a n	*!*		**	*
 t a i a n	*!		**	**

e. t a j ã n				
f. t ã j a n	*!		**	*

Because /a/ is the most sonorous segment and has no licit nonnuclear equivalent (i.e., *[ã]), every underlying /a/ must be parsed by a separate syllable. Any attempt to shove /a/ into a marginal position (cf. candidates 117c-e) fatally violates H̄NUC. Of those candidates which satisfy H̄NUC by assigning each /a/ to its own syllable, only one does so without also violating ONSET; this is the optimal candidate: (117b) sangrient[a.ja]ncha.

2.6 Summary

In this chapter I examined the variability of syllable merger in a variety of syllable types. Following a brief review of syllable merger, sonority sequencing, and glide formation conventions, an OT account for syllable merger was presented. It was proposed that the facts of variation in syllable merger for American dialects may be expediently explained if two MARKEDNESS constraints - ONSET and HIGLIDE - are left partially ranked over a specified range of the constraint hierarchy; i.e. if they are defined as FCs. In Peninsular dialects, HIGLIDE is fully ranked, and only ONSET is an FC.

Next, the effect of word stress on merger was explained in Peninsular, standard Mexican, and Chicano Spanish using the constraint pair STRESS and MAX-S(TRESS). In Peninsular Spanish, stressed syllable merger occurs freely in most dialects, as long as it conforms to the requirements of sonority

sequencing (monitored by HNUC). Often the result of merger is a stress shift, in which stress moves to the most sonorous vowel in the merged syllable (e.g. *men[wá]ntiguo*). Stress shift forces stress misalignment, and therefore violates either MAX-S or STRESS. Because these constraints are ranked below ONSET and MAX- μ in Peninsular Spanish, stressed syllable merger is permitted.

In standard Mexican Spanish (and indeed in many Latin American dialects), stress shift is prohibited (e.g. *v[í]lotes*, not **v[jé]lotes*). These data indicate that the constraints STRESS and MAX-S dominate ONSET in this dialect, because syllable merger may not result in the relocation of word stress. Because offglides occur only if the first vowel is stressed, STRESS and MAX-S must dominate MAX-WI- μ , which in turn dominates HNUC.

In Chicano Spanish, stress shift is permitted, but vowel deletion at word boundaries is preferred to offglide formation regardless of whether stress is present. In such contexts, the deleted vowel is invariably the first in the sequence. This pattern follows a universal constraint which preserves the nuclearity of word-initial vowels: MAX-WI- μ . In Chicano, offglide formation is banned by the ranking MAX-WI- μ » MAX-IO. In Peninsular and Mexican Spanish, offglide formation is permitted at word boundaries (provided that it does not violate higher ranked HNUC in Peninsular and MAX-S/STRESS in Mexican), because this ranking is reversed. Feature identity in vocoid sequences is avoided by the constraint OCP, which is undominated in all three dialects.

The final section contained an analysis of identical vowels in sequence and the stylistic options for their realization. Merger of identical vowels was explained using the constraints ONSET and MAX- μ , and also NOLONG. NOLONG was applied to ban syllables containing more than one mora. As with distinct vowel sequences, Largo speech is characterized by vowel hiatus. In Andante and Allegretto speech, long vowels are represented tautosyllabically. In Allegretto speech, NOLONG forces one of the moras to be unparsed, resulting in a short (monomoraic) vowel.

Finally, sequences of three or more vowels were examined. It was shown that these “super-sequences,” regardless of length, may be accounted for in the present FC model without special accommodation. Outputs were shown to be constrained primarily by the constraints HNUC and ONSET.

The present approach also enables a unified description of the possible realizations of identical and different vowels in connected speech, all the while accounting for the influence of stress and dialect-specific preferences for certain types of processes related to syllable merger, such as glide formation and segment deletion.

CHAPTER 3

CONSONANT ASSIMILATION, NEUTRALIZATION, AND ASPIRATION

Spanish phonology is characterized by a broad range of stylistic effects which affect consonants and consonant clusters. For example, in connected speech, a nasal consonant generally assimilates in place to a following obstruent; e.g. *con piedras* → co[m]piedras, *con llaves* → co[ɲ]llaves, *con ganas* → co[ɲ]ganas (cf. Navarro Tomás 1967; Harris 1969; Hooper 1972; Goldsmith 1979; Hualde 1989a; and others). The same is true of laterals, e.g. *fie[l] novia*, *fie[l] zorro*, *fie[ʎ] yegua* (Hualde 1989a: 22). Likewise, unvoiced fricatives partially voice before a voiced consonant; e.g. *mismo* → mi[sʰ]mo, *rasgo* → ra[sʰ]go. These three types of assimilation - nasal place, lateral place, and voicing - are typical of casual speech styles, and are fairly standard across all Spanish dialects.

At least one variety of Cuban Spanish is characterized by the velarization of morpheme-final nasals. This process allows only one nasal allophone morpheme-finally: [ŋ]. Although nasal place assimilation holds in this dialect morpheme-internally, place assimilation is typically suppressed - at least partially - in favor of velarization between a verb stem and derivational suffix. In Largo speech one hears *redi[m]ir*, but *rede[ɲ]ción*, *rede[ɲ]tor* (Guitart 1976: 75). Compare this /m~ɲ/ alternation to the expected alternation in a so-called “nonvelarizing” dialect, such as Castilian, in which place assimilation occurs as expected: *redi[m]ir* ~ *rede[ɲ]ción* ~ *rede[ɲ]tor*.

Another stylistic process which is common in many areas of the Spanish-speaking world is aspiration. In general, aspiration can be heard with a high degree of frequency in coastal areas, predominantly those in and adjacent to the Caribbean, as well as the Pacific coast of South America, and also Argentina, Uruguay, and southern Spain (cf. Canfield 1981; Lipski 1994). Aspiration generally targets syllable-final /s/, and where it exists, /θ/, converting them to [h]. In most dialects which favor it, aspiration may occur within a word, at a word boundary, and at the end of an utterance; e.g. e[h]ta[h] cosa[h] (<*estas cosas*, Guitart 1976: 21). Like place and voice assimilation, aspiration is a variable process sensitive to notions of style.

Continuancy assimilation and coda obstruent devoicing are two stylistic processes which interact in connected speech. Hualde (1989a: 35) indicates that a voiced coda obstruent may have any of four phonetic realizations, depending on style. The word *digno*, with its underlying voiced obstruent, may be realized any of the following ways: 1) [-cont, +voice] di[g]no; 2) [-cont, -voice] di[k]no; 3) [+cont, +voice] di[ɣ]no; 4) [+cont, -voice] di[x]no. In these examples, coda obstruent devoicing also competes with voicing assimilation; cf. Hualde's example *adquirir*, in which the underlying /d/ may be realized as partially voice-assimilated [ð⁰], or as fully devoiced [θ].

In this chapter, each of the above-mentioned processes is reviewed in turn, and an OT analysis is presented.

3.1 Place assimilation

Spanish features two types of place assimilation: nasal and lateral. In both types, the place node, which dominates the place features, is spread (assimilated) from a following consonant. Assimilation may occur within a word, across a word boundary, or across a morpheme boundary. Within morphemes, assimilation is generally compulsory. Thus the nasal segment in *banco* and the lateral segment in *sueldo*, both morpheme-internal, are totally place-assimilated regardless of speech style (cf. Navarro Tomás 1967: 112; Harris 1969: 11).

Across morpheme boundaries, however, place assimilation is variable, and is indeed more likely to occur within a word than across a word boundary. In addition, assimilation processes across morpheme boundaries are more common in Allegretto speech than in Largo speech. Some examples of place assimilation across a word boundary follow in (118).

(118) Place assimilation (Allegretto speech)¹

a.	<u>nasals</u> (Hualde 1989a: 17)	b.	<u>laterals</u> (Hualde 1989a: 22)
	co[n] amigos		fiel] burro
	co[m] piedras		fiel] foca
	co[m̩] fuerza		fiel̩] zorro
	co[n̩] cera		fiel̩] toro
	co[n̩] dientes		fiel] novia
	co[n] latas		fiel̩] yegua
	co[n] llaves		fiel] gorila
	co[n̩] ganas		

These data show that nasals and laterals can form homorganic clusters with a following consonant across a word boundary, in Allegretto speech. Although essentially similar processes, nasal and lateral place assimilation are subject to different restrictions. First, nasals may place assimilate absolutely; that is, *any* nasal may place-assimilate to *any* following consonant, regardless of the place of articulation of either segment. The result: there are as many nasal allophones as there are points of articulation in the oral cavity. Laterals, on the other hand, place-assimilate only within the coronal place node (i.e. only if the following consonant is coronal); before any other type of consonant, such as a dorsal or labial, /l/ is realized as [l̩].

¹ Spanish has the three nasal phonemes /n, m, ŋ/, which share five allophones, one for each major point of oral articulation: bilabial [m], labiodental [m̩], dental [n̩], palatal [ɲ], and dorsal [ŋ]. The two lateral phonemes are /l/ and /ɮ/. As a phoneme, /ɮ/ occurs in very few dialects, mostly in the highland regions of Perú and Bolivia. Both /l/ and /ɮ/ are coronal, and /ɮ/ is additionally [-anterior]. Syllable-finally, /ɮ/ is realized as [l̩]. The phoneme /l/ has two syllable-final allophones, all coronal: dental [l̩] and palatal [ɲ̩]. See also Penny (1986: 493-494).

One might argue that the difference between the distribution of nasal and lateral allophones is determined by physiological constraints imposed by the manner of articulation of the consonant in question. For example, nasals have in common only one feature: air flow through the nasal cavity. Nasal air flow may be combined with any oral occlusion. Therefore a nasal may be articulated at any point in the oral cavity without ceasing to be a nasal.

For laterals, the matter is quite different. In Spanish, as indeed in most languages, laterals are by definition coronal. A speaker would be hard-pressed to articulate a lateral with any other articulator in the oral cavity except the tongue tip. How, for example, could one articulate a “lateral bilabial,” given that the orbicularis oris muscle is virtually incapable of producing a lateral constriction? It seems sensible that noncoronal lateral allophones are excluded from the list on the grounds that they are physiologically impractical. In such cases, the coronal [+anterior] allophone [l] is selected instead.

Although bilabial laterals may be unattested in the world’s languages, the velar lateral [L] is not.² Why does Spanish not recognize [L] as a valid allophone in such lateral-consonant combinations as *fiel gorila*, which would yield fie[L] gorila? Instead, assimilation of the dorsal place node is suppressed in favor of the heterorganic sequence [-lg-]. The same is true for bilabial and labiodental places of articulation (see 119).

(119) No lateral place assimilation before velars or labials (Hualde 1989b: 181)

el puerto e[l] puerto

el foco e[l] foco

el gorila e[l] gorila

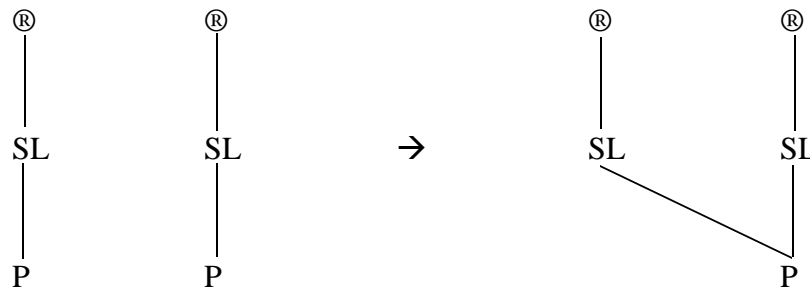
² According to Ladefoged (1993), the velar lateral - represented phonetically as [L] - is found in some languages of Papua New Guinea. English, Catalán, Portuguese, and other languages have a “dark” or “velarized” [ɫ], but this sound is an approximant; i.e. there is no lateral occlusion.

In this section, nasal and lateral assimilation are presented as two varieties of a single process of place assimilation. The OT analysis will demonstrate that the failure of /l/ to assimilate in place before noncoronal consonants is the result of competing IDENT constraints which, arranged hierarchically, must be violated minimally.

3.1.1 Feature spreading

In simplest terms, place assimilation is place node sharing. Two adjacent segments which are place-assimilated are homorganic because they share the place features of one or the other segment. This relationship is most expediently expressed autosegmentally (120).

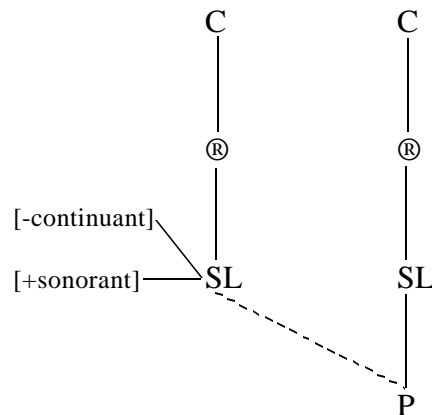
(120) Place assimilation (cf. Goldsmith 1979: 5; Hualde 1989a: 19)



Rule (120) shows two adjacent segments, each with its own root node \textcircled{R} , supralaryngeal node SL, and place node P. The first segment assimilates the place node of the second segment (shown by the dotted line) and concomitantly delinks its original place node. The result is two segments which share a single place node. The segments are “place-assimilated” or “homorganic.”

In order for place assimilation to be accurately described for Spanish, information must be added to the structural description of the rule. Hualde (1989a: 23) accounts for nasal and lateral place assimilation by means of a single unified rule, shown in slightly modified form in (121).

(121) Place assimilation of nasals and laterals (cf. Hualde 1989a: 23; cf. also Hualde 1989b: 181)³



Hualde's rule notation treats nasal and lateral segments as the natural class of noncontinuant sonorants. The structural description of the rule excludes the sonorants /r/ and /r̄/ (as well as the vowels) because all of these are characterized by air flow which is both oral *and* central, thereby making them [+continuant].

As stated, the rule is insufficient to adequately constrain the possible allophones of /l/. Recall that all allophones of /l/ must be coronal; this rule falsely predicts that noncoronal laterals are possible. In such cases where a labial or velar lateral allophone might result, the alveolar allophone is mandated: [l]. Coronality of laterals must be ensured by separate well-formedness rule.

In his discussion of lateral assimilation, Harris (1969) accounts for the restriction on lateral place by limiting the conditioning environment for lateral assimilation to coronal obstruents

³ Hualde's version of the rule uses 'X' rather than 'C' notation, and therefore must specify that the first segment occupies a syllable rhyme (coda). Because any CC sequence in which the first member is [-continuant, +sonorant] may only be syllabified C.C, the reference to position within the syllable is unnecessary.

only. He uses α - β notation, as is the norm in the linear model for referring to assimilation processes (see 122).

(122) Lateral assimilation (Harris 1969: 19)

$$/l/ \quad \rightarrow \quad \left[\begin{array}{l} \alpha \text{ anterior} \\ \beta \text{ distributed} \end{array} \right] / \text{---} \left[\begin{array}{l} +\text{obstruent} \\ +\text{coronal} \\ \alpha \text{ anterior} \\ \beta \text{ distributed} \end{array} \right]$$

Harris' rule enforces homorganicity of /l/ to a following obstruent, but *only* if the obstruent is coronal. If /l/ precedes a labial or velar, then the rule fails and homorganicity does not obtain.

In more recent approaches (cf. Harris 1989b and Cressey 1978), certain place-manner feature combinations are deemed illicit and are filtered out, as it were, in favor of the [+coronal, +anterior] allophone [l].⁴ Hualde (1989b) envisions a pair of segment well-formedness constraints which forbid the manner feature [+lateral] from being simultaneously linked to either the [+labial] or [+dorsal] place node (see 123).

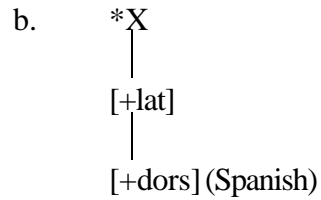
(123) Well-formedness conditions on lateral place (Hualde 1989b: 181-182)

a.

$$\begin{array}{c} *X \\ | \\ [+lat] \\ | \\ [+lab] \end{array} \quad (\text{universal})$$

⁴ Hualde (1989a: 23) specifies the restriction on lateral place as follows:
 “Todo segmento con el rasgo [+lateral] ha de ser [coronal].”

“[+labial] cannot be connected to a segment X if X is connected to [+lateral].”



“[+dorsal] cannot be connected to a segment X if X is connected to [+lateral].”

Cressey (1978: 119) expresses the restrictions on lateral place using two positive redundancy rules (124).

(124) Lateral place: redundancy rules (Cressey 1978: 119)

- a. [+lat] → [-back] “No velar laterals.”
 b. [+lat] → [+cor] / $\left[\begin{array}{c} \text{---} \\ +ant \end{array} \right]$ “No labial laterals.”

Morpheme-internally, place assimilation is accompanied by delinking of the nasal or lateral segment’s original place node and is therefore total in nature. Following Harris, it is maintained that the assimilatory operation defined in (121) is compulsory only within morphemes, thus *ganga* → ga[ŋ]ga and *triunfo* → triu[m]fo regardless of speech style.⁵ Between morphemes, and also across word boundaries, assimilation is variable. Two place nodes linked to a single segment are realized as a *partial* assimilation. This argument, made by Harris (1969: 9), is based on observations made by Navarro Tomás (1967: 89) for Peninsular Spanish:

⁵ Harris (1969: 11) states: “...there is complete neutralization of nasals before obstruents; that is, only homorganic clusters of nasal plus obstruent occur [morpheme-internally].”

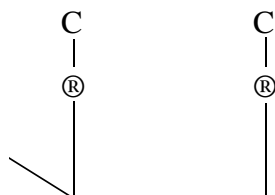
En contacto con las consonantes *p*, *b*, la *n* final de una palabra anterior se pronuncia corrientemente *m*, sin que este sonido pueda advertirse diferencia alguna entre expresiones como, por ejemplo, *con padre* y *compadre*, pronunciadas ambas [kompáðre], o entre *con placer* y *complacer*, pronunciadas [komplaθér]. La *n* final mantiene, sin embargo, su propia articulación, ... cuando por lentitud o vacilación en el lenguaje aparece desligada de la consonante siguiente. Suelen darse asimismo, según la rapidez con que se hable, formas intermedias de asimilación en que la *n*, sin perder enteramente su articulación alveolar, resulta en parte cubierta por la oclusión de los labios. En la conversación ordinaria, la transformación de la *n* en *m* ante las oclusivas bilabiales *p*, *b*, se produce de una manera regular y constante.

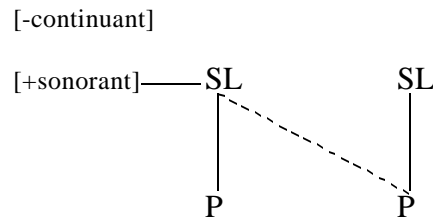
Harris interprets Navarro Tomás's assertions as follows: "lentitud o vacilación" corresponds to Largo (careful) speech, in which assimilation across morpheme or word boundaries does not occur. "Conversación ordinaria" corresponds to Allegretto (casual) speech, in which place assimilation is generally total, as within words. The "formas intermedias de asimilación" represent an intermediate style, Andante, in which partial assimilations are permitted, as at morpheme (or word) boundaries. A partial assimilation is characterized by place node spreading *without* concomitant delinking of the original place node. In other words, a partially assimilated segment has two place nodes: its own, and *also* the one spread to it by the following segment.

An explanation of place assimilation in Spanish must account for several different facts. Intramorphemically, place assimilation of nasals and laterals must be accompanied by delinking. Intermorphemically, delinking applies in Allegretto but not in Andante. These two rules are represented autosegmentally in (125).

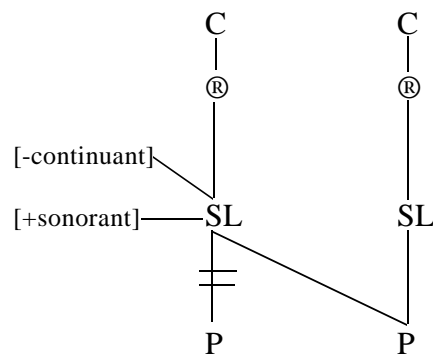
(125) Place assimilation and Delinking (cf. Hualde 1989a, 1989b)

a. Place assimilation (compulsory intramorphemically, variable intermorphemically)





b. Delinking (compulsory intramorphemically, variable intermorphemically)



In sequence, these rules account for the stylistic variation observed by Navarro Tomás, Harris, Hualde, and others. In Andante, rule (125a) place-assimilates a nasal or lateral to a following consonant, and (125b) does not apply. In Allegretto style, or intramorphemically regardless of style, rule (125a) applies *followed by* rule (125b).

Place assimilation data illustrating the possible assimilation types (as well as nonassimilation) are categorized by type (intramorphemic, intermorphemic) and style (Largo, Andante, Allegretto) in (126) and (127). Nasal assimilation data are shown in (126). Lateral assimilation data are found in (127).

(126) Stylistic variation in nasal place assimilation (Harris 1969; Hualde 1989a: 17)⁶

⁶ The superscript ties indicate that some degree of gestural overlap is present. The phonetic analysis of overlapped segments follows from Sagey (1986: 28): “It is only branchings to specifications on a single tier that are phonologically ordered.” Because distinct place nodes represent distinct tiers, the phonetic realization of a root node linked to two place nodes must be a gestural overlap.

	<u>Largo</u>	<u>Andante</u>	<u>Allegretto</u>
<i>triunfo</i>	.....	triu[m̩]fo	
<i>cuando</i>	.....	cua[n̩]do	
<i>canso</i>	.....	ca[n]so	
<i>rancho</i>	.....	ra[n̩]cho	
<i>ganga</i>	.....	ga[n̩]ga	
<i>con piedras</i>	co[n] piedras	co[n̩m̩] piedras	co[m] piedras
<i>con fuerza</i>	co[n] fuerza	co[n̩m̩] fuerza	co[m̩] fuerza
<i>con cera</i>	co[n] cera	co[n̩] cera	
<i>con dientes</i>	co[n] dientes	co[n̩] dientes	
<i>con latas</i>	.....	co[n] latas	
<i>con chorizo</i>	co[n] chorizo	co[n̩] chorizo ⁷	
<i>con llaves</i>	co[n] llaves	co[n̩] llaves	
<i>con ganas</i>	co[n] ganas	co[n̩m̩] ganas	

(127) Stylistic variation in lateral place assimilation (cf. Navarro Tomás 1967: 114; Hualde 1989a: 22)

	<u>Largo</u>	<u>Andante</u>	<u>Allegretto</u>
<i>alzar</i>	a[l̩]zar	
<i>caldero</i>	ca[l̩]dero	
<i>falsedad</i>	fa[l̩]sedad	

⁷ Hualde (1989a) identifies the allophone which occurs before /ç/ as distinct from the one which precedes /j/. I take the position here that all nasal [+coronal, -anterior] places of articulation are the same.

<i>colcha</i>	.....	co[ʎ]cha	.....
<i>fiel zorro</i>	fiel[l] zorro	fiel[ɲ] zorro	.....
<i>fiel toro</i>	fiel[l] toro	fiel[ɲ] toro	.....
<i>fiel novia</i>	.....	fiel[l] novia	.....
<i>fiel yegua</i>	fiel[l] yegua	fiel[ʎ] yegua	.....

As the data in (126) and (127) show, Largo speech is characterized by absence of place assimilation; in each case the phoneme /n/ is realized phonetically as [n] and /l/ is realized [l]. Allegretto speech is characterized by total place assimilation.⁸ In Andante speech, the nasal and obstruent gestures overlap, yielding partial place assimilation.⁹

As with the nasals, the coronal allophones of /l/ have the same basic realization in both Andante and Allegretto, the main exception being that lateral coarticulation is impossible. In addition, /l/ cannot place-assimilate to a noncoronal consonant for physiological reasons.

⁸ Navarro Tomás (1967: 118) points out that the nasal sequence /nm/ - found in such words as *inmediato* and *inmóvil* - is exceptional in that it does not allow total place assimilation to occur, even in most casual (Allegretto) style. Total assimilation is perceived by the listener, even though the coronal gesture is still physically present. He observes:

En el grupo *nm* la articulación de la primera consonante, en la conversación ordinaria, va generalmente cubierta por la de la *m*: la lengua realiza, de manera más o menos completa, el contacto alveolar de la *n*; pero al mismo tiempo la *m* forma su oclusión bilabial, siendo en realidad el sonido de esta última el único que acústicamente resulta perceptible.

Hualde (1989a: 19) disagrees with Navarro Tomás's assessment, arguing that the sequence /nm/ may be realized as an overlap or as geminate [mm], thus *conmigo* → co[n̄m]migo or co[m]migo.

Harris (1969, 1984b) and Hualde (1989a) note similar restrictions on the sequence /mn/, which may be found in words like *alumno* and *himno*. These clusters resist assimilation altogether, and in discussions of nasal-nasal assimilation are usually isolated as exceptions (cf. Hualde 1989a: 22).

⁹ It should be noted that certain types of nasal-obstruent overlap are impossible because they involve the same articulator. Obviously a single articulator cannot be in two places at once. Therefore all the coronal allophones of /n/ - that is, [n], [ɲ], and [ɳ] - cannot be coarticulated with another coronal segment. This observation follows from the one made by Sagey (1986: 28). The tokens containing coronal allophones are therefore phonetically the same in Andante and Allegretto speech.

3.1.2 The Spreading imperative

Feature spreading in any language for whatever reason requires a “spreading imperative” (cf. Padgett 1996: 20-21). In autosegmental phonology, this imperative is achieved by means of a “spreading rule” such as the one in (125a). In OT, there can be no “rule” of assimilation; rather, the constraint system must be designed to suppress all candidates containing nasal-consonant clusters which are heterorganic. In this study, the preferability of candidates containing homorganic clusters to those without is determined by the relative ranking of five MARK and FAITH constraints: LICENSE-PLACE, *COMP-SEG, ONSET-PLACE, LAT/COR, and IDENT [place]. These constraints are summarized in (128). Each will be discussed further as appropriate.

(128) Summary of constraints

LICENSE-PLACE

“The place node of a coda consonant must be linked to a syllable onset.”¹⁰

In order to be “licensed,” the place node of a coda consonant must have a “path” - via structural linking - to a syllable onset (cf. Padgett 1996: 16). In *un beso* u[n.b]eso, LICENSE-PLACE is not satisfied because there is no path from the place node of coda consonant [n] to the onset of the following syllable onset [b]. In *un beso* u[nm.b]eso and u[m.]beso, however, this condition is met. (LIC-PLACE)

*COMP-SEG

“No complex segments are allowed.”¹¹

¹⁰ See Pulleyblank (1997) for a different approach to place assimilation.

¹¹ This constraint is inspired by Clements & Hume’s (1995: 255) No Branching Constraint, cited below:
“Configurations of the form

A

B

C

are ill-formed, where A is any class node (including the root node), A immediately dominates B and C, and B and C are on the same tier.”

Every time a segment contains two of one type of structural node - whether class, place, or terminal - it is structurally complex and violates *COMP-SEG.

ONSET-PLACE (cf. Padgett 1996)

“Onset place features have input correspondents.”¹²

This constraint expresses the tendency in language to assimilate coda consonants to onset consonants, but not vice-versa. The realization u[mb]eso (<*un beso*) satisfies ONSET-PLACE. The realization *u[nd]eso, however, violates this constraint, because the coronal place node of the onset [d] has been changed in the output. (ONS-PLACE)

LAT/COR

“All laterals are coronal.”

This constraint winnows out only those laterals which are coronal; it rejects those which are labial or dorsal (cf. Hualde 1989a: 23).

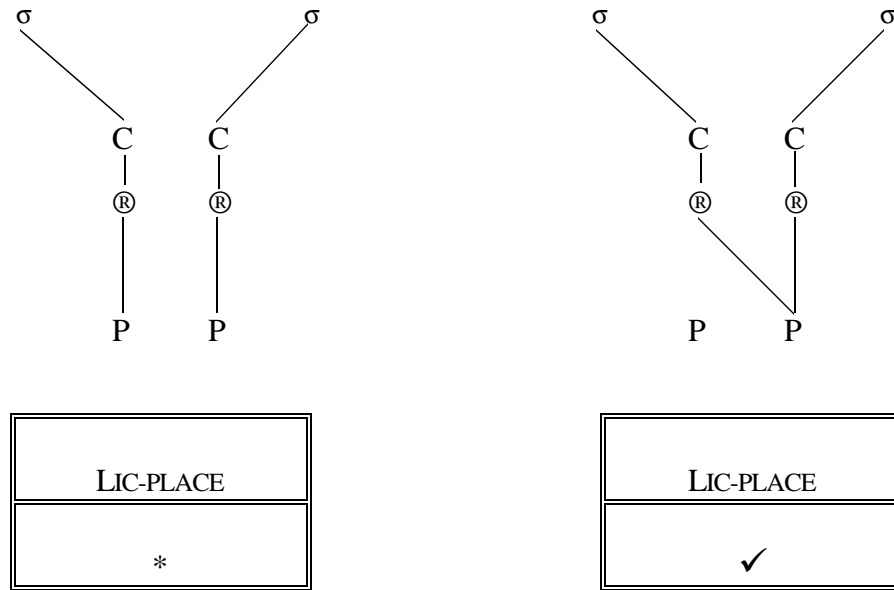
IDENT [place]

“Underlying place features are retained in the output.”

This constraint competes with LIC-PLACE. While LIC-PLACE enforces homorganicity of coda nasals to onset consonants, IDENT [place] ensures the faithful realization of the underlying place features. For example, in u[m]beso, IDENT [place] is violated. In u[n]beso, it is satisfied.

The constraint LIC-PLACE is motivated by evidence from many languages. For example, Itô (1986: 20-21) notes that in Japanese, syllable codas are systematically disallowed unless they are “doubly linked” such that their place node is linked to the onset of the following syllable. Allowable structures therefore include homorganic nasal-stop clusters as well as geminates (see 129).

¹² Pulleyblank (1997: 68) achieves this same effect by the rankio faithfulness constraints: FAITH [PLACE] OBSTRUENTS » FAITH [PLACE] NASALS. Jun (1996b: 224) takes a similar approach.



In Spanish, LIC-PLACE may be violated in some speech styles but must be satisfied in others. For example, in Largo, LIC-PLACE may be violated in order to satisfy any number of constraints on feature faithfulness. In Allegretto, however, LIC-PLACE is satisfied at the expense of place faithfulness. The principle of homorganicity across heterosyllabic consonant clusters (as ordained by LIC-PLACE) holds almost uniformly for Spanish, but not quite. Unlike Japanese and Attic Greek, Spanish does allow heterorganic clusters between syllables; recall the unassimilated cluster in e[l.g]orila, and also many others not yet mentioned, such as combinations of /r/ or /s/ plus stop: *marca* → ma[r.k]a, *vasco* → va[s.k]o. This analysis will show that coda licensing may be blocked when faithfulness to an underlying place node is indicated by a higher-ranked constraint.¹³

3.1.3 LICENSE-PLACE and consonant release

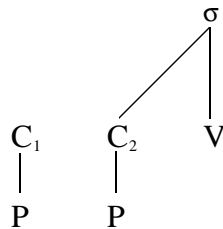
¹³ “Licensing” may be satisfied by other forms of linking besides place assimilation. For example, the coda /s/ in *rasgo* → ra[sʰ.ɣ]o is licensed because it is linked to the *laryngeal node* of the following consonant, thereby satisfying a different LICENSE constraint: LICENSE (LARYNGEAL). This type of coda licensing as well as its satisfaction will be discussed in due course.

Padgett (1996) makes a series of important observations which must be incorporated into any detailed discussion of place assimilation. First, a consonant followed by a vowel (syllable nucleus) is considered to be “released.” A consonant followed by another consonant is considered to be “unreleased” *unless* it shares a place node with the following released segment. Release may be viewed as a characteristic of any onset consonant.

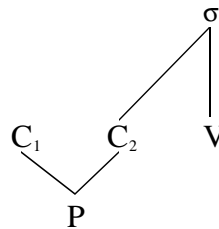
Not every consonant is released, however. A coda consonant is not followed by a syllable nucleus, but rather a syllable onset. Two types of consonant positions within the syllable, released and unreleased, are illustrated in (131).

(131) Consonant release

a. C₁ is unreleased
C₂ is released



b. C₁ is released
C₂ is released



where C₁ = a consonant *not* syllabifiable as onset
and C₂ = a consonant syllabifiable as onset.

Diagrams (131a) and (131b) show two consonants, C₁ and C₂, followed by a vowel. C₂ is the onset of the syllable and is therefore released. C₁, for some reason of relative sonority, cannot be incorporated into this same syllable. Because it is followed by a consonant rather than a vowel, it is unreleased; this is the circumstance diagrammed in (131a). Nevertheless, C₁ may become released if it links structurally to released C₂ such that its place node is parsed by the root node of C₂. Such release by association is shown in (131b). The necessary association to guarantee release - and satisfy coda licensing - is achieved by place assimilation.

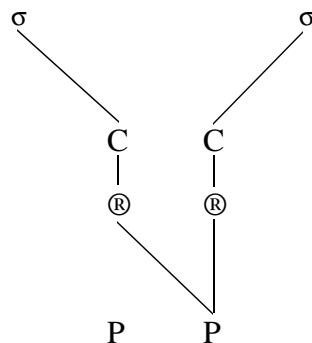
Padgett's observations regarding consonant release allow the key generalization of place assimilation to be expressed: where assimilation occurs, it is always the released consonant - i.e. the onset - which acts as the trigger. Where place assimilation is permitted, it proceeds from right to left, regardless of the featural identities of the segments involved. Herein lies the motivation for the constraint ONS-PLACE.

Padgett (1996), Jun (1996b), and others have argued for a constraint of this general type to express the fact of directionality in place assimilation. Whereas LIC-PLACE compels assimilation, it makes no provision for the source or target (i.e. direction) of assimilation. Indeed, assimilation from left to right *or* from right to left will satisfy LIC-PLACE. The constraint ONS-PLACE is therefore necessary to ensure that place features are spread *leftward* from the released consonant to the unreleased consonant, and not the other way around.

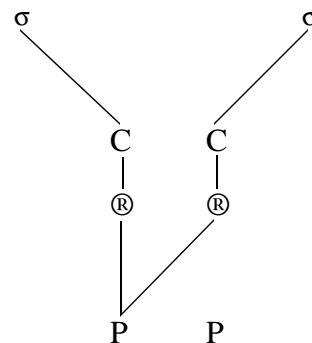
ONS-PLACE operates as follows. First, it scans the output string for consonants which are released. For each released consonant identified, it verifies that the consonant's output place features are faithful to their input correspondents. If so, then ONS-PLACE is satisfied (see 132).

(132) ONS-PLACE satisfaction and violation: *un beso*

a. u[mb]eso



b. *u[ɲd]eso



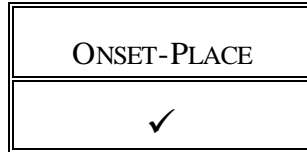


Diagram (132a) portrays a right-to-left place assimilation. The released segment in the cluster is [b]. Because the output place node of [b] is faithful to its input correspondent, ONSET-PLACE is satisfied. Diagram (132b) also portrays place assimilation, but in this instance, it is left-to-right. The place node of the released segment [d] is not faithful to that of its input correspondent /b/, and therefore causes violation of ONSET-PLACE.

3.1.4 Assimilation and overlap: some articulatory considerations

In a previous section it was argued that the “spreading imperative” may be achieved by the constraint LIC-PLACE. Like many constraints, LIC-PLACE may be violated in order to satisfy higher-ranked constraints. In Spanish, place assimilation fails precisely when LIC-PLACE satisfaction violates such a higher-ranked constraint, or when LIC-PLACE may be satisfied so as to cause less structural damage in the output than place assimilation. The notion of “less” is determined, of course, by the ranking of the constraints themselves.

In order for the range of variation observed for Spanish place assimilation to be sufficiently described, the grammar must accommodate three degrees of assimilation: 1) no place assimilation; 2) partial place assimilation; and 3) total place assimilation. Of these alternatives, 1 and 3 are straightforward. Alternative 2, however, is - for lack of a better term - fuzzy. The notion “partial” permits *any degree* of overlap between the two articulatory gestures involved.

(133) Three types of gestural overlap (cf. Browman & Goldstein 1990)

no overlap

partial overlap

total overlap

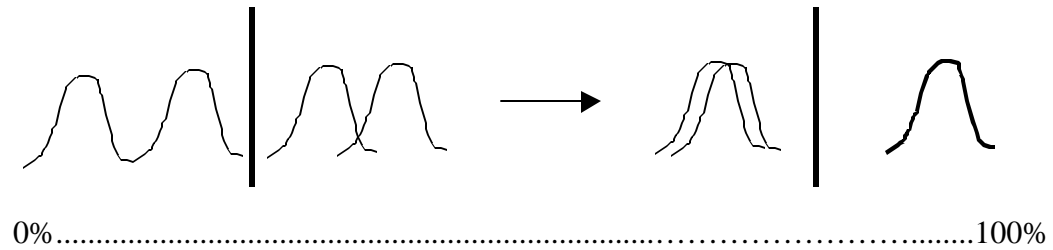


Figure (133) illustrates the range of theoretically possible gestural overlap between two extremes, 0% and 100%. In instances of no (0%) overlap, place assimilation does not occur; cf. *un beso* u[nb]eso. In cases of partial overlap, gestures may be overlapped, but neither gesture is omitted. Total overlap does not occur in Spanish; instead, we have seen that the place node of the target segment is delinked.¹⁴

In the approach taken here, the grammar itself does not distinguish degrees of overlap. Instead, a constraint ranking which selects overlap as the optimal phasing between two segments specifies merely that some degree of overlap is optimal.

Let us now address the question of acoustic masking, raised by Browman & Goldstein (1990) in their discussion of gestural overlap. What exactly happens to a gesture whose acoustic effect is masked by another? One solution is to delete the masked segment altogether. Boersma (1997a: 3) maintains that languages generally tend to eliminate any linguistic material which is superfluous, in order to minimize articulatory effort. Along these same lines, Jun (1996b) proposes a Production Hypothesis of acoustic salience (see 134).

¹⁴ Total overlap is unachievable in speech because it requires a perfect coordination of gestures, something even skilled speakers are incapable of (Keith Johnson, personal communication). It should be noted also that even if total overlap were possible in human speech, it would fail to serve any economizing purpose, because one of the gestures would always be acoustically “masked” by the other, as argued by Browman & Goldstein (1990: 53):

In general, given comparable overlap patterns, the more extreme the constriction associated with a gesture, the better able that gesture is to acoustically mask (or aerodynamically interfere with) another gesture with which it is cooccurring.... Thus, overlap by a following consonant (stop or fricative) gesture would be most able to contribute to hiding of an alveolar closure gesture. This observation concurs with the one made by Navarro Tomás (1967: 89, cited above) regarding nasal overlaps: the “extreme” constriction associated with an onset consonant acoustically obscures the gesture immediately preceding it.

(134) Production Hypothesis (Jun 1996b: 224)

Speakers make more effort to preserve the articulation of speech sound with powerful acoustic cues, whereas they relax in the articulation of sounds with weak cues.

Regarding this hypothesis, Jun contends that

...speakers are reluctant to exert effort on segments which present inherent acoustic weaknesses, since their preservation would not be very helpful for their perception (Jun 1996b: 224).


This hypothesis can be applied to the notion of total place assimilation. In a partially overlapped nasal sequence - such as the $[\widehat{nm}]$ in $u[\widehat{nm}]$ beso or the $[\widehat{nm}]$ in $u[\widehat{nm}]$ foro - the acoustic cues of the coronal gesture are partially masked by those of the labial gesture (recall Navarro Tomás 1967: 89). Nevertheless, because the overlap is partial, the place features of both segments remain acoustically salient. In cases where the gestures are nearly 100% overlapped, however, the consonant gesture associated with the weaker acoustic cues - i.e. the coda $[n]$ - is much less salient. At the same time, the very salient gesture associated with the onset consonant is retained. Total overlap of gestures in rapid speech therefore constitutes a wasted effort; instead, it is more economical to *eliminate* the highly obscured gesture on the grounds that it has minimal acoustic cues and no longer serves a real communicative function. In Allegretto, categorical deletion replaces total overlap: $u[m]$ beso, $u[n]$ foro, $co[n]$ ganas.

In summary, partial place assimilation is gradient, allowing a range of degrees of articulatory overlap. Total place assimilation is not possible in practice. Even if it is achieved approximately, it has no real functional value for the speaker or listener, because of its eclipsing effect on acoustic information. Rather than totally overlap two segments, one of the gestures - the acoustically weaker one associated with the syllable coda - is deleted.


3.1.5 An OT account

Nasal and lateral place assimilation is always categorical within morphemes; in this context there is no stylistic choice available to speakers. In addition to being compulsory, intramorphemic place assimilation is also total; i.e. no gestural overlaps occur. For intramorphemic place assimilations, the ranking IDENT [nas] , IDENT [lat], MAX-IO » LIC-PLACE » IDENT [place] is indicated (see 135 and 136).

(135) Intramorphemic nasal place assimilation (compulsory)

/triunfo/	IDENT [nas]	MAX-IO	LIC-PLACE	IDENT [place]
a. trjun.fo.			*!	
 b. trjuŋ.fo.				*
c. trju<n>.fo.		*!		
d. trjuŋ.fo.	*!			

(136) Intramorphemic lateral place assimilation (compulsory)


/kaldero/	IDENT [lat]	MAX-IO	LIC-PLACE	IDENT [place]
a. kal.de.ro.			*!	
 b. ka _l .de.ro.				

c. ka<l>.de.ro.		*!		
d. kad.de.ro.	*!			

IDENT [nas] and IDENT [lat] are “manner” constraints in that they monitor the manner of articulation of a segment, rather than the place. Ranking the manner identity constraints IDENT [lat] and IDENT [nas] above IDENT [place] ensures that the manner features [+nasal] and [+lateral] of a coronal segment are realized in the output, even if the place of articulation changes.

Assimilation of the nasal or lateral to the following released segment (rather than vice-versa) is ensured by the ranking ONS-PLACE » IDENT [place], as shown in (137).

(137) Directionality of place assimilation enforced by ONS-PLACE

/trunfo/	ONS-PLACE	MAX-IO	LIC-PLACE	IDENT [place]
a. trjun.fo.			*!	
 b. trjun̄.fo.				*
c. trjun.so.	*!			*
d. trju<n>.fo.		*!		

In (137), both candidates (137b) and (137c) violate IDENT [place]. Candidate (137c), however, also violates high-ranked ONS-PLACE, and is therefore rejected as a viable output. Optimal candidate (137b) violates only low-ranked IDENT [place].

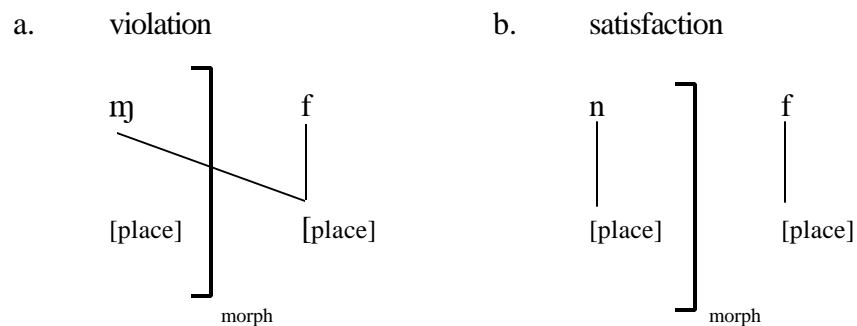
Intermorphemically, the number of place assimilation choices increases to three (non, partial, total). This allowance is attributed to an ALIGN constraint against place linkages spanning morpheme as well as word boundaries (see 138).

(138) ALIGN (morpheme, left, place, left) (cf. McCarthy & Prince 1993b: 2)

“Every morpheme is left-aligned with a place node.”

Because ALIGN requires every morpheme to be left-aligned with a place node, place nodes shared across morpheme or word boundaries violate ALIGN (see 139).

(139) ALIGN violation and satisfaction: *un # foro*



The linked structure in (139a) violates ALIGN because the left edge of the morpheme (word) *foro* is not aligned with the left edge of a place node. The left edge of the place node is

the leftmost segment to which the place node is linked. In (139b), ALIGN is satisfied because the left edge of the morpheme *foro* forms a “crisp edge” with the labial place node.¹⁵

ALIGN and LIC-PLACE are in competition. In Largo style, this competition is resolved in favor of ALIGN. Thus Largo must be characterized by the ranking ALIGN » LIC-PLACE. It is maintained that LIC-PLACE is an FC.

(140) Largo: ALIGN » LIC-PLACE: *un foro*

/un # foro/	IDENT [nas]	MAX-IO	ALIGN	LIC-PLACE	IDENT [place]
☞ a. un.fo.ro.				*	
b. un̩.fo.ro.			*!		*
c. uf.fo.ro.	*!		*		*
d. u<f>.fo.ro.		*!			

(141) Largo: ALIGN » LIC-PLACE: *triunfo*

/triunfo/	IDENT [nas]	MAX-IO	ALIGN	LIC-PLACE	IDENT [place]
a. trjun.fo.				*!	
☞ b. trjun̩.fo.					*
c. trju<n>.fo.		*!			
d. trjuɸ.fo.	*!				*

While ALIGN rejects any candidate containing place-linkage across a morpheme boundary (140), this constraint is inactive in assimilation morpheme-internally. In the case of

¹⁵ For a thorough OT discussion of place alignment and “crisp edges” shared by phonological and prosodic categories, the reader is referred to Itô and Mester (1994).

triumfo (141), therefore, ALIGN pays no attention to a place-linkage between /n/ and /f/, because it is morpheme-internal. As a result, place assimilation is assured intramorphemically, even in Largo style.

In order for place assimilation to be enforced across morpheme boundaries, as is the case in Andante and Allegretto, LIC-PLACE must rank above ALIGN. In this analysis, it is maintained that LIC-PLACE (a MARK constraint) is an FC, unranked with respect to ALIGN. The ranking LIC-PLACE » ALIGN » IDENT [place] enforces partial place-assimilation across morpheme boundaries (see 142).


(142) Andante: LIC-PLACE » ALIGN: *un foro*

/un # foro/	IDENT [nas]	MAX-IO	LIC- PLACE	ALIGN	IDENT [place]
a. un.fo.ro.			*!		
b. un̩.fo.ro.				*	*!
c. u<n>.fo.ro.		*!			
d. uñ̩.fo.ro.				*	
e. uf.fo.ro.	*!			*	*

As shown by earlier data, nasal-stop sequences are realized with total place assimilation in Allegretto speech. The two types of place assimilation, partial and total, may be accounted for by the ranking of *COMP-SEG relative to IDENT [place]. In Andante, partial assimilation (gestural overlap) is maintained by the ranking IDENT [place] » *COMP-SEG. In Allegretto, total assimilation is maintained by the reverse ranking *COMP-SEG » IDENT [place]. *COMP-SEG is therefore assigned FC status.¹⁶


*COMP-SEG bans any segment with more than two nodes on the same representational tier, thereby enforcing structural simplicity. This intermediate variety satisfies *both* LIC-PLACE *and* IDENT [place], in which case the ranking LIC-PLACE » ALIGN » IDENT [place] selects a partially assimilated output. Tableau (143) is identical to (142), with the constraint *COMP-SEG added for completeness. Tableau (144) presents the Allegretto evaluation for the same input.

(143) Andante: LIC-PLACE » IDENT [place] » *COMP-SEG: *un foro*

/un # foro/	IDENT [nas]	MAX- IO	LIC- PLACE	ALIGN	IDENT [place]	*COMP- SEG
a. un.fo.ro.			*!			
b. unŋ.fo.ro..				*	*!	
c. u<n>.fo.ro.		*!				
 d. unŋ̄.fo.ro.				*		*
e. uf.fo.ro.	*!			*	*	


(144) Allegretto: LIC-PLACE » *COMP-SEG » IDENT [place]: *un foro*

¹⁶ See Padgett (1996) for a detailed implementation of the constraint *COMP-SEG in the description of partially- and totally-assimilated segments.

/un # foro/	IDENT [nas]	MAX- IO	LIC- PLACE	ALIGN	*COMP- SEG	IDENT [place]
a. un.fo.ro.			*!			
 b. un̩.fo.ro.				*		*
c. u<n>.fo.ro.		*!				
d. un̩̄.fo.ro.				*	*!	
e. uf.fo.ro.	*!			*		*

So far in this section, discussion of place assimilation has focused primarily on nasals. The key dominance relations ONS-PLACE » LIC-PLACE » IDENT [place] motivate place assimilation not just of nasals, but of laterals as well. Indeed, only one additional constraint is needed to fully describe lateral assimilation: LAT/COR. The interaction of these constraints is shown in the following tables for two tokens, *el beso* and *el chiste*. The first token refuses place assimilation because of LAT/COR violation. The second undergoes place assimilation. Note that gestural overlap is not an option in lateral assimilation, as one coronal gesture cannot overlap another, because both occupy the same tier (recall Sagey 1986).

(145) Largo: *el beso*

/el # beso/	ONS- PLACE	IDENT [lat]	MAX- IO	LAT/COR	ALIGN	LIC- PLACE
 a. el.βe.so.						*
b. el.le.so..	*!				*	
c. eβ.βe.so..		*!			*	
d. e ^[lab] .βe.so..				*!	*	
e. el.β ^[lat] e.so.				*!	*	
f. e<l>.βe.so.			*!			

In Largo, assimilation is usually banned on the basis of the ranking ALIGN » LIC-PLACE. As tableau (145) shows, ALIGN is inactive on the set of candidates because any attempt to place-assimilate the sequence [lb] violates one of the three higher-ranked constraints ONS-PLACE, IDENT [lat], or LAT/COR. In Andante speech (tableau 146), LIC-PLACE raised above ALIGN, place-assimilated candidates are still ruled out by the same higher-ranked constraints.

(146) Andante: *el beso*

/el # beso/	ONS-PLACE	IDENT [lat]	MAX-IO	LAT/COR	LIC-PLACE	ALIGN
☞ a. el.βe.so.					*	
b. el.le.so.	*!					*
c. eβ.βe.so.		*!				*
d. el ^[lab] .βe.so.				*!		*
e. el.β ^[lat] e.so.				*!		*
f. e<l>.βe.so.			*!			

In instances of place assimilation within the coronal articulator node (such as *el chiste* → e[χ] chiste), ALIGN acts decisively in Largo to ban assimilation (see 147).

(147) Largo: *el chiste*

/el # čiste/	ONS-PLACE	IDENT [lat]	MAX-IO	ALIGN	LIC-PLACE
☞ a. el.čis.te.					*
b. eʎ.čis.te.				*!	
c. ec.čis.te.		*!		*	
d. el.lis.te.	*!			*	
e. e<ʎ>.čis.te.			*!		

In Andante, LIC-PLACE ranks above ALIGN, thereby forcing violation of the latter constraint and allowing place assimilation to occur (see 148).

(148) Andante: *el chiste*

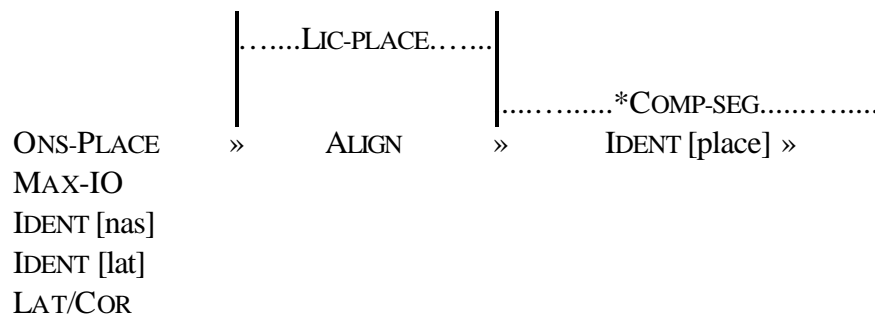
/el # čiste/	ONS-PLACE	IDENT [lat]	MAX-IO	LIC-PLACE	ALIGN
a. el.čis.te.				*!	
☞ b. eʎ.čis.te.					*
c. ec.čis.te.		*!			*
d. el.lis.te.	*!				*
e. e<ʎ>.čis.te.			*!		

In this section, place assimilation of nasals and laterals was accounted for by the ranking LIC-PLACE » IDENT [place]. Morpheme-internally, place assimilation is both compulsory and

total. Across morpheme boundaries, it is variable. The variability of assimilation in connected speech is determined by the FC LIC-PLACE and its relationship to ALIGN. Under the ranking ALIGN » LIC-PLACE, place linkages across morpheme boundaries are banned, as is the case in Largo style. The reverse ranking LIC-PLACE » ALIGN forces place linkages across morpheme boundaries. Partial linkages satisfy IDENT [place] but violate *COMP-SEG. Total linkages satisfy *COMP-SEG but may violate IDENT [place]. Because complex linkages are not categorically enforced or banned cross-stylistically, it is maintained that *COMP-SEG is an FC.

Invariable constraint relations include those between the manner and place constraints; these relations are constant regardless of style: IDENT [nas] , IDENT [lat] » IDENT [place]. Likewise, the ranking LIC-PLACE » IDENT [place] is independent of style. In order to ensure that all lateral allophones are coronal, LAT/COR must also dominate LIC-PLACE invariably. These relations are summarized in diagram (149).

(149) Constraint hierarchy for nasal and lateral place assimilation



Based on this analysis, the following typological predictions can be made:

(150) Typological predictions

- a. ONS-PLACE » LIC-PLACE
Only coda consonants place-assimilate.

- b. ALIGN » LIC-PLACE » IDENT [place]
Place assimilation occurs only morpheme-internally.
- c. LIC-PLACE » ALIGN » IDENT [place]
Place assimilation occurs in all contexts.
- d. IDENT [nas] » LIC-PLACE
Place-assimilated nasals remain nasal.
- e. IDENT [lat] » LIC-PLACE
Place-assimilated laterals remain lateral.
- f. LAT/COR » LIC-PLACE
All laterals are coronal, even in place assimilation contexts.
- g. LIC-PLACE » *COMP-SEG » IDENT [place]
Place assimilation is total (gestural overlaps are banned).
- h. LIC-PLACE » IDENT [place] » *COMP-SEG
Place assimilation is partial (gestural overlaps are enforced).

3.2 Nasal neutralization, place faithfulness, and assimilation

The first section of this chapter focused on the assimilation of nasals to a following consonant. In Andante and Allegretto styles, such clusters are homorganic (as required by the FC LIC-PLACE), with the place node of the released consonant spreading to the nasal (enforced by ONS-PLACE). In syllable onset, the nasals generally maintain distinct place features; cf. the minimal triad *cana*, *caña*, *cama*, realized with alveolar, palatal, and bilabial points of articulation, respectively. In the Allegretto style of many dialects, underlying nasal place is preserved before any vowel, and may be relinquished before any consonant. In other positions, specifically utterance-finally, nasals neutralize, or fail to be contrastive. The default place of articulation for utterance-final nasals varies across dialects, but is always either [n] or [ɲ]. In no dialect is [m] or [ɲ] the default nasal.

In Castilian Spanish, the default point of articulation of utterance-final final nasals is coronal: [n], thus *álbum* → álbu[n], *footing* → footi[n], etc. Before a consonant, total place assimilation holds as expected in Allegretto style: álbu[n] lleno, footi[m] práctico. In a so-called “velarizing” dialect such as Cuban, these same items are realized with [ŋ] as the default coda nasal, and with a velarized-assimilated overlap before a consonant, thus: álbu[ŋ], footi[ŋ], but álbu[ŋ̃]lleno, footi[ŋ̃m]práctico. Three processes are therefore in competition in any Spanish dialect: 1) place faithfulness (onset); 2) place assimilation (coda, before a consonant); and 3) neutralization (coda, utterance-finally).

I will call dialects which favor [n] in neutralization “alveolarizing” so as to contrast them to “velarizing” dialects. I will abbreviate them A-dialects and V-dialects, respectively.

Nasal place neutralization is generally defined as a lexical rule which affects word-final nasals. In connected speech, neutralized nasals are resyllabified as syllable onsets before a vowel, and may be place-assimilated before a consonant. Resyllabification and nasal place assimilation are both postlexical rules, and therefore apply across word boundaries as well as within words. Hualde (1991a: 67-68) formulates two nasal neutralization rules, both of which act upon a syllable coda ((R)hyme, in his notation), in the noncyclic lexical stratum. These rules obligatorily apply after word-level syllabification (see 150).

(150) Nasal place neutralization in syllable coda (Hualde 1991a: 67-68; cf. also Harris 1991a: 182)

a. Nasal neutralization

$$[+nasal] \rightarrow [+coronal] / \text{---} \begin{array}{c} | \\ \text{R} \end{array}$$

b. Nasal velarization

$$[+nasal] \rightarrow [+back] / \text{---} \begin{array}{c} | \\ \text{R} \end{array}$$

Hualde (1991a) argues that in an A-dialect, Nasal Neutralization applies but Nasal Velarization does not, whereas in a V-dialect, Nasal Neutralization and Velarization apply in sequence. To illustrate this rule interaction, sample V-dialect derivations of *pan* and *pan pequeño* are provided in (151).¹⁷

(151) Neutralization and Velarization in a V-dialect (based on Hualde 1991a: 68; cf. also Harris 1991a: 183)

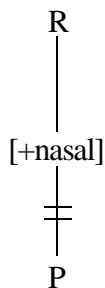
	[pan]	[pan] [alemán]	[pan] [pekeɲo]
Word-level strata			
Syllab (1st cycle)	[pan.]	[pan.] [a.le.mán.]	[pan.] [pe.ke.ɲo.]
Neut (150a)	OK	OK	OK
Syllab (2nd cycle)	OK	OK	OK
Velarizn (150b)	[paŋ.]	[paŋ.] [a.le.máŋ.]	[paŋ.] [pe.ke.ɲo.]
Postlexical stratum			
Nasal Assim	N/A	N/A	[paŋ̄m.pe.ke.ɲo.]
Resyllab	OK	[pa.ŋa.le.máŋ.]	OK
	[paŋ.]	[pa.ŋa.le.máŋ.]	[paŋ̄m.pe.ke.ɲo.]

¹⁷ The focus of Hualde's (1991a) study is Chinato, a V-dialect spoken in the province of Cáceres, Spain. The observations he makes, however, apply to V-dialects in general.

As shown in (151), a velarized nasal surfaces in syllable coda [paŋ.], resyllabified as a syllable onset [pa.ŋa.le.mán.], or in syllable coda with assimilation to a following consonant [paŋm.pe.ke.ɲo.]. In an A-dialect, the Velarization rule is omitted, and these same forms emerge with [n]: [pan.], [pa.na.le.mán.], or assimilated [nm̃]: [panm̃.pe.ke.ɲo.].

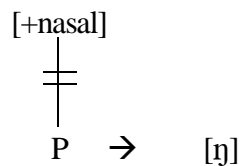
Hualde's analysis assumes that Nasal Neutralization occurs both in A-dialects and V-dialects. Harris (1984b) takes a somewhat simpler approach. In his treatment, word-final nasals delink their place node, and are subsequently assigned place by a dialect-specific redundancy rule (see 152 and 153).

(152) Rhyme (coda) place node delinking (cf. Harris 1984b: 74)



(153) Default place assignment (cf. Harris 1984b: 76)

a. V-dialects



b. A-dialects

[+nasal]

As shown in the foregoing discussion, it is generally accepted that Neutralization is a word-level operation, which may be followed by either of two postlexical rules: Resyllabification and Place Assimilation. Whereas Neutralization is compulsory, Place Assimilation is variable. Although both A-dialects and V-dialects allow Place Assimilation, there is a crucial difference in the types of assimilation allowed in each dialect type. Recall that in A-dialects, Place Assimilation may be either partial or total; thus *un beso* is realized [un̄m.be.so.] in Andante, and [um.be.so.] in Allegretto (cf. Harris 1969). In V-dialects, Place Assimilation is not total even in Allegretto. In these dialects, *un beso* has but one fast speech realization: u[ŋ̄m]beso, and totally assimilated u[m]beso is unallowed. Of course u[ŋ]beso, without Place Assimilation but with Neutralization, is permitted in Largo speech.¹⁹

This fundamental difference between the assimilation types allowed in A- and V-dialects is shown in (154). Sample derivations of the sequence *pan pequeño*, with nasal place assimilation, are given for both A-dialects and V-dialects. Overlapped segments are indicated by a superscript tie.

(154) Interaction of Neutralization and Place Assimilation: *pan pequeño*

a. A-dialect pattern

	[pan] [pekeɲo]
<i>Word-level</i>	
Syllab	[pan.] [pe.ke.ɲo.]
Neut (152, 153a)	n
<i>Postlexical</i>	
Place Assim (125a)	[pan̄m̄.pe.ke.ɲo.] → Andante

¹⁹ Hualde (1989a: 21) states that in V-dialects, the operation responsible for delinking the underlying place node of a coda nasal is typically blocked (*bloqueada*), thereby preventing total assimilation altogether. Guitart (1976: 22) observes that in Havana Spanish, word-final nasals may be place-assimilated to a following consonant, the result of which is a “co-articulation where a dorsovelar element is *always* present” (emphasis mine -- REM). See also Hualde (1991a: 68).

Delinking (125b)	[pam.pe.ke.no.]	→	Allegretto
b. V-dialect pattern			
			[pan] [pekeŋo]
<i>Word-level</i>			
Syllab			[pan.] [pe.ke.no.]
Neut (152, 153b)			ŋ
<i>Postlexical</i>			
Place Assim (125a)			[paŋ̄m.pe.ke.no.] → Andante
Delinking (125b)			BLOCKED → Allegretto

In both dialect types, Neutralization (152, 153) precedes Place Assimilation. In both dialects, the Place Assimilation rule (125a) applies variably. The output of this rule is a partially-assimilated nasal, consistent with Andante speech style: [paŋ̄m.pe.ke.no.] in A-dialects, [paŋ̄m.pe.ke.no.] in V-dialects. In A-dialects, the output of Place Assimilation may be fed into Delinking (125b), which delinks the underlying place node of the coda nasal. In this case, the output is [pam.pe.ke.no.], consistent with Allegretto style.

In V-dialects, the Delinking rule (125b) is not available, and total Place Assimilation is therefore banned. In V-dialects Place Assimilation is partial even in Allegretto: [paŋ̄m.pe.ke.no.].

Although Place Assimilation may be accompanied by Delinking in A-dialects, in V-dialects, there is tension between the Place Assimilation of *syllable*-final nasals on the one hand, and Neutralization of *word*-final nasals on the other. When these two contexts coincide, velarization must be satisfied regardless of style. In V-dialect connected speech, partial assimilation emerges as a stylistic compromise, brought about by pressure from competing constraints.

3.2.1 Constraints on nasal place

In the serial approaches reviewed so far, Neutralization need only target a coda nasal. It is not necessary to stipulate that the nasal be word-final, because the subsequent Place Assimilation rule uniformly place-assimilates all coda nasals which are word-internal. Thus, at an intermediate level of representation, the word *bombón* is realized with two neutralized nasals; in an A-dialect, both coda nasals are [coronal]: [bon.bon.]. This output is then fed into Place Assimilation, which adjusts the place of the first nasal, but not the second. The output is [bom.bón.]. Word-internally, Neutralization is rendered opaque by the subsequent application of Place Assimilation.

In V-dialects, a neutralized nasal is resyllabified as the onset of the next syllable if it precedes a word which is vowel-initial (recall [pa.Na.le.máN.]). This distribution is achieved by ordering the postlexical Resyllabification rule *after* the word-level Neutralization rule. In A-dialects, however, Resyllabification and Neutralization are arguably both postlexical, and in that order. This ordering allows Resyllabification to bleed off possible inputs to Neutralization, and thereby prevent neutralized nasals from appearing in syllable onset. In both dialect types, Neutralization precedes Place Assimilation, and both rules are postlexical.

(155) Rule ordering in A-dialects and V-dialects

	<u>A-dialects</u>	<u>V-dialects</u>
input	[álbum][ermoso]	[álbum][ermoso]
<i>Word level</i>		
Syllab	[ál.bum.][er.mo.so.]	[ál.bum.][er.mo.so.]
Neut (V-dialects only)		ŋ
<i>Postlexical</i>		
Resyllab	[ál.bu.mer.mo.so.]	[ál.bu.ŋer.mo.so.]
Neut (A-dialects only)	N/A	
Other rules	[ál.βu.mer.mo.so.]	[ál.βu.ŋer.mo.so.]

If both varieties of Neutralization were handled in the same stratum, then incorrect results would be given. For example, if A-dialects underwent Neutralization at the word level as do the V-dialects, then the false output *álbu[n]hermoso would be indicated. If V-dialects underwent Neutralization postlexically, then the output would be the incorrect *álbu[m]hermoso.

An OT analysis cannot rely on distinctions between domains of rule applications, or envision surface-opaque intermediate representations to account for dialectal differences of the type outlined here. Let us say, for instance, that Neutralization is effected by a set of ranked constraints, each of which bans a different nasal place from coda position. In A-dialects, the lowest-ranked constraint would be the one which bans [coronal] nasals. In V-dialects, the lowest-ranked constraint would be the one which bans [dorsal] nasals. If this subhierarchy was in turn ranked below LIC-PLACE, then Place Assimilation would be enforced within words, and neutral place would emerge only utterance-finally.

This approach would fail to explain the fact that in V-dialects, neutralized nasals appear in syllable onset before a vowel (recall the [ál.βu.ŋer.mo.so.] example in 155). In a serial model, this distribution is the result of Resyllabification. Obviously it is not the case that Neutralization applies in all codas and also some onsets; rather, it applies in codas at the word level, then feeds Resyllabification, which shifts the neutralized nasals to onset position when the following word begins with a vowel.

In OT, a neutralized nasal which appears in syllable onset on the surface is subject to the same constraints as a non-neutralized nasal in the same position. Both types either violate or satisfy ONS-PLACE. If ONS-PLACE ranks above the Neutralization subhierarchy, then faithfulness to onset place features is required, and the desired sequence [ál.βu.ŋer.mo.so.] is banned in favor of incorrect *[ál.βu.mer.mo.so.], in which all onset place features are faithfully represented. In order to ensure that neutralized nasals are allowed to fall into onset position without relinquishing their neutral place specification, it would have to be the case that the

Neutralization constraints dominate ONS-PLACE in this dialect type. It would also require that the Neutralization constraints target not *coda* nasals, but rather *morpheme-final* nasals. After all, the segment at the right edge of a morpheme remains in this position regardless of how it is syllabified.

In this analysis, Neutralization is determined by two positive positional constraints which command nasal place at the right edge of a word. These are $\text{NAS/DOR}]_{\text{morph}}$ and $\text{NAS/COR}]_{\text{morph}}$. Both constraints are universal; therefore both are present in A-dialects as well as V-dialects. They are defined in (156).

(156) Constraints on morpheme-final nasal place

$\text{NAS/DOR}]_{\text{morph}}$

“Morpheme-final nasals are [dorsal].”

$\text{NAS/COR}]_{\text{morph}}$

“Morpheme-final nasals are [coronal].”

Which place of articulation may occur word-finally is determined entirely by the ranking of these two MARK constraints relative to the FAITH constraints IDENT [place] and ONS-PLACE. In A-dialects, $\text{NAS/COR}]_{\text{morph}}$ ranks above the relevant FAITH constraints and $\text{NAS/DOR}]_{\text{morph}}$ ranks below. In V-dialects, the reverse is true.

A key effect which must be accounted for is the distribution of neutralized nasals in surface onset position in both dialect types. It has already been proposed that in V-dialects, $\text{NAS/DOR}]_{\text{morph}}$ must dominate ONS-PLACE, in order that neutralized place may be represented in syllable onset. In A-dialects, ONS-PLACE must rank above $\text{NAS/COR}]_{\text{morph}}$, because Neutralization fails whenever a word-final nasal is in a surface syllable onset (see 157).

(157) Constraint rankings (revised)

a. A-dialects

ONS-PLACE » NAS/COR]_{morph}

b. V-dialects

NAS/DOR]_{morph} » ONS-PLACE

3.2.2 An OT account

In this section, I provide an OT account for the interaction of Neutralization, Place Assimilation, and onset place faithfulness in Allegretto speech. Representative data will be taken from the following table (see 158).

(158) Allegretto data: A-dialects

a. __##

álbum álbu[n]

cantan canta[n]

b. __#C

álbum lindo álbu[n]lindo

álbum grande álbu[ŋ]grande

álbum lleno álbu[ŋ]lleno

c. __#V

álbum hermoso álbu[m]hermoso

(159) Allegretto data: V-dialects

a. __##

álbum álbu[ŋ]

cantan canta[ŋ]

b. __#C

álbum lindo álbu[ŋ̄m]lindo

álbum fino álbu[ŋ̃]fino

álbum lleno álbu[ŋ̃]lleno

c. __#V


álbum hermoso álbu[ŋ]hermoso

In this OT analysis, outputs are decided by the categorical ranking of ONS-PLACE above the operative Neutralization constraint (A-dialects) or below it (V-dialects), and also by the variable ranking of LIC-PLACE relative to the Neutralization constraint. The Neutralization constraints dominate IDENT [place], as it is possible in both dialect types to override Place Faithfulness in favor of Neutralization.

Examples of Allegretto Neutralization, Place Assimilation, and Place Faithfulness in an A-dialect are given in (160)-(171).

(160) A-dialects (Allegretto): Neutralization utterance-finally

álbum → álbu[ŋ]

/álbum/	ONS-PLACE	LIC-PLACE	NAS/COR] _m	IDENT [place]
a. ...m.]			*!	
 b. ...n.]				*
c. ...ŋ.]			*!	*

(161) A-dialects (Allegretto): Neutralization preempted by Place Assimilation before C

álbum grande → álbu[ŋ] grande

/álbum # grande/	ONS-PLACE	LIC-PLACE	NAS/COR] _m	*COMP-SEG	IDENT [place]

a. ...m.]g...		*!	*		
☞ b. ...ŋ.]g...			*		*
c. ...n.]g...		*!			*
d. ...m̄ŋ.]g...			*	*!	

(162) A-dialects (Allegretto): Neutralization preempted by Onset Place Faithfulness

álbum hermoso → álbu[m] hermoso


/álbum # ermoso/	ONS-PLACE	LIC-PLACE	NAS/COR] _m	*COMP-SEG	IDENT [place]
☞ a. ...m]er...			*		
b. ...ŋ]er...	*!		*		*
c. ...n]er...	*!				*

Utterance-finally, NAS/COR]_{morph} actively constrains nasal place (160). If the nasal precedes another consonant, the effect of NAS/COR]_{morph} is overridden by the effect of LIC-PLACE, which is higher ranked. LIC-PLACE enforces Place Assimilation at the expense of Neutralization (161). Finally, if the nasal is an onset, then ONS-PLACE actively ensures Faithfulness to the underlying place node (162).

In a V-dialect, by contrast, NAS/DOR]_{morph} must dominate ONS-PLACE, in order to ensure that neutralized nasals may occupy any surface syllable position. These constraints must rank below LIC-PLACE in Allegretto, in order that Place Assimilation is ensured. Both ONS-PLACE and *COMP-SEG are low-ranked in the V-dialects, and are therefore typically inactive in candidate evaluation. Recall from the earlier discussion of Place Assimilation that the ranking IDENT [place] » *COMP-SEG bans total Place Assimilation. Examples follow in (163)-(165).


(163) V-dialects (Allegretto): Neutralization utterance-finally

álbum → álbu[ŋ]

/álbum/	NAS/DOR] _m	LIC-PLACE	IDENT [place]	ONS-PLACE
a. ...m.]	*!			
b. ...n.]	*!		*	
 c. ...ŋ.]			*	


(164) V-dialects (Allegretto): Neutralization preempted by (partial) Place Assimilation before C

álbum fino → álbu[ŋ̃m] fino

/álbum # fino/	NAS/DOR] _m	LIC-PLACE	IDENT [place]	*COMP-SEG	ONS-PLACE
a. ...m.]f...	*!	*			
b. ...ŋ.]f...		*!	*		
c. ...n.]f...	*!	*	*		
d. ...m̃.]f...	*!		*		
 e. ...ŋ̃m̃.]f...			*	*	

(165) V-dialects (Allegretto): Onset Place Faithfulness preempted by Neutralization before V

álbum hermoso → álbu[ɲ] hermoso

/álbum # ermoso/	NAS/ DOR]m	LIC- PLACE	IDENT [place]	*COMP- SEG	ONS- PLACE
a. ...m]er...	*!				
 b. ...ɲ]er...			*		*
c. ...n]er...	*!		*		*


Tableaux (163) and (164) show that Neutralization is enforced whenever a nasal is morpheme-final. If the nasal is morpheme-final *and* before a consonant (164), then a compromise is struck between NAS/DOR]_{morph} and LIC-PLACE. The optimal candidate is the one which satisfies *both* constraints by introducing a segment with a complex place node: [ɲ̠]. In the example, the velar element [ɲ] of this segment satisfies NAS/DOR]_{morph}, and the bilabial element [ɲ̠] satisfies LIC-PLACE.

The V-dialect ranking must categorically ban total Place Assimilation. In the last section, partial Assimilation was constrained by the FC *COMP-SEG. Ranked below IDENT [place], coarticulation is permitted. Ranked above IDENT [place], coarticulation is disallowed. It must be the case in V-dialects that *COMP-SEG may dominate LIC-PLACE, but not NAS/DOR]_{morph}. This ranking crucially ensures that Neutralization cannot be preempted by total Place Assimilation, as it is in A-dialects. Tableaux (166) and (167) illustrate this ranking in

candidate evaluation of the sequence *álbum lindo*. Two speech styles are represented: Largo and Allegretto. In Largo, Place Assimilation is blocked by the ranking *COMP-SEG » LIC-PLACE. In Allegretto, *COMP-SEG ranks below LIC-PLACE, and Place Assimilation is permitted provided that Neutralization – overseen by NAS/DOR]_{morph} - is simultaneously respected. If NAS/DOR]_{morph} is held categorically ranked above *COMP-SEG in all styles, then total assimilation is banned from all outputs.

(166) Largo: V-dialects: NAS/DOR]_{morph} » *COMP-SEG » LIC-PLACE

álbum lindo → álbu[ŋ]lindo

/álbum # lindo/	NAS/ DOR]m	*COMP- SEG	LIC- PLACE	IDENT [place]
a. ...m.]l...	*!		*	
b. ...n.]l...	*!			*
 c. ...ŋ.]l...			*	*
d. ...mn̄.]l...	*!	*		
e. ...n̄ŋ.]l...		*!	*	

(167) Allegretto: V-dialects: NAS/DOR]_{morph} » LIC-PLACE » *COMP-SEG

álbum lindo → álbu[n̩]lindo

/álbum # lindo/	NAS/DOR] _m	LIC-PLACE	*COMP-SEG	IDENT [place]
a. ...m.]l...	*!	*		
b. ...n.]l...	*!			*
c. ...ŋ.]l...		*!		*
d. m̄n.]l...	*!		*	
e. ...n̩.]l...			*	*


In (167), winning candidate (e) is the only one which satisfies both NAS/DOR]_{morph} and LIC-PLACE. Candidates satisfying only one *or* the other - (167a), (167c), (167d) - are rejected. The optimal candidate (167e) satisfies both constraints by satisfying *both* constraints in a single coarticulated segment.

In A-dialects, a stylistic distinction is maintained between Largo (unassimilated), Andante (partially assimilated), and Allegretto (totally assimilated) representations. For example, the word sequence *álbum grande* is realized as álbu[n]grande in Largo, álbu[n̩]grande in Andante, or álbu[ŋ]caro in Allegretto. Note that the representation álbu[n̩]grande simultaneously satisfies the relevant Neutralization constraint NAS/COR]_{morph} and the coda licensing constraint LIC-PLACE. The representation álbu[ŋ]caro satisfies LIC-PLACE but

violates NAS/COR]_{morph}. This is possible because NAS/COR]_{morph} is ranked categorically below LIC-PLACE. The version álbu[m̃]grande is therefore selected by the ranking LIC-PLACE » NAS/COR]_{morph} » *COMP-SEG. The candidate álbu[ŋ]grande is selected by the ranking LIC-PLACE » *COMP-SEG » NAS/COR]_{morph} (see 168 and 169).²⁰

(168) Andante: A-dialects: LIC-PLACE » NAS/COR]_{morph} » *COMP-SEG

álbum grande → álbu[m̃]grande

/álbum # grande/	LIC-PLACE	NAS/ COR] _{morph}	*COMP-SEG	IDENT [place]
a. ...m.]g...	*!	*		
b. ...n.]g...	*!			*
c. ...ŋ.]g...		*!		*
d. ...m̃.]g...		*!	*	
 e. ...m̃.]g...			*	*

²⁰

As shown earlier, Place Assimilation is blocked altogether (Largo style) if ALIGN is ranked above LIC-PLACE. Sample rankings for Largo will not be shown.

(169) Allegretto: A-dialects: LIC-PLACE » *COMP-SEG » NAS/COR]_{morph}

álbum grande → álbu[ŋ]grande

/álbum # grande/	LIC-PLACE	*COMP-SEG	NAS/ COR] _{morph}	IDENT [place]
a. ...m.]g...	*!		*	
b. ...n.]g...	*!			*
c. ...ŋ.]g...			*	*
d. $\widehat{m\eta}$.]g...		*!	*	
e. $\widehat{m\eta}$.]g...		*!		*

This analysis shows that two different types of Neutralization emerge from the reordering of a set of constraints. The Neutralization constraints NAS/COR]_{morph} and NAS/DOR]_{morph} are ranked differently in each dialect type, with different effect.

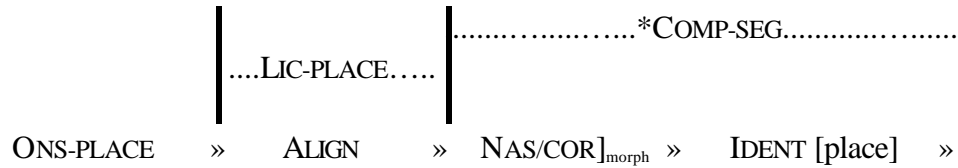
In A-dialects, NAS/COR]_{morph} is ranked within the field of flotation of the FC *COMP-SEG, thereby enabling the higher-ranked constraint LIC-PLACE to be satisfied either of two ways. If *COMP-SEG is ranked below NAS/COR]_{morph} (168), then Place Assimilation is partial. If ranked above, then Assimilation is total (169).

In V-dialects, NAS/DOR]_{morph} ranks above LIC-PLACE, out of the field of flotation of *COMP-SEG. As a result, satisfaction of LIC-PLACE is contingent upon NAS/DOR]_{morph} being satisfied as well. Unless both are satisfied, Assimilation is blocked altogether.

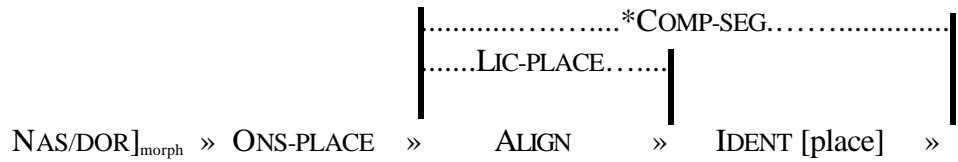
The constraint hierarchies for A- and V-dialects are diagrammed in (170). The constraint ALIGN is included for the sake of completeness. Note that the full range of FC *COMP-SEG is shown.

(170) Ranking summary: nasal Neutralization and Assimilation

a. A-dialects



b. V-dialects



The typological predictions made by these rankings, as well as their representative dialect types, are summarized in (171). NAS/X refers generically to either of the Neutralization constraints.

(171) Typological predictions

- a. ONS-PLACE » NAS/X]_{morph}
Neutralization is banned from onset (A-dialects).
- b. NAS/X]_{morph} » ONS-PLACE
Neutralization may appear in onset (V-dialects).
- c. NAS/X]_{morph} » IDENT [place]
Neutralization overrides Place Faithfulness (A and V dialects).
- d. LIC-PLACE » NAS/X]_{morph} » IDENT [place]
Place Assimilation overrides Neutralization (A-dialects).

- e. $NAS/X]_{\text{morph}} \gg LIC-PLACE \gg IDENT [p_{\text{place}}$
Neutralization overrides Place Assimilation (V-dialects).
- f. $LIC-PLACE, NAS/X]_{\text{morph}} \gg *COMP-SEG$
Neutralization and Place Assimilation may be simultaneously satisfied by a
place-contour segment (V-dialects and A-dialects).
- g. $LIC-PLACE \gg *COMP-SEG \gg NAS/X]_{\text{morph}}$
Place assimilation preempts Neutralization; no contour segments are allowed
(A-dialects).

3.3 Voicing assimilation, devoicing, and continuancy assimilation

In this section, the interaction of three processes is examined: voicing assimilation, devoicing, and continuancy assimilation. The examples hold for Peninsular dialects, which may contain one or more of the processes (cf. Hualde 1989a, Martínez-Gil 1991). Presentation of all the relevant data will be followed by an OT analysis.

3.3.1 Voicing assimilation

Voicing assimilation is the process by which a segment spreads its laryngeal node to an adjacent segment. Typically handled as a postlexical rule in generative analyses (cf. Martínez-Gil 1991), this type of assimilation applies throughout the speech utterance, without reference to morpheme- or word-boundaries. Like the assimilation types discussed in previous sections, voicing assimilation is associated with casual speech style. Although all Spanish dialects seem to allow partial voicing assimilation of segments, few if any allow total assimilation.

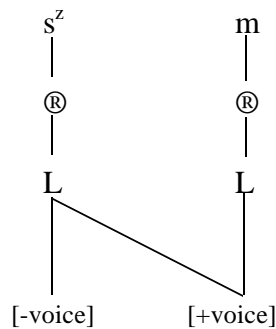
We begin by reviewing some essential voicing assimilation data for Mexico City Spanish (see 172). The superscript segments represent the second phase in a voicing contour.

(172) Voicing assimilation in Mexico City Spanish: *mismo* (Harris 1969: 8)

Largo speech	[mís.mo.]
Andante speech	[mís ^z .mo.]
Allegretto speech	[mís ^z .mo.]

The style data shown in (172) for *mismo* range from Largo to Allegretto. In Largo speech, coda [s] followed by a voiced consonant does not voice-assimilate. In Andante and Allegretto, the coda [s] is partially assimilated to the following voiced consonant. Because the assimilation applies within a single tier (coronal), the result is a voicing contour (recall Sagey 1986: 28). This structure is diagrammed in (173). As with nasal place assimilation, the contour is the result of a doubly linked laryngeal (L) node.

(173) Representation of partial voice assimilation: *mismo* (cf. Sagey 1986: 28)



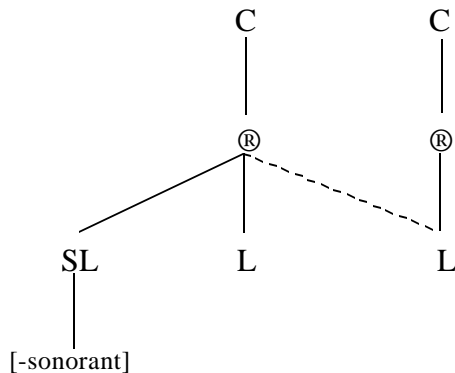
Harris (1969: 29), Hooper (1972: 530), and others generally concur that Andante and Allegretto speech styles are characterized in most dialects of Spanish by partial voicing assimilation. Except in very fast speech (Presto, see Harris 1969), total voicing assimilation is unattested, and will not be treated further here. Examples of partial voicing assimilation in Peninsular Spanish follow in (174).

(174) Voicing assimilation (Harris 1969: 29, 40-44; Hooper 1972: 10)

Agfa → a[ɣ^x]fa
desde → de[s^z]de
mismo → mi[s^z]mo
absurdo → a[β^h]surdo
adquirir → a[ð^h]quirir
zigzag → zi[ɣ^x]zag (note: orthographic 'z' represents [θ])

The sampling of data from Peninsular Spanish shows that voicing assimilation targets coda fricatives - voiced and unvoiced alike - before any consonant. Hualde (1989a) expresses this voicing assimilation by means of an autosegmental rule which spreads a consonant's laryngeal node to a preceding [-sonorant, +voice] consonant in syllable coda (he refers to the rhyme). Because a [-sonorant] consonant plus a consonant cannot be realized in the same syllable for phonotactic reasons, the syllable information is excluded from the representation in (175).

(175) Partial voicing assimilation (based on Hualde 1989a: 33)²¹



²¹ Hualde (1989a) maintains that voicing assimilation is total (i.e. *mismo* → [mizmo]), and therefore formulates his version of the rule to concomitantly delink the underlying laryngeal node of the leftward segment. In the version shown here, and throughout this study, assimilation is held to be partial, and the underlying laryngeal node is therefore retained.

Hualde's rule shows *partial* voicing assimilation because the laryngeal class node (L) of the left-hand consonant is retained even though the laryngeal class node of the segment following has been assimilated. This is the type of assimilation which occurs in Andante [mís^z.mo.]. In Largo, underlying [voice] features are faithfully represented, thus *mismo* → [mís.mo.] (see 172).

3.3.2 Continuancy assimilation

Continuancy assimilation is the process whereby voiced stops acquire the marking for [continuant] of a previous segment. Spanish has three voiced stop phonemes: /b, d, g/. The fricative allophones of these three segments are represented by the following phonetic symbols: [β, ð, ɣ]. Mascaró (1991) describes the distribution of voiced stops and spirants as follows:

(176) Distribution of voiced stops and spirants (Mascaró 1991: 168)

a.	voiced stops: [b, d, g]			
	After pause	<i>bien</i>	<i>gana</i>	<i>desdén</i>
		[b]ien	[g]ana	[d]esdén
	After nasal	<i>ambos</i>	<i>onda</i>	<i>un gato</i>
		am[b]os	on[d]a	un [g]ato
	After lateral	-	-	<i>aldea</i>
	(/d/ only)	-	-	al[d]ea

b.	voiced spirants: [β, ð, γ]			
	After vocoid	<i>hay vino</i>	<i>viuda</i>	<i>hago</i>
		hay [β]ino	viu[ð]a	ha[γ]o
	After fricative	<i>desvío</i>	<i>desde</i>	<i>afgano</i>
		des[β]ío	des[ð]e	af[γ]ano
	After r	<i>carbón</i>	<i>verde</i>	<i>mar gruesa</i>
		car[β]ón	ver[ð]e	mar [γ]ruesa
	After lateral	<i>mil veces</i>	-	<i>alga</i>
	(/b, g/ only)	mil [β]eces	-	al[γ]a

Harris (1984a) sums up the distribution of voiced stops and spirants even more succinctly (see 177).

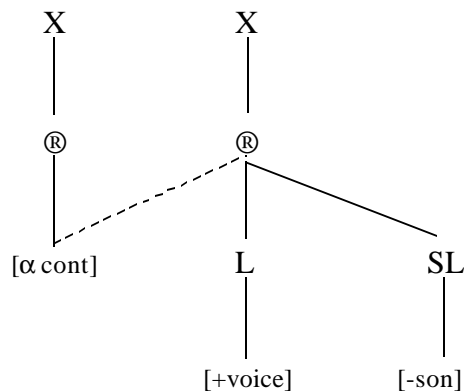
(177) Stops versus spirants (cf. Harris (1984a: 149-50))

- | | | | |
|----|--|------|---|
| a. | stops | (i) | after a pause: [b]an, [d]an, [g]ana |
| | | (ii) | after a homorganic stop: hom[b]ro, hon[d]o, tol[d]o |
| b. | spirants in all other contexts: la[β]o, la[ð]o, la[γ]o | | |

How the distribution of stops and spirants is accounted for depends on which type of segment - stop or fricative - is posited as basic. For example, some studies (e.g. Harris 1984a) argue that the stops are underlying, and the spirants derived by rule. Others (e.g. Hualde 1988) propose the opposite, namely that spirants are underlying and the stops are derived by rule. Others (Lozano 1979; Mascaró 1984; Harris 1985) propose that *both* stops and spirants are derived by rule. Each approach carries with it a different set of predictions. Despite the unresolved controversy, most studies concur that continuancy assimilation is achieved by the

rightward spreading of a feature [continuant] from a vowel or consonant to a voiced obstruent. A nonlinear expression of continuancy assimilation is given in (178).²²

(178) Continuancy assimilation (Martínez-Gil 1991: 544; cf. also Harris 1984a: 151)



Because the structural description of the continuancy assimilation rule specifies only [αcont] as a necessary element of the spreading segment, the rule may be fed by any segment with a feature [continuant], whether a fricative or sonorant consonant, a glide, or a vowel. In addition, it may be fed by the output of a previous application of the same rule. The iterativity of continuancy assimilation as well as its application across morpheme- and word boundaries indicate that this rule is a postlexical one, applying across the board.

Mascaró's (1984) original analysis of continuancy assimilation (which has served as a basis for almost every subsequent study) maintained two specifications for the feature [continuant]: [+] and [-]. In his analysis, vowels are marked [+continuant] and unvoiced stops were marked [-continuant]. Voiced stops, however, are underlyingly unmarked for the feature [continuant]. This featural analysis is motivated by the fact that voiced stops trigger spirantization but unvoiced ones do not; in a radically underspecified feature system, a feature may only be spread to a segment which is unspecified for that feature (e.g. Avery & Rice

²² Continuancy assimilation and related data are discussed in numerous studies, including Lozano (1979), Mascaró (1984, 1991), Harris (1984a), Hualde (1989a), Martínez-Gil (1991, 1997), and Palmada (1997).

1989). In such an analysis, segments unspecified for a specific feature either assimilate the feature from an adjacent segment or are assigned a default value for the feature. In surface representations, all segments are fully specified for all features.

(179) Continuancy assimilation: *abdica* (Mascaró 1984: 292)

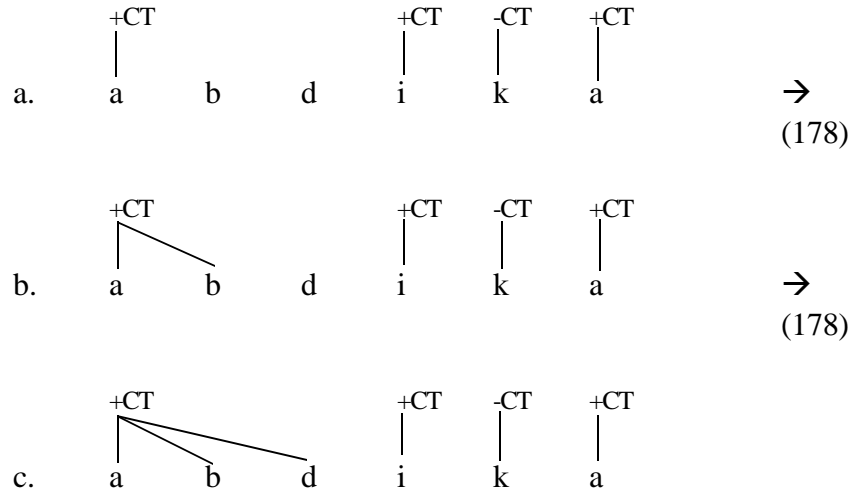


Figure (179) shows how values for the feature [continuant] are assigned to voiced stops in the token *abdica*. This analysis maintains no underlying values for [continuant] for voiced stops; in phonemic representation such segments are typically given as capital “archisegments,” thus: /aBDika/. In (179a), all segments except for voiced stops are shown associated to [continuant] features (marked [\pm CT] in Mascaró’s nomenclature). In (179b), the feature [+CT] spreads rightward from the initial /a/ in /aBDika/ per rule (178). The result is [aβDika]. In the second iteration of rule (178), the [β] output of the first iteration now satisfies the structural description of the rule and spreads [+CT] one more position to the right, assigning its value to /D/. The result (179c) is an output in which all segments are specified for [continuant]: [aβðika].

In the case of voiced stops preceded by a nasal, it is the feature value [-CT] which is spread, because nasals are [-CT]. Spreading of [-CT] from nasals accounts for the distribution of stops after a nasal; cf. am[b]os, on[d]a, gan[g]a.

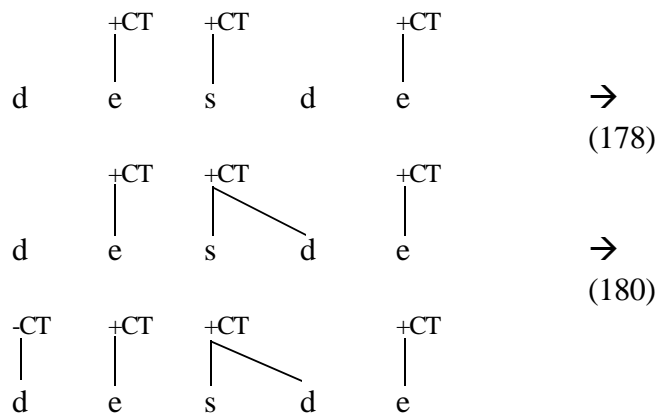
There is one environment which cannot be targeted by left-to-right continuancy spreading: utterance-initial. The feature value of a voiced obstruent in this position must be filled in by means of a redundancy rule which assigns the default value [-cont].

(180) Default continuancy assignment

$$\begin{bmatrix} \text{-son} \\ \text{+voice} \end{bmatrix} \rightarrow \text{[-cont]}$$

Rule (180) targets any voiced obstruent which has not acquired a specification for [cont] by virtue of being situated to the right of a segment already so specified. A sample derivation of the token *desde* (underlyingly /DesDe/) is given in (181).

(181) Continuancy: assimilation and default assignment: *desde*



So far, all the examples of CA have targeted [+voice] obstruents. There are, however, instances in which underlying [-voice] obstruents are realized [+cont] as well. The uniform realization of coda obstruents as [+cont] is not attributed to continuancy assimilation, but rather to a separate process which targets all obstruents in coda position.

Martínez-Gil (1991: 546) maintains that in one major variety of Peninsular Spanish, underlying voiceless stops are realized as stops phonetically whenever they precede an unvoiced segment; e.g. *apto* → a[p]to, not *a[ϕ]to; *actuar* → a[k]tuar, not *a[x]tuar. This argument lends support to his theory that unvoiced fricatives [ϕ, θ, x] occur as allophones of /p, t, k/ only before a voiced segment (e.g. *é[θ^δ]nico*), or as a result of devoicing (e.g. a[ϕ]solver). Although this observation may hold for one dialectal variety, other linguists have argued in favor of a general tendency to neutralize *all* syllable-final obstruents regardless of their phonological environment or voicing heritage. In a discussion of continuancy assimilation in Peninsular Spanish, Hualde (1989a: 35) argues:

Nótese que ... en posición final de sílaba interna a una palabra hay total neutralización en los dos rasgos [\pm voz] y [\pm continuyente], de tal modo que [díño], [díño], [díño] y [díño] o [adkirír], [aðkirír], [atkirír] y [aθkirír] no pueden ser sino realizaciones de una sola palabra....

Although the examples Hualde gives include only tokens which are underlyingly [+voice], it is clear that his characterization applies to coda obstruents across the board, regardless of underlying voicing - hence his usage of the symbol [\pm]. We understand from Hualde that coda neutralization of the features [cont] and [voice] occurs regardless of underlying specification for either feature.

Navarro Tomás (1967) also provides evidence that it is possible for [-voice] coda stops to be realized as fricatives before an unvoiced consonant (see 182).

(182) Syllable-final /p/, /k/ (Navarro Tomás 1967: 87, 138)²³

²³ All the examples Navarro Tomás (1967: 97) gives for coda /t/ realized as a fricative are ones in which it also precedes a voiced consonant. His accompanying clarification, however, refers to syllable-final /t/ in general:

opción → o[β]ción
actor → a[ɣ]tor, a[ɣ^g]tor, a[^gk]tor, a[ɣ^k]tor

According to Navarro Tomás, the fricative realization of /p, t, k/ reflects relaxed speech style, whereas the stop realizations reflect speech which is loud or emphatic (*fuerte/enfática*). Navarro Tomás suggests that this neutralization is typically resolved in favor of the voiced variant, thus /p/ → [β] in the word *opción*. Hualde, however, states that the devoiced variant is favored, thus /d/ → [θ] in *adquirir*. Both Navarro Tomás' and Hualde's explanations demonstrate that all coda obstruents may be realized as fricatives, regardless of underlying voicing. Rejection of certain variants by certain speakers reflects a stylistic preference rather than the impossibility of these variants.²⁴

In this study, it will be maintained that speakers apply voicing assimilation, devoicing, and continuancy assimilation - or some combination of these - as an exercise of stylistic choice in connected speech. Obviously some of these processes are incompatible with others. For example, a speaker cannot simultaneously voice-assimilate an obstruent to a following voiced segment, and also devoice it. However, if voicing assimilation is to a following unvoiced segment, then devoicing applies as well, albeit vacuously. When competition arises between processes, preference must be accorded to one or the other, as both cannot be satisfied simultaneously. This observation follows from Hualde's (1989: 34) statement:

La t final de sílaba ... aparecen [sic] únicamente con su propio sonido de oclusiva sorda en pronunciación fuerte o enfática. En la conversación normal se reduce en estos casos a una d [our [ð] -- REM] sonora y fricativa.

²⁴ Hualde (1989a: 35) specifically states that neutralization of the features [voice] and [cont] holds only word-internally; at the end of an utterance, the underlying [-cont] features of unvoiced obstruents are respected in the output: *cénit* → cénit[t], not *cénit[θ]. Because they have no underlying specification for [cont] (cf. Mascaró 1984), voiced obstruents may be realized as [+cont] or [-cont] in this position: *verdad* → verda[ð] OR verda[θ]. I believe that specified [cont] features are licensed by the right edge of the prosodic word and are therefore subject to a special faithfulness provision. In the interest of space, such provision will not be discussed in this study. Henceforth, all mention of "devoicing" will refer only to word-internal obstruents.

En unos hablantes hay claro predominio de la regla de ensordecimiento; en otros, la regla de asimilación en voz tiene aplicación preponderante.

In the following section, Hualde's claim regarding stylistic control over these variable processes will be formalized in a system of variably-ranked constraints. It will be maintained that all obstruents, regardless of underlying voicing, may be realized [+cont] in connected speech coda. Additionally, if a speaker favors voicing assimilation, the result is a partially assimilated segment - often with a voicing contour. If a speaker favors devoicing, then the result is a segment which is [-voice] and free of voicing contour.

3.3.3 Devoicing

In many dialects, such as Andalusian, coda obstruent voicing assimilation is in competition with coda obstruent devoicing. Whereas voicing assimilation seeks to link a coda consonant to the laryngeal node of a following consonant, devoicing works to neutralize all coda consonants in favor of the marking [-voice]. Data presented by Hualde (1989a) indicate that devoicing, like voicing assimilation, operates without reference to morpheme or word boundary information (see 183).

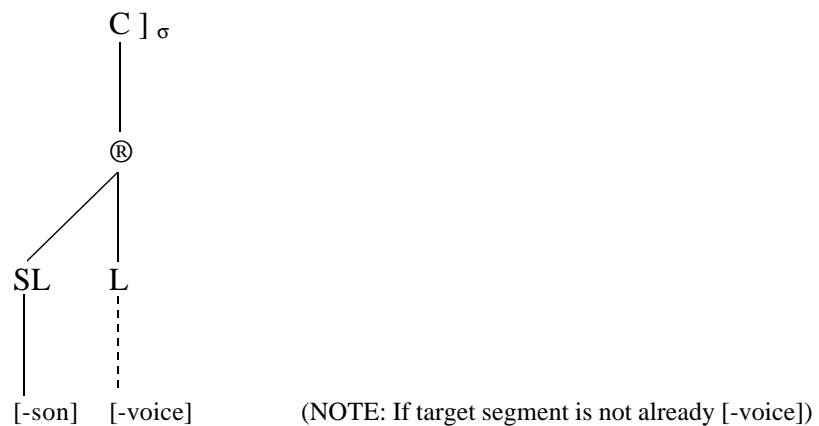
(183) Coda obstruent devoicing (Hualde 1989a: 32-34)

<i>adjunto</i>	a[t]junto
<i>digno</i>	di[k]no
<i>obsoleto</i>	o[ϕ]soleto
<i>Agfa</i>	A[x]fa

<i>verdad</i>	verda[ð]
<i>zigzag</i>	zigza[x]
<i>smog</i>	smo[x]
<i>Gorbachov</i>	Gorbacho[f]

Also like voicing assimilation, devoicing targets any coda continuant. If devoicing applies, it affects the entire segment; i.e. there are no partially devoiced outputs. The devoicing rule in (184) follows Hualde's (1989a: 36) formulation.

(184) Coda obstruent devoicing (insertion of feature [-voice]) (cf. Hualde 1989a: 36)



Because devoicing targets only coda obstruents, coda [-voice] obstruents frequently alternate with onset [+voice] obstruents: cf. *pared* → [pa.réθ.], but *paredes* → [pa.ré.ðes.].

3.3.4 Constraining the coda

Before proceeding with an OT account of the variable interaction of voicing assimilation, continuancy assimilation, and devoicing, I wish to draw attention to two constraints and their motivation.

(185) *C/OBS[+voice] “No coda [+voice] obstruents.”

*C/OBS[-cont] “No coda [-cont] obstruents.”

The two constraints defined in (185) are responsible for coda devoicing and coda continuancy, respectively. The notation of these constraints, as well as their universal motivation, will be briefly reviewed, and their relevance to the Spanish data will be established.

In order to explain the distribution of certain segments in some syllable positions but not others, Prince & Smolensky (1993: §8) envisioned two categories of positional constraints, *P (peak) and *M (margin). *P constraints ban segments from syllable peaks, and *M constraints ban segments from syllable margins (i.e. onset or coda). A *P constraint and a *M constraint presumably exist for every segment, with positional typologies emerging from the ranking of the combined set of constraints. For example, if the constraint *M/i (“/i/ may not occupy a syllable margin”) is ranked below MAX-IO in some language, then it is predicted that /i/ must be pushed to a syllable margin - i.e. made a nonnuclear glide - rather than be deleted. If MAX-IO ranks below the constraint *P/a, then it is predicted that /a/ may delete rather than be made nonnuclear. Prince & Smolensky (1993) attributed discrepancies between onset and coda segment inventories to the position of *CODA and ONSET within the hierarchy of *P and *M constraints.

Colina (1995: 55) exploded the *M constraint family into *O (*Onset) and *C (*Coda) subfamilies, in order to capture asymmetries in the onset and coda consonant inventories for Spanish. Two of her proposed rankings are given in (186).

(186) Associational constraints in Spanish (Colina 1995: 55)

- a. ONSET » *C/I,U
- b. *O/I,U , ONSET » *INSERT FEAT

The rankings in (186) express the fact that the Spanish high vocoids /i/ and /u/ may occupy a syllable coda (as glides [j] and [w] respectively) in order to satisfy ONSET, but may not occupy a syllable onset (as glides [j] and [w] respectively) to satisfy ONSET. In syllable

onset, these vocoids are reinforced and acquire a nonunderlying feature (presumably [-cont]), thus emerging as [j] and [g^w], respectively, in this position. The ranking in (866a) allows high coda glides as in *rey* [rej], but the ranking in (196b) bans onset glides in favor of reinforced onset stops, thus *yema* [jéma].

This type of analysis - in which specific segments or segment classes can be specifically banned from either onset or coda - has inevitably raised the question as to what other segmental material can be banned from these positions as well. Other studies, such as Goodman (1995), have further “exploded” (subdivided) the *C constraint family into a smaller family of constraints targeting individual distinctive features. The primary argument is that if a segment may be banned from a syllable position, then so may each of its composite features. Under such an analysis, the ranking ONSET » *C/IU might be restated as ONSET » *C/[+high], *C/[-low], *C/[+tense], etc., with no loss of descriptive accuracy.

Ample evidence suggests that languages often do ban individual features from coda position, and, by association, also ban the segments which contain them. Two examples which will be considered here are drawn from German and Portuguese. Consider first the German data in (187).

(187) German coda condition (Hall 1992: 53)

<i>Dieb</i>	[di:p.]	‘thief’
<i>Diebe</i>	[di:bə.]	‘thieves’
<i>brav</i>	[bRa:f.]	‘honest’
<i>braver</i>	[bRa:vʌ.]	‘more honest’
<i>Rad</i>	[Ra:t.]	‘wheel’
<i>Rades</i>	[Ra:dəs.]	‘wheel-GEN-SG’

These data illustrate a process common to many languages, namely coda devoicing. The underlying /b/ in the form *Dieb* is devoiced when it cannot be syllabified as a syllable onset; note that in the plural *Diebe*, such syllabification is possible, and devoicing does not occur. One version of the coda devoicing rule is given in (188).

(188) German coda devoicing (Hall 1992: 53; cf. also Vennemann 1972; Booij & Rubach 1987: 21; Rubach 1990: 80; and others)

$[-\text{sonorant}] \rightarrow [-\text{voice}] / __]_{\sigma}$

This same rule can be formulated as a *C constraint on surface structure: *C/[-son,+voice], or alternately *C/OBS[+voice]. In German, this constraint dominates the constraint IDENT [voice] categorically (i.e. in all speech styles) (see 199).

(189) Coda obstruent Devoicing in German: *Dieb*

	/dib/	*C/OBS[+voice]	IDENT [voice]
a.	di:b.	*!	
b.	di:p.		*

Because all constraints are present in all language grammars, *C/OBS[+voice] is present in the grammar of Peninsular Spanish as well. In Peninsular Spanish, however, it is not ranked

categorically above IDENT [voice] as it is in German; rather it is ranked variably with respect to this constraint. This means that speakers may devoice coda obstruents or represent them faithfully to underlying voicing as an exercise of stylistic control.

Now let us look at a different type of coda condition in Brazilian Portuguese. The data in (190) are English words as they are pronounced by native speakers of European and Brazilian Portuguese, taken from Blanco (1980), a study on loanword phonology.

(190) Portuguese syllable codas (Blanco 1980)

Eur:	[bór.də.]	‘board’	
	[mɔ.pə.]	‘mop’	(Note: [ə] represents a [-voice] central vowel.)
Brz:	[fɔ̃.gi.]	‘fog’	
	[uds.tó.ki.]	‘Woodstock’	
	[kĩ̃.gis.]	‘kings’	

Each of the English examples contains at least one coda consonant. In these pronunciations, the solution for both the European and Brazilian Portuguese speakers is to epenthesize a vowel ([ə] in European, [i] in Brazilian) so as to avoid having a coda stop. Note that /r/ and /s/ - both [+cont] - are acceptable codas and do not condition epenthesis.

In both European and Brazilian Portuguese, the stops /b, d, g, p, t, k/ are all banned from syllable coda. The only consonants permitted in syllable coda are /r, l, s, z/ (cf. Mascherpe 1970: 67; also Mira Anteus 1975, Mattoso Câmara 1972, Giangola 1996). Those excluded are all [-cont]. These consonants can be banned as a class by the coda condition constraint *C/OBS[-cont].

In Portuguese, *C/OBS[-cont] is categorically ranked above DEP-IO, thereby forcing the insertion of epenthetic material (see 191).

(191) Epenthesis in Portuguese: pronunciation of English *fog* (cf. Blanco 1980)

/fog/	*C/OBS [-cont]	MAX-IO	IDENT [cont]	DEP-IO
a. fɔg.	*!			
b. fɔ.g □.				*
c. fɔ<g>.		*!		
d. fɔy.			*!	

In Peninsular Spanish, coda stops may be realized as [+cont] in casual style, regardless of underlying voicing (recall Navarro Tomás 1967 and Hualde 1989a). This variable distribution suggests that *C/OBS[-cont] is an FC in Peninsular Spanish. The Spanish solution to pressure from this constraint is not epenthesis; instead, coda stops are made [+cont]. This option does not exist in Portuguese because the identity constraint on continuancy, IDENT [cont], ranks above DEP-IO in this language (see 191), thereby banning changes to the value [cont] for the sake of coda condition satisfaction. In Peninsular Spanish, however, *C/OBS[-cont] may rank either above *or* below IDENT [cont], depending on style. When it is ranked above the IDENT constraint, all coda stops are realized [+cont]. When it is ranked below the IDENT constraint, coda stops are retained as stops. In order to rule out epenthesis as a possible solution, DEP-IO categorically outranks both *C/OBS[-cont] and IDENT [cont].

In the following section, the constraints *C/OBS[+voice] and *C/OBS[-cont] are presented as FCs in Peninsular Spanish. It will be shown that a wide range of stylistic output variants are allowed by the interaction of these two constraints with other MARK and FAITH constraints.

3.3.5 An OT Account

The necessary constraints for voicing assimilation, devoicing, and continuancy assimilation are presented in (192).

(192) Constraint summary: voicing assimilation, devoicing, continuancy assimilation

LICENSE-LARYNGEAL

“The laryngeal node of a coda consonant must be linked to a syllable onset.”

Requires the same type of “path” to a syllable onset as required by LIC-PLACE. (LIC-LARYN)

CONT

“The value of the feature [cont] in voiced obstruents must agree with that of the preceding segment.”

This constraint is modeled after Martínez-Gil’s (1997: 190) constraint SPIR, which serves the same function.

IDENT [cont]

“Underlying values for [cont] may not change.”

Unvoiced obstruents are specified for [cont], whereas voiced ones are not. Therefore alternations of the type /p/~[ϕ], /t/~[θ], /k/~[x] constitute IDENT [cont] violations, but those of the type /b/~[β], /d/~[ð], and /g/~[ɣ] do not.

OBS[-cont]

“All obstruents are [-cont].”

Based on an observation made for Spanish by Martínez-Gil (1991: 543) which states that [+sonorant] segments are generally [+voice] and therefore [-sonorant] segments are generally [-voice]. This constraint targets *all* obstruents as a natural class, voiced and unvoiced: [b, d, g, p, t, k]. A “redundancy constraint,” it serves to ensure that no voiced obstruent is left without a [cont] feature in the output.

*C/OBS[-cont]

“Coda obstruents may not be [-cont].”

This constraint expresses the generalization - for some speech styles - that obstruent continuancy is enforced syllable-finally, regardless of underlying voicing: *adquirir* → a[ð]quirir; *étnico* → é[θ]nico. The same generalization does not hold for unvoiced obstruents syllable-initially: *arde* → ar[ð]e; but *arte* → *ar[θ]e.

*C/OBS[+voice]

“Coda obstruents may not be [+voice].”

Sets the default voicing value of syllable-final stops to negative (cf. *digno* → di[x]no or alternatively di[k]no). In direct competition with LIC-LARYN, which seeks to maintain voicing before a voiced onset.

The distribution of stops and fricatives in Spanish is accounted for cross-stylistically by the constraints IDENT [cont] and CONT. IDENT [cont] examines only those segments specified for [cont], a class which includes unvoiced obstruents but not voiced ones. Therefore changes from /p, t, k/ to [ϕ, θ, x] constitute IDENT [cont] violations, whereas changes from /b, d, g/ to [β, ð, γ] do not.

CONT examines voiced obstruents for their adherence to continuancy spreading. Because CONT affects only voiced obstruents, unvoiced obstruents are altogether ignored in evaluation. Because they target discrete classes of segments, these two constraints are never in competition, and their relative ranking is insignificant in candidate evaluation.

The following OT analysis classifies the data into three stylistic types. Each category may be characterized by the presence or absence of voicing assimilation and/or devoicing. Voicing assimilation may not occur in conjunction with devoicing, however, as these operations are in opposition (see 193).

(193) Stylistic classifications

Type 1: “All obstruents are [-cont].”

-assim,-devoi	e.g.	di[g]no, o[b]tener, é[t]nico
+assim, -devoi	e.g.	di[g]no, o[b ^p]tener, é[t ^d]nico
-assim,+devoi	e.g.	di[k]no, o[p]tener, é[t]nico

Type 2: “All [+voice] obstruents are [+cont] after [+cont].”

-assim,-devoi	e.g.	di[γ]no, o[β]tener, é[t]nico
---------------	------	------------------------------

+assim,-devoi	e.g.	di[ɣ]no, o[β ^ϕ]tener, é[t ^d]nico
-assim,+devoi	e.g.	di[x]no, o[ϕ]tener, é[t]nico

Type 3: “All [+voice] obstruents and coda [-voice] obstruents are [+cont] after
[+cont]

-assim,-devoi	e.g.	di[ɣ]no, o[β]tener, é[θ]nico
+assim,-devoi	e.g.	di[ɣ]no, o[β ^ϕ]tener, é[θ ^δ]nico
-assim,+devoi	e.g.	di[x]no, o[ϕ]tener, é[θ]nico

This classification supposes - perhaps incorrectly - that continuancy is the primary stylistic correlate. In Type 1, all obstruents are [-cont]. In Type 2, [+voice] obstruents are [+cont], but [-voice] obstruents are [-cont]. In Type 3, all obstruents are [+cont], regardless of voicing (see 194).

(194) Values for [cont] of obstruents in three speech types

	[+voice]	[-voice]
Type 1	-	-
Type 2	+	-
Type 3	+	+

Within each speech type, obstruents may additionally assimilate or devoice (but not necessarily both, as these processes are potentially in opposition). Alternately, they may fail to assimilate or devoice, in which case they are realized faithfully to their underlying voicing, free of voicing contours.

3.3.5.1 Type 1

In Type 1, all obstruents are realized as [-cont]. To constrain the value of the feature [cont] in the output, we begin with four constraints **CONT**, **OBS[-cont]**, **IDENT [voice]**, and **IDENT [cont]**. **CONT** is active only in environments preceded by a segment specified for [cont]. In other positions, such as phrase-initially, there is no preceding segment to spread its feature [cont]. In such cases, the [-cont] allophone is enforced by **OBS[-cont]**, which is ranked high. This same constraint ensures that every voiced obstruent surfaces with a specification for [cont]; the default feature value is minus.

OBS[-cont] competes with **CONT** insofar as **CONT** produces voiced continuants and **OBS[-cont]** produces voiced stops. How such competition is resolved is determined by the relative ranking of these constraints. In Type 1 speech, which is characterized by [-cont] obstruents, **OBS[-cont]** must dominate **CONT**, as shown in (195).

(195) Type 1: *digno*

	/digno/	OBS [-cont]	CONT
☞	a. díg.no.		*
	b. díy.no.	*!	

Other candidates, which satisfy **CONT** but display voicing unfaithfulness, violate **IDENT [voice]**, which must rank above **CONT** in the Type 1 ranking (see 196).

(196) Type 1: *digno*

/digno/	OBS [-cont]	IDENT [voice]	CONT
☞ a. díg.no.			*
b. díy.no.	*!		
c. dík.no.		*!	
d. díx.no.	*!	*	

Because [+voice] obstruents are unspecified for the feature [cont] underlyingly, they are made [+cont] at no expense. The [-voice] obstruents are [-cont] underlyingly. In Type 1 speech, these obstruents satisfy both OBS[-cont] and IDENT [cont]. Voicing contours are blocked by the constraint *COMP-SEG, which may rank above or below LIC-LARYN, but not above IDENT [voice]. If *COMP-SEG were to rank above IDENT [voice], then totally voicing assimilation would be permitted. Note that the [-voice] obstruent /t/ in *ético* is of no interest to CONT, which monitors only obstruents which are [+voice]. The only constraint violated by the optimal candidate in tableau (197) is LIC-LARYN.

(197) Type 1: *ético*

/ético/	OBS [-cont]	IDENT [voice]	*COMP-SEG	LIC-LARYN
☞ a. ét.ni.ko.				*
b. ét ^d .ni.ko.			*!	
c. éd.ni.ko.		*!		
d. éθ ⁰ .ni.ko.	*!		*	
e. éð.ni.ko.	*!	*		
f. éθ.ni.ko.	*!			*


In order for voicing assimilation to be allowed in Largo speech, LIC-LARYN must dominate IDENT [voice]. This ranking ensures that the laryngeal node of a coda consonant is parsed by a syllable onset. Because voicing assimilation is only partial, it is maintained that the FC *COMP-SEG ranks below both IDENT [voice] and LIC-LARYN, and that the ranking IDENT [voice] » LIC-LARYN is invariable (198).

(198) Type 1 (with voicing assimilation): *étnico*

/étniko/	OBS [-cont]	IDENT [voice]	LIC-LARYN	*COMP-SEG
☞ a. ét.ni.ko.			*!	
b. ét ^d .ni.ko.				*
c. éd.ni.ko.		*!		
d. éθ ⁰ .ni.ko.	*!			*
e. éð.ni.ko.	*!	*		
f. éθ.ni.ko.	*!		*	

Devoicing is achieved by ranking *C/OBS[+voice] above IDENT [voice]. Because devoicing is variable, it is argued that *C/OBS[+voice] is an FC in this dialect. Ranked above IDENT [voice], devoicing is ensured. Ranked below, underlying voice specifications are respected (199).

(199) Type 1 (with devoicing): *digno*

/digno/	OBS [-cont]	*C/OBS [+voice]	IDENT [voice]	LIC-LARYN
a. díg.no.		*!		
b. díγ.no.	*!	*		
 c. dík.no.			*	*
d. díx.no.	*!		*	*
e. díx ^y .no.	*!	*	*	
f. dík ^g .no.		*!	*	

3.3.5.2 Type 2

In the present analysis, Type 2 speech is characterized by the presence of voiced [+cont] obstruents. In Type 1, all obstruents were uniformly realized [-cont] by the constraint OBS[-cont], which ranked above both IDENT [cont] and CONT. In Type 2, OBS[-cont] ranks below IDENT [cont] and CONT. As a result, [+voice] obstruents are realized [+cont], and [-voice] obstruents remain faithful to their underlying specification [-cont] (see 200 and 201).

(200) Type 2: *obtener*

/obtener/	IDENT [voice]	CONT	OBS [-cont]

a. ob.te.nér.		*!	
☞ b. oβ.te.nér.			*
c. oΦ.te.nér.	*!		*
d. op.te.nér.	*!	*	

(201) Type 2: *ético*

/ético/	IDENT [voice]	IDENT [cont]	OBS [-cont]
☞ a. ét.ni.ko.			
b. éθ.ni.ko.		*!	*
c. éð.ni.ko.	*!		*
d. éd.ni.ko.	*!		

Voicing assimilation and devoicing are achieved in Type 2 using the same FC movements as in Type 1 speech. Voicing assimilation is accomplished by ranking the FC *COMP-SEG below LIC-LARYN. The ranking *C/OBS[+voice] » IDENT [voice] effects devoicing (see 202 and 203).

(202) Type 2 (with voicing assimilation): *obtener*

/obtener/	IDENT [voice]	CONT	OBS [-cont]	LIC-LARYN	*COMP-SEG
a. ob.te.nér.		*!		*	
b. oβ.te.nér.			*	*!	

c. o ϕ .te.nér.	*!		*		
d. op.te.nér.	*!	*			
e. ob ^p .te.nér.		*!			*
f. o β^{ϕ} .te.nér.			*		*

(203) Type 2 (with devoicing): *obtener*

/obtener/	*C/OBS [+voice]	IDENT [voice]	CONT	OBS [-cont]	LIC- LARYN
a. ob.te.nér.	*!		*		*
b. o β .te.nér.	*!			*	*
c. o ϕ .te.nér.		*		*	
d. op.te.nér.		*	*!		
e. ob ^p .te.nér.	*!		*		
f. o β^{ϕ} .te.nér.	*!			*	

3.3.5.3 Type 3

As shown earlier, Type 3 speech is characterized by the realization of all [+voice] obstruents and coda [-voice] obstruents as [+cont]. In Type 2, [+cont] assimilation to [+voice] obstruents is enforced by the constraint CONT. This same constraint, however, disregards any segment which is not [+voice] underlyingly. For this reason, the [-voice] obstruents are left [-cont] in Type 2.

In Type 3, the effect of CONT is supplemented by an FC referred to here as *C/OBS[-cont]. Recall from the discussion of the coda condition in Portuguese that this MARK constraint ensures that all coda obstruents, regardless of voicing heritage, are realized [+cont]. It is in conflict with IDENT [cont] and OBS[-cont], and in Type 3 must outrank both of these

constraints. In order to account for the fact that the realization of [-voice] obstruents as [+cont] varies according to style, it is maintained that *C/OBS [-cont] is an FC (see 204).

(204) Type 3: *ético*

/ético/	IDENT [voice]	*C/OBS [-cont]	IDENT [cont]	OBS [-cont]	*COMP- SEG	LIC- LARYN
a. ét.ni.ko.		*!				*
b. ét ^d .ni.ko.		*!			*	
c. éd.ni.ko.	*!	*				
d. éθ ⁰ .ni.ko.			*	*	*!	
e. éð.ni.ko.	*!		*	*		
f. éθ.ni.ko.			*	*		*

In Type 3, voicing assimilation and devoicing are achieved as in Largo and Andante, respectively, by promoting LIC-LARYN above *COMP-SEG, and *C/OBS[+voice] above IDENT [voice] (see 205 and 206).

(205) Type 3 (with voicing assimilation): *ético*

/ético/	IDENT [voice]	*C/OBS [-cont]	IDENT [cont]	OBS [-cont]	LIC- LARYN	*COMP- SEG
a. ét.ni.ko.		*!			*	
b. ét ^d .ni.ko.		*!				*
c. éd.ni.ko.	*!	*				
d. éθ ⁰ .ni.ko.			*	*		*
e. éð.ni.ko.	*!		*	*		

f. éθ.ni.ko.			*	*	*!	
--------------	--	--	---	---	----	--

(206) Type 3 (with devoicing): *obtener*

/obtener/	*C/OBS [+voice]	IDENT [voice]	*C/OBS [-cont]	CONT	OBS [-cont]	LIC- LARYN
a. ob.te.nér.	*!		*	*		*
b. oβ.te.nér.	*!				*	*
c. oϕ.te.nér.		*			*	
d. op.te.nér.		*	*!	*		
e. ob ^p .te.nér.	*!		*	*		
f. oβ ^ϕ .te.nér.	*!				*	

The putative rankings for the three speech Types are provided in (207) and (208). Mainly for ease of exposition, it has been maintained that the styles differ in their handling of obstruents and the assignment of the feature [+cont] (recall diagram 194). The other processes, which include voicing assimilation and devoicing, are shown without style association, although it is understood that these are connected speech processes are more likely to occur in Andante and Allegretto than in Largo style.

(207) Main variable rankings

a. Type 1 All obstruents are [-cont] in all contexts.

OBS[-cont] » CONT, IDENT [cont]

b. Type 2 All [+voice] obstruents are [+cont] after [+cont].

CONT » OBS[-cont] , *C/OBS[-cont]

- c. Type 3 All [+voice] obstruents and coda [-voice] obstruents are [+cont].

*C/OBS[-cont] » CONT, IDENT [cont], OBS[-cont]

(208) Other stylistic rankings

- a. No voicing assimilation, no devoicing

Obstruents do not assimilate [voice].

Obstruents are realized faithfully to underlying [voice].

IDENT [voice] » *C/OBS[+voice] , LIC-LARYN

- b. Voicing assimilation but not devoicing

All obstruents (partially) assimilate [voice] of following C.

IDENT [voice] » *C/OBS[+voice] » LIC-LARYN » *COMP-SEG

- c. Devoicing but not voicing assimilation

All coda obstruents are [-voice].

*C/OBS[+voice] » IDENT [voice]

Although the FCs in question may occupy other positions in the hierarchy, it is assumed that FCs do not float to positions in which they do not effect a distinct output. Thus, if the requirement is for *C/OBS[-cont] to dominate IDENT [cont], CONT, and OBS[-cont] in order for coda continuancy assimilation to be mandated, then it is assumed that *C/OBS[-cont] does not float any higher than the lowest ranking position necessary to satisfy this requirement. Likewise, it does not occupy a ranking position any lower than necessary to produce all the attested outputs. In (209), the minimum flotation range of the three FCs relative to the fully ranked constraints is represented following Reynolds' (1994) schematic model.

Allegretto [mis²mo]

When voicing assimilation occurs in a dialect of Spanish, it usually follows the partial pattern illustrated in (210). However, assimilation of coda /s/ does not occur in all dialects. In many dialects, assimilation of coda /s/ is suppressed in favor of an altogether different process: aspiration. In simplest terms, an aspirated /s/ is realized as [h]. Some examples of aspiration from Coria Spanish (southern Spain) are provided in (211).

(211) Aspiration of /s/ in Coria Spanish (Cummins 1974: 75-76)

avispa avi[h]pa

escuela e[h]cuela

puesta pue[h]ta

The context for aspiration in a vast majority of dialects is syllable coda. One possible statement of the aspiration rule is as a simple substitution of /s/ for [h], in a syllable “rhyme,” or coda.

(212) Aspiration rule (Harris 1991a: 182)

$$s \rightarrow h / \begin{array}{c} \text{---} \\ | \\ \text{R} \end{array}$$

Although adequate, rule (212) presents aspiration as an arbitrary substitution of one set of features (those of [s]) for another (those of [h]). Why should an unvoiced coronal fricative be replaced by a glottal one? Linear studies of aspiration, such as Guitart (1976), were hard-pressed to identify any difference between [s] and [h] in terms of articulatory complexity, because [s] was generally held to be the least marked continuant cross-linguistically (cf. Chomsky & Halle 1968). As a result, Guitart’s approach to aspiration data for Havana Spanish in his landmark study of segmental markedness was quite tentative:

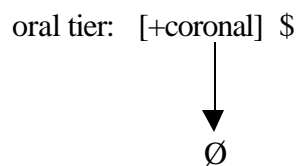
Segmentally, [/s/] is no more complex than any other nonsyllabic segment, e.g. it is no more complex than /p, t, k, n/, which along with /s/ are the least complex nonsyllabics; ... Why, then, should /s/ be replaced in syllable- and word-final position by a segment that is perceptually inferior, i.e. more marked? For [h] is not as noisy as [s], not as intense, etc. (73-74).

His proposed solution, although sketchy, was in fact directly in line with the now well-accepted autosegmental analysis:

Perhaps it could be argued that [h] is less complex, i.e. more natural, than either [s] or [f] from a physiological point of view. In the first place, one would think of the greater noise intensity of both [s] and [f] vis-à-vis [h] is the product of a relatively greater degree of articulatory effort. Secondly, it seems that the production of either [s] or [f] is mechanically a more complex process than that of [h], for in the stridents there is an additional obstacle involved: the lower teeth in [s] (in addition to the constriction made by the tongue) and the upper teeth in [f]... (74) .

Goldsmith (1979), one of the first major autosegmental studies of aspiration, assimilation, and positional neutralization in Spanish, formalizes this very point. Appealing to the nodular structure of /s/, Goldsmith describes /s/-aspiration not as an inexplicable feature substitution, but rather as place node delinking. His original autosegmental formulation of aspiration is shown in (213).

(213) Aspiration (Goldsmith 1979: 8)

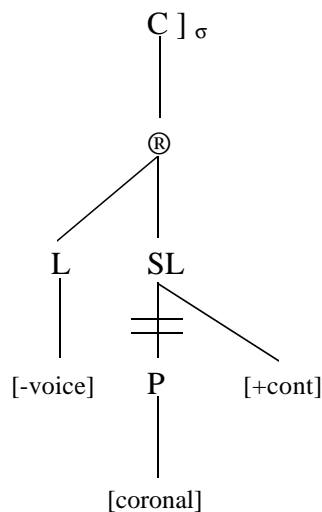


This formulation makes a significant generalization, one which embodies the descriptive elegance of autosegmental phonology as well as the essence of Guitart's original proposal. Rule (213) targets not the segment but rather a *subsegment* thereof: the [coronal] place node. Deletion of this feature leaves only the laryngeal features of the segment, which occupy a separate tier from the oral tier. The result of the rule is a “placeless” fricative, a specification consistent with [h]. In support of his analysis, Goldsmith offers the following argument:

...[T]here is no clue as to why the change is from s to h rather than z, say, or t, or any relatively common segment. I should like to say that the element which the underlying s becomes is not one specifically marked as having a wide open oral gesture; rather ... we should say that the [h] is simply the feature of voiceless glottal friction and [we should] leave the other nonsignificant features unspecified' (7).

Hualde's (1989a: 38) formulation of aspiration as a delinking rule is shown in (214).

(214) Aspiration (delinking of place node) (cf. Hualde 1989a: 38)



In rule (214), a segment which is [+coronal, -voice, +continuant] delinks its supralaryngeal node (SL). Structural dependents of this node include the place node (P) and

the manner feature [+cont]. Without its place node, the resulting segment is marked simply as a voiceless laryngeal continuant; this is the specification for [h].²⁵

3.4.1 Some aspiration varieties

The process of /s/ aspiration and deletion discussed in this section is generally considered typical of southern Spain (Andalucía) and the coastal regions of Latin America. Many varieties of aspiration are found across the range of dialects. In Peninsular Spanish, aspiration has three main manifestations. In addition to involving the delinking of a coda /s/ place feature (as is the case in Coria Spanish, see 211), it is possible for aspiration to entail gemination, and even a combination of aspiration and gemination. Alzar (1955: 291) provides examples of these three types, all of which can be heard in central Spain (see 215).

(215) Three aspiration varieties in Peninsular Spanish (Alzar 1955: 291; cf. also Hualde 1989a: 39)

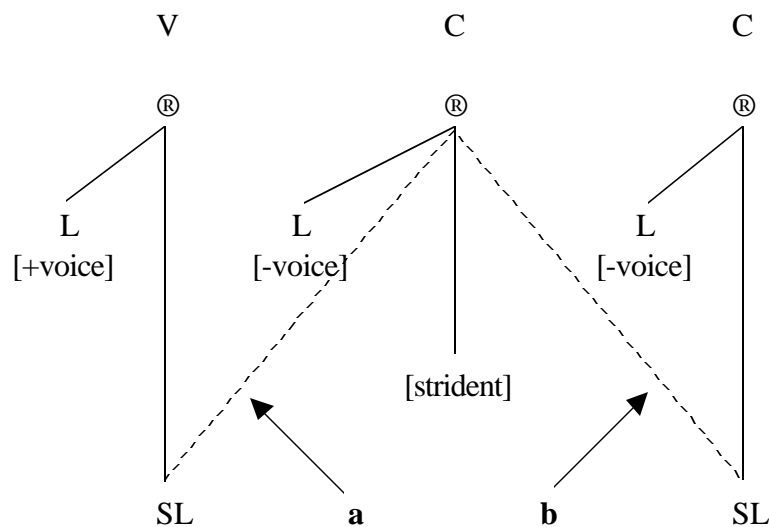
	<i>los pies</i>	<i>dos toros</i>	<i>las casas</i>
A	lo[h] pie[h]	do[h] toro[h]	la[h] casa[h]
B	lo ^[hp] pie[h]	do ^[ht] toro[h]	la ^[hk] casa[h]
C	lo[p] pie[h]	do[t] toro[h]	la[k] casah

²⁵ Hualde (1989a) and Lipski (1986) both note that in dialects which distinguish between two unvoiced coronal fricatives, such as Castilian, both fricatives may undergo aspiration in syllable coda; thus *diez* → die[θ] without aspiration, die[h] with aspiration (Hualde 1989a: 38). Hualde claims that in his native Peninsular dialect, the unvoiced velar fricative /x/ also participates in aspiration syllable-finally; thus *reloj* → relo[h]. For further discussion of /s/-aspiration in Spanish, the reader is directed to Ma & Herasimchuk (1971); Cedergren (1973); Goldsmith (1979); Poplack (1980); Terrell (1981); Lipski (1986); Hualde (1989a; 1991); Harris (1991); Widdison (1997); and others.

In Variety A, typical of Coria, aspiration occurs following rule (214), and no further rules apply. Variety B, which is the common mode of aspiration in Cúllar Baza, is a combination of aspiration and supralaryngeal assimilation. Variety C, which is heard sporadically in Cúllar Baza, is not aspiration at all, but rather total assimilation (gemination) of the /s/ to the following consonant.

Hualde (1989a) suggests that the phonetic [ʰ] in Variety B is the result of a voicing contour on the preceding vowel, rather than the result of a place contour on the consonant [s]. Diagram (216) shows the rule responsible for this effect.

(216) Aspiration (after Hualde 1989a: 42; cf. also Hualde 1989b: 188)



(a, b, or a and b)

Rule (216) actually incorporates two rules which may occur separately or in combination. In either instance, a coda /s/ (coda position can be surmised phonotactically and need not be expressed in the rule) acquires the supralaryngeal node of an adjacent segment, either a vowel to the left or a consonant to the right. If it acquires the supralaryngeal node of the vowel to its left, the result is [h]. This is the case in lo[h] pie[h] (Variety A). If it acquires the

supralaryngeal node of the consonant to its right, the result is a geminate: lo[p] pie[h] (Variety C). If it acquires supralaryngeal nodes from *both* adjacent segments, the result is a preaspirated consonant which has assimilated the supralaryngeal node of the following consonant: lo^[hp] pie[h] (Variety B).

3.4.2 Which feature gets left?

Goldsmith's (1979) analysis formalizes aspiration as a structure delinking operation, i.e. one in which feature structure is excluded in the phonetic realization of the segment (recall rule 213). The logical conclusion, then, is that aspiration is not a feature substitution, but rather a process of structural simplification. The phonetic output [h] is "simpler" than the input segment /s/ because it has less structure: specifically, /s/ has a place node, and [h] does not. This approach to the problem allows [h] to be formalized as less marked than /s/.

In a series of instrumental studies, Widdison (1997) discovered that the perceptual cue for /s/ was physically present in both unaspirated and aspirated words. In words which contain a phonetic /s/, this segment is preceded by glottal widening which slightly overlaps the articulation of the preceding vowel. In words which contain an aspirated /s/, glottal widening is preserved in absence of the phonetic [s].

The glottal widening is an acoustic subcomponent of the /s/ gesture which becomes acoustically salient only if the coronal constriction is removed by aspiration, as Widdison claims:

The key point is that the aspiration accompanies a fully specified /s/ and reassociation of [h] with the previous vowel occurs not as a stage of production, but as an error in perception (259).

What is the acoustically salient feature underlying both /s/ and /h/? One shared natural class is [+continuant], but vowels are part of this class also. Given Widdison's observations

about the overlap of aspiration on the preceding vowel, it does not follow that aspiration could be merely the superimposition of one feature [+continuant] upon another.

It cannot be the feature [strident], because /s/ is [+strident] and [h] is [-strident] (cf. Durand 1990: 57).

The feature associated with aspiration, shared by /s/ and /h/, is [+spread glottis] (henceforth [+SG]), an articulator feature dependent of the laryngeal node. Kenstowicz (1994: 39) identifies this feature as the one associated with aspiration of voiceless stops in English, thus the aspirated [p^h] in English *pin* is [+SG] but the unaspirated [p] in *spin* is [-SG]. Kenstowicz indicates that the feature [+SG] represents the widest possible aperture of the glottis, and is typically associated with consonants, but not vowels.

The phasing of this feature can be represented using phase-window graphics (cf. Browman & Goldstein 1990). Figure (217) shows the orchestration of gestures in unaspirated *pesco*, i.e. [pesko]. Figure (218) shows the orchestration of gestures in aspirated *pesco*, i.e. [pehko]. Both graphics follow essentially from Widdison's (1997) discussion.

(217) Speech score: unaspirated *pesco* [pesko]

Tier	Gestural Score				
Lips	p				
Tongue Tip		s			
Tongue Body		e		k	o
Glottis [+SG]		h			

(218) Speech score: aspirated *pesco* [pehko]

Tier	Gestural Score
Lips	p [shaded]
Tongue Tip	[shaded]
Tongue Body	[shaded] e [shaded] k o
Glottis [+SG]	[shaded] h [shaded]

In (217), the [+SG] gesture is coordinated with the tongue tip gesture /s/. In (218), the tongue tip gesture /s/ is no longer present, yet the [+SG] gesture is retained. In both instances, inexact phasing of the tongue tip and glottal gestures produces a *perceived* [SG] contour on the preceding vowel. Deletion of /s/ entails deletion of the coronal place node as well as the manner feature [+strident], but the feature [+SG] is retained.

3.4.3 An OT account

This analysis will focus on the three aspiration varieties attested in Peninsular Spanish, specifically those of Coria and Cúllar Baza (cf. 215). Representative data are organized in (219). Primary data sources include Alzar (1955) for central Peninsular Spanish, Salvador

(1958) for Cúllar Baza, and Cummins (1974) for Coria. Hualde (1989a) and (1989b) contain discussions of these same data in a generative framework.

(219) Peninsular Spanish aspiration data (Hualde 1989a: 39; cf. Alzar 1955: 291; Salvador 1958: 223; Cummins 1974: 75-76; Martínez-Gil 1991: 558)

	A	B	C
<i>obispo</i>	obi[h]po	obi ^[hp] po	obi[p]po
<i>susto</i>	su[h]to	su ^[ht] to	su[t]to
<i>mosca</i>	mo[h]ca	mo ^[hk] ca	mo[k]ca
<i>esfera</i>	e[h]fera	e ^[hf] fera	e[f]fera
<i>mismo</i>	mi[h]mo	mi[m̥]mo	mi[m]mo
<i>isla</i>	i[h]la	i[ɰ]la	i[ʎ]la
<i>asno</i>	a[h]no	a[ɲ]no	a[n]no

The last three data in (219) provide convincing evidence that Variety B assimilation is not total, but rather of the supralaryngeal node. Because only the supralaryngeal node is spread (recall 216), the underlying [-voice] feature of /s/ is retained, resulting in a [-voice] segment [m̥, ɰ, ɲ], but not a true geminate.

In this analysis, it will be shown that the three dialectal varieties may be described in terms of variable constraint rankings. The selection of [h] as the output of /s/ is determined by the interaction of four MARK constraints: *C/[+strident], *C/[+SG], IIC-ROOT, and HAVE-PLACE; and four FAITH constraints: IDENT [strident], IDENT [SG], DEP-PLACE, and DEP-LINK. These constraints are reviewed in (220).

(220) Constraints involved in /s/-aspiration

*C/[+strident]

“No coda [+strident] segments.”

This constraint bans any [+strident] segment from coda position. In nonaspirating dialects, such as those of the highland Andes, Mexico City, and Castille, *C/[+strident] is dominated by IDENT [strident], and coda stridents are permitted. In aspirating dialects, *C/[+strident] may dominate IDENT [strident], thereby banning such segments from coda position. (*C/[+strid])

*C/[+SG]

“No coda [+SG] segments.”

Like *C/[+strid], this constraint bans any segment bearing the feature [+SG] from syllable coda. While *C/[+strid] notices only [s], *C/[+SG] is sensitive to both [s] and [h].

LIC-ROOT

“Coda consonants are licensed by an onset root node.”

There are two types of /s/-assimilation which coincide with aspiration (see figure 239). In Variety B, assimilation is incomplete, because voice features are excluded; cf. *mismo* → mi[m̥]mo rather than mi[m]mo (Martínez-Gil 1991: 558). This effect is achieved by ranking IDENT [SG] » *μ/[+SG]. In Variety C, assimilation is total, and the feature [SG] is forcibly unparsed: *mismo* → mi[m]mo. This effect is achieved by the ranking *μ/[+SG] » IDENT [SG]. LIC-ROOT is itself ranked low in the hierarchy, and acts only as a tiebreaker.

IDENT [strident]

“The value of [strident] may not change.”

This constraint monitors faithfulness of the feature [strident] on segments specified for this feature, specifically /s/. (IDENT [strid])

IDENT [spread glottis]

“The value of [spread glottis] may not change.”

Bans changes to the feature [spread glottis], born underlyingly by /s/ and all unvoiced fricatives, including [h]. (IDENT [SG])

DEP-PLACE

“No place node insertion.”

Unlike IDENT [place], which ensures that underlying place nodes do not change, DEP-PLACE monitors surface place nodes for faithfulness to their input correspondents. As a result, DEP-PLACE is violated by any place node change. However, the deletion of a place node, as occurs in Variety A aspiration (/s/ → [h]), does not violate DEP-PLACE.

HAVE-PLACE (cf. Itô, Mester & Padgett 1994)

“No placeless segments.”

DEP-LINK

“No nonunderlying structural association lines.”

In the following OT analysis, the MARK constraints *C/[+strid], *C/[+SG], and HAVE-PLACE are FCs. The ranking of these three constraints relative to the FAITH constraints IDENT [strid], IDENT [SG], DEP-PLACE, and DEP-LINK, which are fixed, determines the range of output realizations of coda /s/. Note that LIC-ROOT, a MARK constraint, is fixed.

The constraints IDENT [strid] and *C/[+strid] are in competition. As an FC, *C/[+strid] may rank either above or below IDENT [strid]. The ranking IDENT [strid] » *C/[+strid] enforces feature faithfulness and is the ranking associated with Largo style. The ranking *C/[+strid] » IDENT [strid] bans any [+strident] segment from coda position (see 221 and 222).

(221) Largo (Varieties A, B, C): *susto*


	/susto/	IDENT [strid]	*C/[+strid]
☞	a. sú.s.to.		*
	b. sú.h.to.	*!	

(222) Allegretto (Variety A): *susto*

	/susto/	*C/[+strid]	IDENT [strid]
	a. sú.s.to.	*!	
☞	b. sú.h.to.		*

In tableau (222), which shows candidate evaluation for Allegretto, candidate (b) is not the only possible candidate which satisfies *C/[+strid]. The replacement of coda /s/ by *any other* [-strident] segment would satisfy *C/[+strid] and therefore be a possible output. However, the only alternate to [s] in this position is [h], indicating that IDENT [SG] dominates *C/[+strid]. This ranking states that the underlying [+SG] feature must be retained, and prohibits the gratuitous substitution of some other [-strid] segment, such as [t] or [p] (see 223).

(223) Allegretto (Variety A): *susto*


/susto/	IDENT [SG]	*C/[+SG]	*C/[+strid]	IDENT [strid]
a. sú.s.to.		*	*!	
 b. sú.h.to.		*		*
c. sú.t.to.	*!			*
d. sú.p.to.	*!			*

The retention of [+SG] at some other point of articulation, such as /f/, violates *C/[+strid] as well as DEP-PLACE (see 224 and 225).

(224) Largo (Varieties A, B, C): *susto*


/susto/	IDENT [SG]	*C/[+SG]	IDENT [strid]	*C/[+strid]	DEP-PLACE
 a. sú.s.to.		*		*	
b. sú.h.to.		*	*!		
c. sú.f.to.		*		*	*!
d. sú.t.to.	*!		*		
e. sú.θ.to		*	*!		*

(225) Allegretto (Variety A): *susto*

/susto/	IDENT [SG]	*C/[+SG]	*C/[+strid]	IDENT [strid]	DEP- PLACE
a. sú.s.to.		*	*!		
 b. sú.h.to.		*		*	
c. sú.f.to.		*	*!		*
d. sú.t.to.	*!			*	
e. sú.θ.to.		*		*	*!


It must be assumed in Largo and Allegretto that MAX-IO dominates both *C/[+strid] and IDENT [strid]; otherwise coda [+strident] segments are subject to deletion rather than aspiration (see 226).

(226) Allegretto (Variety A): *susto*

/susto/	MAX-IO	IDENT [SG]	*C/[+SG]	*C/[+strid]	IDENT [strid]
a. sú.s.to.			*	*!	
 b. sú.h.to.			*		*
c. sú.t.to.		*!			*
d. sú<s>.to.	*!				

In all Varieties, LIC-ROOT ranks below IDENT [strid] and DEP-PLACE. In (227), LIC-ROOT is inactive on the candidate set.


(227) Allegretto (Variety A): *susto*

/susto/	IDENT [SG]	*C/[+SG]	*C/ [+strid]	IDENT [strid]	DEP- PLACE	LIC- ROOT
a. sú.s.to.		*	*!			*
 b. sú.h.to.		*		*		*
c. sú.t.to.	*!			*		
d. sú.f.to.		*	*!		*	*
e. sú.θ.to.		*		*	*!	*

The constraint rankings examined so far in the above tableaux (221)-(227) represent a Variety A dialect (cf. 215). In this dialect class, aspiration occurs without concomitant gemination; thus the assimilated candidates [sú^{ht}.to.] and [sút.to.] are banned (see 228). In evaluation, the candidate [sú^{ht}.to.] is tied with [súh.to.] for satisfaction of IDENT [strid] because both retain this feature, but DEP-LINK serves as a tiebreaker and forces [sú^{ht}.to.] to be rejected. The candidate [sút.to.], as we have already seen, is suppressed because it violates IDENT [SG] (see 228).



(228) Allegretto (Variety A): *susto*

/susto/	IDENT [SG]	*C/ [+SG]	*C/ [+strid]	IDENT [strid]	DEP- PLACE	LIC- ROOT	DEP- LINK
---------	---------------	--------------	-----------------	------------------	---------------	--------------	--------------

a. sú.s.to.		*	*!			*	
 b. súh.to.		*		*		*	
c. sút.to.	*!			*			*
d. sú ^{ht} .to.		*		*		*	*!

If Variety A is characterized by the low ranking of *C/[+strid] and *C/[+SG] relative to the faithfulness constraints IDENT [SG] and IDENT [strid], then Varieties B and C may be characterized by the reversal of these same rankings. However, tableau (229) shows that the mere reversal of these two constraints is insufficient to select the desired Variety B or C candidates.

(229) Allegretto (Variety B): *susto*

/susto/	IDENT [SG]	*C/ [+SG]	*C/ [+strid]	IDENT [strid]	LIC- ROOT	DEP- LINK
a. sú.s.to.		*	*!		*	
 b. súh.to.		*		*	*	
c. sút.to.	*!			*		*
 d. sú ^{ht} .to.		*		*	*	*!

This problem may be solved by the intervention of HAVE-PLACE, which requires that all segments have place nodes, effectively banning all [h]. If HAVE-PLACE is ranked above DEP-LINK, then the desired Variety B candidate is selected (see 230).

(230) Allegretto (Variety B): *susto* (revised)

/susto/	IDENT [SG]	*C/ [+SG]	*C/ [+strid]	IDENT [strid]	LIC- ROOT	HAVE- PLACE	DEP- LINK
a. sú.s.to.		*	*!		*		
b. sú.h.to.		*		*	*	*!	
c. sú.t.to.	*!			*			*
☺ d. sú ^{ht} .to.		*		*	*		*


In Variety A, the ranking of HAVE-PLACE and DEP-LINK is reversed so as to enable the optimal candidate [míh.mo.] (see 231).

(231) Allegretto (Variety A): *susto* (revised)

/susto/	IDENT [SG]	*C/ [+SG]	*C/ [+strid]	IDENT [strid]	LIC- ROOT	DEP- LINK	HAVE- PLACE
a. sú.s.to.		*	*!		*		
☞ b. sú.h.to.		*		*	*		*
c. sú.t.to.	*!			*		*	
d. sú ^{ht} .to.		*		*	*	*!	


In order for gemination to be enforced (Variety C), *all* coda [+SG] segments must be uniformly banned. However, there is no way to suppress desired candidate (231d) (which contains a coda [+SG] feature) in favor of (231c) (which does not) using only the five constraints on hand. One solution is to invoke the FC *C/[+SG] which, like the FC *C/[+strid], bans a specifically-valued distinctive feature from syllable coda. Ranked above IDENT [SG], *C/[+SG] commands the substitution of a [-SG] segment in all syllable coda positions (see 232).

(232) Allegretto (Variety C): *susto*

/susto/	*C/[+SG]	IDENT [SG]	*C/ [+strid]	IDENT [strid]	DEP-LINK
a. sú.s.to.	*!		*		
b. sú.h.to.	*!			*	
 c. sú.t.to.		*		*	*
d. sú ^{ht} .to.	*!			*	*
e. sú.f.to.	*!		*		
f. sú.θ.to.	*!			*	

The segment chosen as the output of /s/ in this instance is not arbitrary; rather, it is a geminate consonant. Everything else being equal, the identity of the output segment is selected by LIC-ROOT, which acts as a tiebreaker among any number of candidates which satisfy *C/[+SG] (see 233).

(233) Allegretto (Variety C): *susto*

/susto/	*C/ [+SG]	IDENT [SG]	*C/ [+strid]	IDENT [strid]	LIC- ROOT	HAVE- PLACE	DEP- LINK
a. sú.s.to.	*!		*		*		
b. súh.to.	*!			*	*	*	
 c. sú.t.to.		*		*			*
d. sú ^{ht} .to.	*!			*	*		*
e. súf.to.	*!		*		*		
f. súθ.to.	*!			*	*		
g. súk.to.		*		*	*!		
h. súp.to.		*		*	*!		

If *C/[+SG] is ranked below IDENT [SG], then the preaspirated (Variety B) variant is indicated (see 234).

(234) Allegretto (Variety B): *susto*

/susto/	IDENT [SG]	*C/ [+SG]	*C/ [+strid]	IDENT [strid]	LIC- ROOT	HAVE- PLACE	DEP- LINK
a. sú.s.to.		*	*!		*		
b. súh.to.		*		*	*	*!	

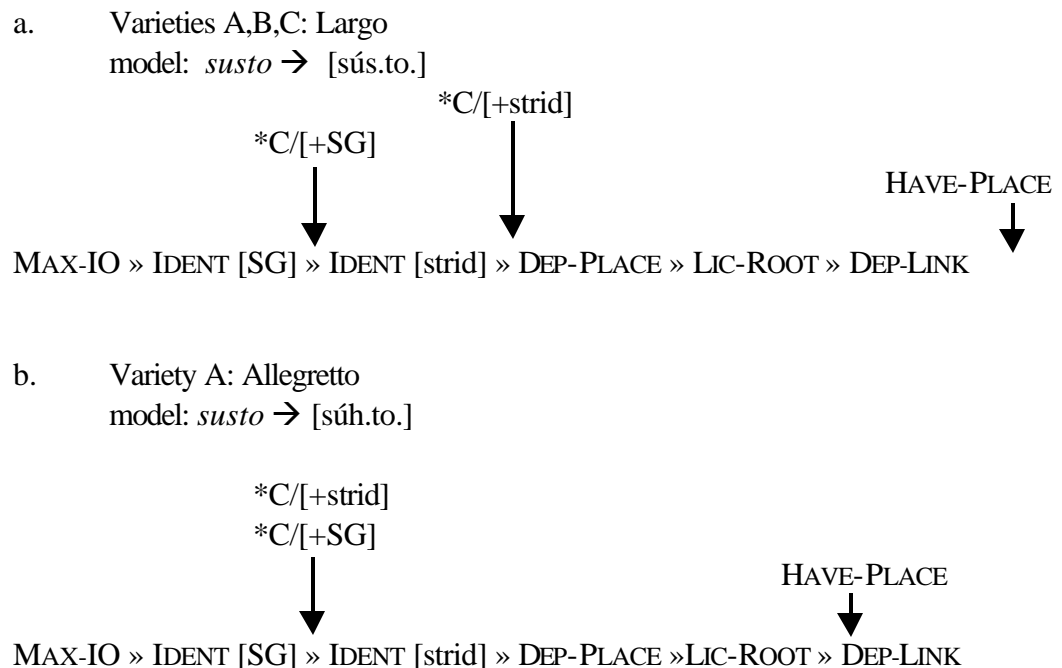
c. sú.to.	*!			*			*
d. sú ^{ht} .to.		*		*	*		*
e. súf.to.		*	*!		*		
f. súθ.to.		*	*!	*	*		
g. súk.to.	*!			*	*		

This OT analysis of aspiration makes use of three FCs: $*C/[+strid]$, $*C/[+SG]$, and HAVE-PLACE. The first two constraints ban specific values of specific distinctive features from syllable coda. HAVE-PLACE requires that segments have place nodes. Ranked above DEP-LINK, assimilation is enforced. Ranked below, placeless [h] is allowed.

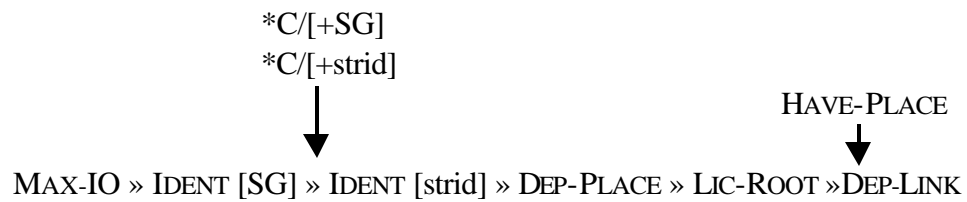
Details of variation with regard to aspiration are determined by the ranking of these FCs - which are MARK constraints - to the FAITH constraints IDENT [strid], IDENT [SG], DEP-LINK, and DEP-PLACE.

To summarize the principle rankings required to account for the three dialectal varieties of aspiration, putative hierarchies are provided in figure (235).

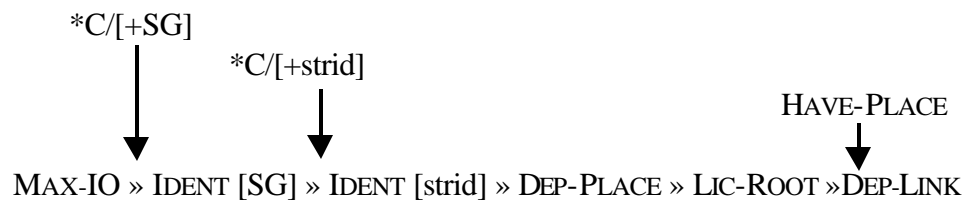
(235) Putative constraint hierarchies: /s/-aspiration



c. Variety B: Allegretto
 model: *susto* → [sú^ht.to.]

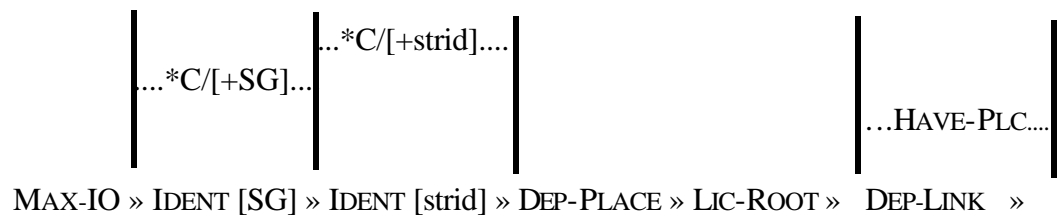


d. Variety C: Allegretto
 model: *susto* → [sút.to.]



The putative rankings in (235) may be combined into a single diagram, with the three FCs specially marked, along with their minimum range of flotation within the hierarchy (see 236).

(236) Fully and partially ranked constraints in /s/-aspiration



3.5 Summary

In this chapter I applied the FC theory of variation to several phonological processes which affect consonants. The first process, nasal and lateral place assimilation, was attributed to the interaction of the constraint LIC-PLACE with IDENT [place]. LIC-PLACE ensures that coda consonants are licensed by the place node of a following syllable onset consonant, thereby requiring pplace node spreading in such contexts. The variability of place node spreading was accounted for by the ranking of the FC LIC-PLACE relative to ALIGN. If LIC-PLACE is ranked below ALIGN, then assimilation is blocked across morpheme boundaries. If LIC-PLACE is ranked above ALIGN, then assimilation is enforced. The ranking LIC-LARYN » IDENT [place] is constant, and expresses the fact that place assimilation is unmarked and also invariable within morphemes. *COMP-SEG, also an FC, constrains assimilated outputs. Ranked above IDENT [place], total assimilation is enforced. Ranked below, however, partial assimilation (overlap) is enforced.

It was shown that in place assimilation contexts, the place node is always spread from a syllable onset to the preceding coda consonant, never vice-versa. The constraint ONS-PLACE acts as a “special case” IDENT [place] constraint which must dominate LIC-PLACE regardless of speech style in order for the correct *direction* of assimilation to be enforced.

In most dialects of Spanish, nasal place assimilation poses an additional problem for consideration because it is often preempted by nasal neutralization, here also called velarization (V) or alveolarization (A). As the names suggest, these processes neutralize word final nasals in favor of a particular place of articulation. In V-dialects, such as Havana Spanish, nasals are typically realized as velar - i.e. [ŋ] - at the end of a word, regardless of position within the syllable. In A-dialects, such as Castilian, word-final nasals which are also utterance-final are

neutralized to [n]. These data were accounted for by two positive neutralizing constraints: $\text{NAS/COR}]_{\text{morph}}$ for A-dialects, and $\text{NAS/DOR}]_{\text{morph}}$ for V-dialects.

The difference in distribution of neutralized nasals is determined by the ranking of $\text{NAS/DOR}]_{\text{morph}}$ and $\text{NAS/COR}]_{\text{morph}}$ to the already motivated constraint ONS-PLACE . In A-dialects, ONS-PLACE must dominate $\text{NAS/COR}]_{\text{morph}}$, because place neutralization never occurs syllable-initially. In V-dialects, however, $\text{NAS/DOR}]_{\text{morph}}$ dominates ONS-PLACE , because a neutralized word-final nasal before a vowel-initial word is allowed to occupy a surface onset without relinquishing its neutralized place features.

Next, three Peninsular Spanish processes - voicing assimilation, continuancy assimilation, and coda obstruent devoicing - were discussed and analyzed together. Voicing assimilation is driven by the licensing constraint LIC-LARYN . Like LIC-PLACE , LIC-LARYN is a fixed constraint which must always be dominated by IDENT [voice] . The result is a grammar in which obstruents voice-assimilate only partially. Continuancy assimilation was attributed to two constraints: CONT , which targets voiced obstruents, and the FC *C/OBS[-cont] , which targets all coda obstruents. The ranking of *C/OBS[-cont] relative to IDENT [cont] determines whether or not a coda obstruent is realized [+continuant] or faithful to its underlying specification for this feature. Coda obstruent devoicing is achieved by the FC *C/OBS[+voice] , which ranks either above or below its corresponding faithfulness constraint IDENT [voice] . The FC *COMP-SEG bans all feature contours across a single segment. Ranked above LIC-LARYN , it requires that un-voice-assimilated segments be preferred to those which satisfy LIC-LARYN by introducing a voicing contour. These three FCs interact across a broad range of the hierarchy to optimize an equally broad range of output variants, voiced and unvoiced, continuant and noncontinuant, assimilated and unassimilated.

In the final section, I presented an OT analysis of aspiration. In Spain (mostly southern), aspiration is manifested in three varieties. In Variety A, coda /s/ is realized as [h]. In Variety B, coda /s/ is realized as a preaspirated totally-assimilated (but not geminated) consonant. In Variety C, coda /s/ is realized as an unaspirated geminate. In the approach taken

here, aspiration is effected by the constraint pair *C/[+strident] and IDENT [strident]. Depending on the ranking of these constraints, aspiration is either indicated or banned. The constraint pair *C/[+SG] and IDENT [SG] is also instrumental in the selection of candidates. Ranked above IDENT [SG], *C/[+SG] bans not only [s] but also [h] from syllable coda; the identity of the new segment is chosen by the FC LIC-ROOT, which ensures total assimilation - gemination - of the coda consonant, in the event that all candidates are tied for all higher constraints. The aspiration analysis also utilized the two FAITH constraints DEP-PLACE and DEP-LINK to militate against the insertion of a nonunderlying place node or association line, respectively.

As in chapter 2, the FC model enables a unified treatment of categorical and variable processes. Intermediate effects, such as coarticulation (gestural overlap) and partial voicing assimilation, emerge as the result of competition between MARK and FAITH constraints, which may be simultaneously satisfied by introducing a feature contour, such as [-voice] → [+voice] or [coronal] → [labial]. Future work will further develop some of the issues addressed in this chapter, and resolve some of the problems involved in formalizing segmental markedness into positive and negative constraints.

CHAPTER 4

CONCLUDING REMARKS

Since the time this study was initially proposed and undertaken, the “variationist” subfield of OT has developed into a legitimate school of OT research. Those in favor of a variationist program generally espouse the theory proposed by Reynolds (1994), which has since been developed further by Nagy & Reynolds (1997), Kang (1997), Borowsky & Horvath (1997), Van Oostendorp (1997), Rose (1997), Zubritskaya (1997), Anttila (1997), Anttila & Cho (1998), and others. These studies collectively argue for a system in which universal constraints are “floating” or “partially ranked.” Learners of this system posit these incomplete rankings in order to account for patterns of linguistic variation within their dialect, so they can reflect these patterns in their own speech.

Despite the broad scope of some of the studies undertaken so far, none has applied the FC model specifically to a discussion of *speech styles*. It has been maintained throughout this study that speech styles are, in fact, distinct micro-dialects shared among the speakers of a community. Speakers shift between these micro-dialects much as they would between the grammars of separate languages. In the theory developed here, language is inherently variable because its users are inherently in control of the constraint system which determines their language. Language style varies because speakers have, contained entirely within their categorical grammar, a variable grammar within which they may exercise full stylistic control.

In nonvariationist OT studies, it is sufficient to undertake two tasks: 1) identify the set of universal constraints which is active on the data in question; and 2) determine the ranking relations among these constraints. In the present variationist study, it is additionally necessary to specify the *nature of the rankings*, i.e. *categorical or variable*.

This study has examined many different constraint rankings, categorical and variable, together. In general, the constraints examined fall into one of two categories: FAITH(FULNESS) or MARK(EDNESS). Whereas FAITH constraints monitor input-output correspondence at the segmental and subsegmental (i.e. featural) level, MARK constraints are sensitive to prosodic organization at the suprasegmental level, i.e. spanning one or more segments. In the interest of consistency, it was maintained that all variably ranked or “floating” constraints - FCs - are MARK constraints. It is not the case, however, that all MARK constraints are FCs. Indeed, speakers of a language are more or less free to use any MARK constraint as an FC, or to rank it categorically (non-variably).

To summarize the essential claims of the FC theory laid out in this dissertation, I will review some of the constraint types (MARK, FAITH) and ranking types (categorical, variable) treated in this study.

First, to say that a pair-wise ranking of two constraints is categorical in a language means that the ranking holds uniformly in all speech styles; i.e. the reverse ranking is never attested in that language or any of its dialects. One example of a categorical ranking which holds across all dialects of Spanish is the relation V-TO-HEAD » STRESS. This ranking predicts that the shift of word stress (STRESS violation) is permitted *provided that* such shift is local in nature. In other words, if due to pressure from a higher constraint the targeted vowel in a word cannot be stressed, then stress may be shifted to a more suitable vowel as long as the targeted vowel is still contained in the stressed syllable. If stress cannot target the vowel itself, then it must at least target the syllable containing it (see 235).

(235) Cross-dialectal categorical ranking: V-TO-HEAD » STRESS

/menú # antiguo/	V-TO-HEAD	STRESS
☞ a. me.nwán. ...		*
b. mé.nwan. ...	*!	

Because the ranking V-TO-HEAD » STRESS is categorical across all Spanish dialects, there is no situation in any dialect in which the reverse ranking STRESS » V-TO-HEAD obtains, and there are no data to justify such a ranking. It is therefore never possible, in any dialect, for candidate (235b) to be selected as optimal. This does not mean that (235a) is optimal in all dialects, because in many dialects, additional constraints intervene and select alternate outputs which are not shown. Nevertheless, it is sufficient to say that the ranking V-TO-HEAD » STRESS is categorical cross-dialectally in Spanish, because (235b) is not a possible output in *any* dialect.

There are other constraint rankings which are not categorical for the Spanish language as a whole, i.e. they vary across dialects. For example, Peninsular Spanish is characterized by the categorical ranking IDENT [high] » MAX-WI-μ. This ranking states that a word-initial mora may be deleted if such deletion will allow the identity of a feature [high] to be retained. In Chicano Spanish, this ranking is categorically reversed. The reverse ranking states that the value of [high] may be changed in order to avoid word-initial gliding. Note that both rankings are categorical, yet only in their respective dialects (see 236 and 237).

(236) Peninsular Spanish ranking: IDENT [high] » MAX-WI-μ: *de uivitas*

/de # ubitas/	IDENT [high]	MAX-WI- μ
a. dew. ...		*
b. dju. ...	*!	

(237) Chicano Spanish ranking: MAX-WI- μ » IDENT [high]: *de uvitas*

/de # ubitas/	MAX-WI- μ	IDENT [high]
a. dew. ...	*!	
b. dju. ...		*

There are some constraint pairs whose ranking varies not *interdialectally* (as is the case for MAX-WI- μ and IDENT [high]), but rather *intradialectally*. Constraints which are variably ranked within a particular dialect may rank either above or below other constraints, as a function of stylistic control. For example, in all dialects of Spanish, ONSET is variably ranked relative to MAX- μ . This means that in the constraint hierarchy of any Spanish dialect, it may be true that ONSET » MAX- μ or MAX- μ » ONSET. The ranking MAX- μ » ONSET enforces vowel hiatus, and is called the “Largo” (slow/careful speech) ranking. The reverse ranking effects glide formation, and is called the “Allegretto” (fast/casual speech) ranking (see 238 and 239; only the essential candidates and constraints are shown).

(238) Largo: MAX- μ » ONSET: *te adoro*

/te # adoro/	MAX- μ	ONSET
☞ a. te.a. ...		*
b. t _̣ ea. ...	*!	

(239) Allegretto: ONSET » MAX- μ : *te adoro*

/te # adoro/	ONSET	MAX- μ
a. te.a. ...	*!	
☞ b. t _̣ ea. ...		*

In summary, variationist OT allows ranking relations to be classified into three groups: 1) categorical within dialects, categorical across dialects; 2) categorical within dialects, variable across dialects; and 3) variable within dialects. Examples of each group are enumerated in (240).

(240) Categorical within dialects, categorical across dialects

a. Stress shift

V-TO-HEAD » STRESS, MAX-S

Stress shift is local.

b. Nasal manner/place

IDENT [nasal] » IDENT [place]

Nasals may change place, but not manner.

c. Lateral manner/place

IDENT [lateral], LAT/COR » IDENT [place]

Laterals may change place within the [coronal] place node, but may not change manner.

d. Voicing assimilation

IDENT [voice] » LIC-LARYN » *COMP-SEG

Voicing assimilation is partial.

(241) Categorical within dialects, variable across dialects

a. Glides at word boundaries

MAX-WI- μ » HNUC (Standard Mexican Spanish)

Only onglides at word boundaries, regardless of sonority.

HNUC » MAX-WI- μ (Peninsular Spanish)

Onglides or offglides at word boundaries, as sonority dictates.

b. Glide height

HIGLIDE » IDENT [high] (Chicano Spanish)

All glides are [+high].

IDENT [high] » HIGLIDE (Peninsular Spanish)

Glides are faithful to their underlying specification for [high].

c. Stress and merger

MAX-S, STRESS » MAX- μ » MAX-WI- μ » HNUC (Standard Mexican Spanish)

Stressed vowels cannot be glided; offglides are allowed at a word boundary only after a stressed nucleus, regardless of sonority.

HNUC » MAX- μ » MAX-S, STRESS » MAX-WI- μ (Peninsular Spanish)

Stress is invisible in glide formation; onglides or offglides are allowed at word boundaries, as sonority dictates.

d. Vowels at word boundaries

HNUC » MAX-IO , IDENT [high] » IDENT [low] » MAX-WI-μ

(Peninsular Spanish)

Low vowels remain low, mid vowels raise.

MAX-WI-μ , HNUC , IDENT [low] » MAX-IO » IDENT [high]

(Chicano Spanish)

Low vowels delete, mid vowels raise.

e. Nasal Neutralization

NAS/X]_{morph} » ONS-PLACE (V-dialects)

Neutralized nasals may be shoved into surface onset position.

ONS-PLACE » NAS/X]_{morph} (A-dialects)

Neutralized nasals never occur in surface onset position.

(242) Variable within dialects

a. Syllable merger

ONSET » MAX-μ

No vowel hiatus (enforces glide formation).

MAX-μ » ONSET

No glide formation (enforces hiatus).

b. Place assimilation

ALIGN » LIC-PLACE

No place assimilation across word boundaries.

LIC-PLACE » ALIGN

Place assimilation is enforced across word boundaries.

c. Degree of place assimilation

*COMP-SEG » IDENT [place]

Partial place assimilation enforced (no total).

IDENT [place] » *COMP-SEG

Total place assimilation enforced (no partial).

d. Coda obstruent continuancy

*C/OBS[-cont] » IDENT [cont]

All coda obstruents are [+cont].

IDENT [cont] » *OBS[-cont]

Coda obstruents are realized faithfully to underlying [cont].

e. Coda obstruent voicing

*C/OBS[+voice] » IDENT [voice]

All coda obstruents are [-voice].

IDENT [voice] » *C/OBS[+voice]

Coda obstruents are realized faithfully to underlying [voice].

f. Aspiration

IDENT [SG] » *C/[+strident] » IDENT [strident]

Coda [+strident] → [h].

IDENT [SG] » IDENT [strident] » *C/[+strident]

Coda [+strident] is represented faithfully to underlying [strident].

This study has not endeavored to derive probabilistic predictions from the availability of constraint rankings within the grammar, even though such quantifications may be possible. Nor has this study examined in detail the many environmental variables which motivate stylistic variation. Applications of variationist OT to specific types of speech situations are left to future research.

The present study recognizes interspeaker and intraspeaker variation as two inseparable axes in the description of variable speech. The FC theory, originally designed to explain facts of *interspeaker* variation, has been adapted here to account specifically for *intraspeaker* variation, without any special modification. The main advantage of the FC model in the

description of stylistic data is its ability to accurately describe the interaction of categorical and variable processes. The resulting grammar is comprehensive.

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