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Vowel Reduction, Vowel Loss, and Syllable Structure Alteration in Yaitepec Chatino¹⁾

Jeffrey Rasch

1 . Introduction

Greenberg (1950) observed that homorganic consonants (consonants with the same place of articulation) are prohibited from occurring as the first two consonants in Semitic roots. This paper reports on an even stronger constraint in Yaitepec Chatino (YAI), to the effect that no two identical consonants can occur in the same phonological word (in Semitic languages, two homorganic or even identical consonants can co-occur as the first two consonants in a word as long as they are not in the same morpheme), and in cases of co-articulated consonants, coincidence of either place of articulation is sufficient to rule out co-occurrence of two given consonants. Other dialects of Chatino allow co-occurrence of identical or similar consonants to varying degrees. Furthermore, the degree to which a dialect of Chatino allows co-occurrence of identical consonants co-varies with the degree of reduction of historical unstressed first-syllable vowels in its words. In YAI, the reduction of the historical first-syllable vowels has largely resulted in a loss of contrastiveness in that position in the word. This paper is organized as follows. Section 2 outlines the phonological characteristics of YAI. Section 3 describes the consonant co-occurrence constraints and the contexts of the reduced vowel in detail. Section 4 surveys the cross-dialectal variation that reveals the likely diachronic development of the pattern. Finally, Section 5 discusses the theoretical implications of the data.

2 . Overview of the Phonology of Yaitepec Chatino

On first impression, the lexicon of Yaitepec Chatino appears to consist primarily of

monosyllabic morphemes, which are frequently combined to produce compounds. However, the onsets to these syllables are often complex, and it soon becomes clear that when an onset contains two stops, there is always a transitional space, usually voiceless, between them. Usually, this transitional space either has a non-descript, *schwa*-like quality or optionally copies the quality of the vowel at the end of the word. Sometimes, however, it does not, so that its vowel quality must be seen as contrastive. If a vowel does not have the non-descript *schwa*-like quality, then it must be [i]/[i̥].

This synchronic pattern is related to a diachronic development in which almost all first syllables of bi-syllabic words, which were regularly unstressed in the Chatino branch of Zapotecan, had their vowels deleted or reduced, depending on the environment, in YAI. All mono-syllabic words in YAI (and many multi-syllabic words, such as verbs inflected for aspect), may now be grouped into three classes, depending on how they were involved in this development. The first class is that of words with only one vowel, some of which have initial consonant clusters and can be seen from comparative evidence to have lost a vowel, such as *s7en* [sʔɛ̃] ‘place’ (cp. cognates from the Chatino dialects of Panixlahuaca (PAN) *seʔe* ‘place,’ Tataltepec (TAT) *siʔi* ‘place,’ and Zenzontepec (ZEN) *sē7ē* ‘place’). The second class consists of words that have reduced vowels, such as *thwin* [tʔkw̃] ‘road’ and *kwta* [kwʔta] ‘fox’. The reduced vowels in these two words are the voiceless *schwa*, transcribed as [ʔ]. The third class is composed of only a few words with two unreduced syllables, such as *jakwa* [hakwa] ‘four’. The available evidence suggests that *jakwa* contains only one morpheme; therefore, it is an example of a morpheme with two unreduced vowels. Another class of words with two unreduced vowels is comprised of verbs affixed with the derivational causative morpheme *xi-* (with allomorphs *x-* and *s-*), as in *xitzen* [ʃitsɛ̃] ‘P.frighten’, derived from the root *tzen* ‘be afraid’. This morpheme is discussed further in Section 5.

The phonemic inventory of YAI, which is very similar to that described for the closely related PAN dialect in Pride & Pride (1997), is given in Tables 1 and 2:

Table 1: The consonants of Yaitepec Chatino

bilabial	inter-dental	alveolar	alveo-palatal	Palatal	velar	labio-velar	glottal
p ³⁾		t	ty [tʲ]		k	kw [kʷ]	ʔ [ʔ]
		tt ⁴⁾	tty		kk	kkw	
	d ⁵⁾ [ɖ]				g ⁶⁾		
nw [m]		n ⁷⁾	ny [nʲ]				
		ʔn [ʔn]	ʔny [ʔnʲ]				
		l	ly [lʲ]				
		r ⁸⁾ [r]					
		s	x [ʃ]				j [h]
		z	zy [z]				jw [hʷ]
		tz [ts]	ch [tʃ]				jy [jʲ]
w				y			
ʔw [ʔʷ]				ʔy [ʔʲ]			

Table 2: The vowels of Yaitepec Chatino

i	u
e	o
a	

Given the phonemes listed in Tables 1 and 2, five different shapes account for all except for a few of the phonologically independent words that are found to occur in the lexicon:

(a) C V (ʔ) (n)

Examples: *ku* [ku] ‘P.eat,’ *ʔni* [ʔnī] ‘animal,’ *teʔ* [teʔ] ‘cloth,’ *neʔ*² [nēʔ] ‘person,’ *tzun* [tsū] ‘warm,’ *kaʔn* [kōʔ] ‘that (the mentioned).’

(b) n/nw . C V (ʔ) (n)

Examples: *nwta* [ɱda] ‘C.give,’ *nte* [ɱde] ‘here,’ *nkwen* [ɱgʷē] ‘ripe,’ *ntan* [ɱdō] ‘leg,’ *ntten*²⁴ [ɱtē] ‘people,’ *nchaʔ* [ɱtʃaʔ] ‘N.soak.’

(c) C C V (ʔ) (n)

Examples: *sti* [sti] ‘father,’ *xtyiʔn* [ʃciʔ] ‘knee,’ *sla* [sla] ‘sleepiness,’ *xlyu* [ʃlyu] ‘knife,’ *yka* [yka] ‘wood,’ *kya* [kya] ‘tomorrow,’ *tʔna* [tʔnō] ‘poor.’

(d) n/nw . C C V (ʔ) (n)

Examples: *ntla*:²⁴ [ɱdla:] ‘peach,’ *nwsta* [ɱsta] ‘C.break apart,’ *njkwa* [ɱhkʷa] ‘N.count,’ *nsʔi* [ɱsʔi] ‘N.buy,’ *nsweʔn* [ɱswēʔ] ‘N.scald.’

(e) C V_[reduced] . C V (ʔ) (n)

Examples: *tʔwa* [tʔwa] ‘mouth,’ *tkwi* [tʔkwi] ‘difficult,’ *kina* [kʲnɔ] ‘sandal,’ *kila* [kʲla] ‘male,’ *kwsa* [kʷsa] ‘grub,’ *kwtyeʔ* [kʷtʲeʔ] ‘ant,’ *lʔan* [lʔʔn] ‘house.’

(f) n/nw . C V_[reduced] . C V (ʔ) (n)

Examples: *nkiʔni* [ŋkʲiʔni] ‘N.do,’ *ntyga* [ŋdʲga] ‘all,’ *ntʔyaʔ* [ŋdʲʔya] ‘pretty,’ *ntja* [ŋtʲha] ‘lazy,’ *ntjwi* [ŋtʲhwi] ‘N.hit,’ *nkitzaʔ* [ŋkʲtʲsaʔ] ‘N.warn.’

The exceptions to the patterns listed above are the few words with two unreduced vowels, such as *jakwa* [hakwa] ‘four.’ Thus, it may be observed that in general, there is one and only one unreduced vowel in a phonological word in YAI. In the discussion that follows, the vowel or vowels that occur before the unreduced vowel in a word will be said to be in the onset to the word. In these terms, it makes no difference whether or not there is a reduced vowel intervening between two consonants—if they occur before the unreduced vowel, they are in the onset. There are always one or two consonants in the onset, in addition to an optional preceding *n* or *nw*. It is possible to combine the patterns above into a single general formula:

Figure 1: The phonological word template

(n/nw.) (C (V_[reduced] .)) C V (ʔ) (n)

Figure 1 may be understood as a general template for the formation of words in YAI. If one inserts a consonant from Table 1 in each of the positions indicated by ‘C’ and a vowel from Table 2 in the position(s) indicated by ‘V’ (the parentheses indicating optional material), there is a fairly high probability that the resulting form will be an actual word in the language. However, there are additional constraints on the pattern shown in Figure 1, as described in the following section.

3. Constraints on Consonant Co-occurrence

Figure 1 describes the structure of phonological words found in YAI more adequately given the four following additional constraints. First, a glottalized segment can occur only immediately preceding or following an unreduced vowel, but not both preceding and following. That is, words such as *ʔya* ‘N.carry’ and *yaʔ* ‘hand’ exist, but there are no words like *ʔyaʔ*, in which there is a glottal segment both before and after the vowel. Second, a reduced vowel, which is found in the types illustrated in (e) and (f) in Table 3, will be either [i]/[i̥] or [ʔ]/[ʔ̥] (the voicing in

quence, and ‘=’ marks the intersections of consonants, sequences of which would be indistinguishable from single phonemes whose existence is argued for by other evidence; for example, *t-s* would be indistinguishable from the phoneme /*tz*/, and *ʔ-w* would be indistinguishable from the phoneme /*ʔw*/ . However such sequences are viewed, they do not occasion the occurrence of reduced vowels. The intersections of segments that are not found to occur in sequence are left empty.

The empty cells are of particular interest here, as they correspond to the basic observation leading to the conclusion that there are patterned constraints in consonant co-occurrence in YAI. The emptiness of some of the cells in Table 3 is coincidental, and many of the empty cells involve consonants that are rare or that have limited distributions in YAI. However, an important subset of the empty cells reflect the existence of consonant co-occurrence constraints. The existence of these constraints first came to my awareness when I was in the process of eliciting a ‘root dictionary’ for the language. Elicitation of a root dictionary is a procedure designed to facilitate the finding of as many as possible of the lexical items of a language as quickly as possible. The researcher first analyzes the basic phonotactic patterns of the language and then generates a list of all possible words, using permutations of the phonemes limited by the basic phonotactic patterns. The researcher then goes through the list, asking the native speaker whether a given form is indeed a word in the language. In the course of that procedure, the existence of consonant co-occurrence constraints quickly became obvious to me. For example, the template shown in Figure 1 suggested the possibility that *ty + k +* some vowel could be a word, and indeed several exemplars were accepted, such as *tyku* ‘river,’ *tykaʔn* ‘be visible,’ *tykaʔ* ‘(herb species),’ and others. However, *ty (+ reduced vowel) + t +* some vowel was consistently rejected, as was *k (+ reduced vowel) + kw +* some vowel. Subsequent thorough investigation of the data showed that these patterns are consistent: there are no words with *ty + t + V* or *k + kw + V*, and the same is true of several other pairings. It is also remarkable that the coronal stop *t*, for example, co-occurs with almost all of the other consonants in word onsets *except* the coronal stops and affricates, which are *t* itself, *ty*, *tz*, and *ch* (see Table 3). The hypothesis put forward here is that those pairs of consonants, along with many others, do not co-occur in the onsets of words because they are too similar to each other. The non-occurring consonant combinations that are related to a constraint against co-occurrence of similar consonants in the onsets of words are those that would be found in the empty cells with dotted boundaries forming a diagonal from the upper left to lower right of Table 3.

The other observation which is summarized in the table is that the presence or absence of a

reduced vowel between two given consonants that occur in the onset to a word is almost entirely predictable. That pattern is represented in the distinction between an ‘X’ and a ‘+’ in a cell. The presence of an ‘X’ at the intersection of the first consonant *t* and the second consonant *kw* means that in all words that include first *t* and then *kw* in their onsets, a reduced vowel intervenes between the *t* and the *kw*. By contrast, the presence of a ‘+’ at the intersection of the first consonant *t* and the second consonant *l/n* means that in all words that include first *t* and then *l* or *n* in their onsets, there is never a reduced vowel between the consonants. Where there is no reduced vowel, a true consonant cluster occurs. The notation ‘X+’ means that free variation between the presence and absence of a reduced vowel is found.

Examples of words with consonant clusters in their onsets include the following: *7ni* ‘animal,’ *s7en* ‘place,’ *uka7* ‘twin,’ *7ya* ‘tooth,’ *skwe* ‘egg,’ *jwta* ‘cattle,’ *tlo* ‘face,’ *xkwi* ‘basket,’ *wyu7* ‘spider,’ *twe7* ‘evergreen (sp.),’ *xtyi7n* ‘knee,’ *y7a* ‘green,’ *kya* ‘tomorrow,’ *j7ya* ‘bow,’ *yka* ‘wood,’ *tzjo* ‘quail,’ *etc.*

The class of words with reduced vowels is exemplified by the following list: *t7a* [tʔa] ‘fiesta,’ *kta* [kʔta] ‘P.bathe,’ *kwnu7* [kwʔnũʔ] ‘worm,’ *ti7a* [tʔiʔa] ‘water,’ *kita* [kʔita] ‘powder,’ *kwrya7* [kwʔriyaʔ] ‘rich,’ *thwin* [tʔkwĩ] ‘road,’ *ty7i* [tʔʔi] ‘smell,’ *kuta7* [kwʔtaʔ] ‘fox,’ *t7yan* [tʔhyã~tʔhyã] ‘bone,’ *tyku* [tʔku] ‘comb,’ *kwtyi7* [kwʔtʔiʔ] ‘frog,’ *k7un* [kʔũ] ‘deaf,’ *kw7o* [kwʔo] ‘spouse,’ *kwxe* [kwʔʃe] ‘dwarf,’ *ki7o* [kʔo] ‘lime,’ *kwcha* [kwʔʃa] ‘sun,’ *kwya7* [kwʔyaʔ] ‘mushroom,’ *kicha7n* [kʔtʃãʔ] ‘fur,’ *kwji* [kwʔhi] ‘skunk,’ *kila* [kʔla] ‘male,’ *etc.*

Words with free variation in the presence or absence of a reduced vowel include *kisu/ksu* [kʔisu~ksu] ‘avocado,’ and *77an* [7ʔã~7ʔã] ‘house.’ No minimal pairs or other evidence has been found suggesting that the *presence* vs. the *absence* of either of the two reduced vowels is contrastive; the only contrastiveness involving the reduced vowels is in the selection of one as opposed to the other. In terms of contrastivity, then, the presence or absence of a reduced vowel is completely non-contrastive in YAI, while the quality of a reduced vowel when there is one is minimally contrastive; [i]/[i̥] contrasts with [ʔ]/[ʔ̥].

This section has described in some detail the phonological patterns relating to reduced vowels and consonant co-occurrence constraints in YAI. The following section turns to a comparison between YAI and other Chatino dialects, in which vowel reduction and the rules regarding constraints on consonant co-occurrence are different. The comparison reveals that vowel reduction and the existence of consonant co-occurrence constraints correlate in the following way: cross-dialectally, the greater the degree of vowel reduction, the greater the presence of consonant co-occurrence constraints.

4 . Cross-dialectal correlations between vowel reduction and consonant co-occurrence constraints

According to Martín Suárez (p.c.), a native speaker of YAI, The Panixlahuaca dialect of Chatino, PAN, is mutually intelligible with YAI, while the Tataltepec dialect (TAT) presents some difficulties of comprehension for a speaker of YAI, and the Zenzontepec dialect (ZEN) is not easily recognized by speakers of YAI as a dialect of the same language. Having listened to speakers of these four dialects, my impressionistic judgment is that the vowel(s) before the final stressed vowel in a word in ZEN are pronounced more fully than those in the other dialects. Unaccented vowels in TAT are more reduced in their pronunciation than those in ZEN, but less reduced than those in PAN and YAI. The reduced vowels in PAN seem similar to or perhaps slightly fuller than those in YAI, but this judgment is somewhat uncertain because the native speaker of PAN whom I interviewed was living in Yaitepec and had lived there for several years. Such subjective judgments do not form a reliable basis for analysis, but there exists another, documented pattern, namely, the extent to which the quality of a reduced vowel is predictable from the phonological environment in each dialect. If the quality of a vowel is predictable, then the vowel's functional load must be small, as it cannot lead to a contrast between two words except by virtue of its presence or absence. Therefore, it may be reduced or deleted with minimal or no loss of information.

In the following paragraphs, I will show that from a comparative perspective, two patterns, namely the predictability of the quality of the reduced vowel and the existence of consonant co-occurrence constraints, co-vary, among the four dialects, with the impressionistic perception of the degree of phonetic reduction of unstressed vowels. This co-variation is illustrated in the following figure, where a '<' indicates that the language to the left presents the pattern to a lesser degree than does the language to the right, and an '=' indicates that the languages on either side are similar or identical with regard to the pattern:

Figure 2: The cross-dialectal co-variation of patterns related to vowel reduction.

	ZEN		TAT		PAN		YAI
phonetic reduction	X	<	X	<	X	=	X
predictability of quality of reduced vowel	X	<	X	<	X	<	X
consonant co-occurrence constraints	X	=	X	<	X	=	X

4.1. Predictability of the reduced vowel.

In varying degrees across the Chatino dialects, in words containing two vowels, there is a tendency for the vowels to be the same. In the following discussion, I will use the term ‘harmonic vowel’ to refer to a first vowel in a word when that vowel has the same quality as the second vowel. This terminology reflects the assumption that the first vowel, which is unstressed or reduced, tends to have the same quality as the final stressed vowel, rather than *vice versa*. Even in ZEN, in which the unstressed vowels are pronounced more fully than in the other dialects, the selection of an unstressed vowel is slightly limited, in that the vowel /o/ occurs in an unstressed position very rarely when it does not also occur in the stressed position of the same word. In other words, non-harmonic /o/ is very rare in ZEN.

In a list of 863 lexical items in ZEN (from Carleton 1997), all words with non-harmonic vowels were tabulated. The results show that /o/ is significantly less likely to occur as a non-harmonic vowel than are any of the other vowels. As a non-harmonic vowel, /e/ occurs in 74 distinct words, such as *keta* ‘flour’ and *kwelu7* ‘joint’; non-harmonic /a/ occurs in 79, such as *jlaku* ‘crop (of a bird)’ and *kati* ‘delicate’; non-harmonic /u/ occurs in 99, such as *luwe* ‘little’ and *suti* ‘father’; non-harmonic /i/ occurs in 116, such as *jila* ‘fart’ and *lisu* ‘avocado tree’; and non-harmonic /o/ occurs in only 13 distinct words, 6 of which are borrowings from Spanish, such as *kojete* ‘cohetete, firecracker’. Among the seven apparently native words with non-harmonic /o/ are *-yotza* ‘to put, place’ and *lonta7a* ‘Oaxaca.’ The relative rarity of non-harmonic /o/ in ZEN is perhaps not a strong enough pattern in its own right to warrant much discussion, but it is of some interest in light of similar but stronger patterns in TAT, PAN, and YAI.

When words with non-harmonic vowels in a TAT⁹⁾ word list of just over 1,400 items (Pride & Pride 1970) were tabulated, 124 examples were found with non-harmonic /i/ (e.g., *lijyā* ‘cane,’ *quiche* ‘thorn’), 147 with non-harmonic /a/ (*satī* ‘bud,’ *taju* ‘group’), and 231 with non-harmonic /u/ (*tsubi* ‘recent,’ *cute* ‘female’), but only 10 were found with non-harmonic /o/ (*conū* ‘worm,’ *loyuu* ‘the country, the region’), and 6 were found with non-harmonic /e/. Of the six examples with non-harmonic /e/, at least three are Spanish borrowings: *cresiya* ‘corazón, heart,’ *parelya* ‘panela, brown sugar,’ and *scuela* ‘escuela, school.’ One looks suspiciously like a borrowing, *corelya* ‘tlacuache (a type of small mammal).’ The other two words with non-harmonic /e/ are *culexi* ‘butterfly’ and *culexu* ‘vulture,’ which, because of their length and similarity of shape, invite the speculation that they are at least etymologically composed forms, i.e., *cule* + *xi* and *cule* + *xu*. Under this analysis, the /e/’s in these words would have been, at least etymologically, full stressed vowels rather than non-harmonic reduced vowels. The vowel /e/

is somewhat but not particularly rare overall: it occurs in 26 monosyllabic words (*ne* ‘in,’ *quee* ‘stone’), and occurs as the final vowel in 54 multi-syllabic words, in 13 of which it also occurs as a harmonic vowel (*tiye* ‘sour,’ *cube* ‘pig,’ *ndye’e* ‘rooster,’ *ye’e* ‘green’).

In a word list of just over 530 lexical items in PAN (Pride & Pride 1997), non-harmonic /u/ occurs in 111 words (eg. *hlyu’we* ‘wing,’ *kuti* ‘soft’), non-harmonic /i/ occurs in 101 (*tyi’o* ‘salt,’ *ki’ya* ‘bed’), and non-harmonic /a/ occurs in 16 (*katū* ‘pot,’ *ngaten* ‘white’), while non-harmonic /e/ occurs in just one variant form, *te’ĩ~te’ē* ‘*cántaro* (a type of clay pot)’ and non-harmonic /o/ occurs in just one word, a borrowing, *sopla* ‘wind, breeze (Sp. *soplar*, blow)’ in the phrase *ku’ni sopla* ‘to fan (lit. ‘to make breeze’)’. /e/ occurs as a harmonic vowel in 11 words (*se’ē* ‘place,’ *lye’e* ‘to lick’), /o/ in 10 words (*koho* ‘to puncture,’ *tuho’o* ‘sea’), and /a/ in 46 words (*kata* ‘flour,’ *kanā* ‘sandal’).

In many PAN words that feature non-harmonic *u*, the second onset consonant is labialized, as in *hlu’we* ‘night,’ *kuhwi* ‘to sell,’ and *tyukwa* ‘to find.’ It is possible that in these words the unstressed vowel assimilates to the labial feature of the following consonant, which would account for part of the large number of non-harmonic *u*’s.

The preceding paragraphs illustrate the second pattern indicated in Figure 1. Cross-dialectally, as the phonetic distinctiveness of the reduced vowel diminishes, it becomes increasingly likely that the reduced vowel will be the same as the unreduced vowel. In that sense, the quality of the reduced vowel becomes more predictable. The probabilities of selection of a non-harmonic vowel among the three dialects discussed in this section are summarized in the following table:

Table 4: The numbers of non-harmonic vowels in lists for three dialects

	<i>i</i>	<i>u</i>	<i>a</i>	<i>e</i>	<i>o</i>	size of list
ZEN	frequent (116)	frequent (99)	frequent (79)	frequent (74)	rare (16)	860
TAT	frequent (124)	frequent (231)	frequent (147)	very rare (6)	very rare (10)	1400
PAN	frequent (101)	patterned (111)	rare (16)	extremely rare (1)	extremely rare (1)	530

In the next table, cognates in the four dialects illustrate the cross-dialectal variation in first syllable vowels of a few words, whose final, stressed syllables remain constant. These forms show that the first syllable vowels are subject to change, and they also illustrate the kinds of changes

that might account for the progressive reduction of the inventory of non-harmonic vowels. In examples 1-7, non-harmonic *e* in ZEN corresponds to either *a* or *i* in TAT and PAN. In examples 8-10, non-harmonic *u* in ZEN corresponds to *i* or \emptyset in TAT and PAN.

Table 5: Cognate sets illustrating cross-dialectal variation in the inventory of reduced vowels.

ZEN	TAT	PAN	YAI	
1) <i>kwetō</i>	<i>cūityū</i>	<i>kwitū</i>	<i>kw̄tun</i> [kw̄tū]	‘bee’
2) <i>yketōʔ</i>	<i>quityūʔ</i>	<i>katūʔ</i>	<i>kitun</i> [k̄tūʔ]	‘pot’
3) <i>keʔya</i>	<i>caʔya</i>	<i>kiʔya</i>	<i>kiʔya</i> [k̄ʔya]	‘hill’
4) <i>xetāʔ</i>	<i>xcatyāʔ</i>	---	<i>staʔn</i> [staʔ]	‘claw’
5) <i>tela</i>	<i>talya</i>	<i>tla</i>	<i>tla</i> [tla]	‘night’
6) <i>kwena ta:</i>	<i>cuañā taa</i>	<i>kunan ta</i>	<i>kw̄na ta:</i> [kw̄nā ta:]	‘rainbow’
7) <i>yketā chajlya</i>	<i>cata xlya</i>	<i>kata jxlya</i>	<i>kita</i> [k̄ita]	‘flour’
8) <i>lutzeʔ</i>	<i>ltseʔ</i>	<i>tseʔ~ltseʔ</i>	<i>tzeʔ</i> [tseʔ]	‘tongue’
9) <i>ntuyaʔ</i>	---	<i>ndiyaʔ</i>	<i>ntiyaʔ</i> [ndyaʔ]	‘cocoa (tree)’
10) <i>chucula</i>	<i>chcula</i>	---	<i>xkw̄la</i> [ʃkw̄la]	‘chocolate’

I interpret the comparative data as showing a trend toward a smaller range of contrastive selections available for the reduced vowel position. Cross-dialectally from ZEN to TAT to PAN to YAI, there is an increasing tendency for the reduced vowel to assimilate in anticipation of the following vowel. Non-assimilating vowels become fewer and fewer. At the extreme of YAI, the only non-assimilating vowel is *i*, and the assimilated reduced vowels are often further reduced to a featureless [̄]/[̄̄].

In the following section, another pattern, that of restrictions on co-occurrence of similar consonants within a word, will be shown to co-vary cross-dialectally with the reduction of the inventory of non-harmonic vowels.

4.2. Consonant co-occurrence constraints, cross-dialectally

As described in section 3 and illustrated in Table 2, strong constraints exist in YAI against the co-occurrence of certain pairs of consonants, whether or not they are separated by a reduced vowel. Many of these constraints do not exist in ZEN or TAT. The following table lists the pairs whose non-occurrence in YAI seems to be motivated by similarity of place and sometimes manner of articulation. If the pair co-occurs in ZEN or TAT, it is checked in the corresponding column(s):

Table 6: Consonant sequences that are disallowed in YAI but occur in ZEN or TAT

	ZEN	TAT
ch-x		
ch-s		
ch-ch	✓	
ch-t	✓	
ch-ty		
ch-tz		✓
t-t	✓	
t-ty	✓	✓
t-tz	✓	
t-ch		✓
ty-t	✓	✓
ty-ty		
ty-tz	✓	✓
ty-ch		
ty-s	✓	
ty-x	✓	✓
tz-t	✓	✓

	ZEN	TAT
tz-ty		
tz-tz		
tz-ch	✓	
tz-s		
tz-x		
s-tz	✓	
s-ch		
s-s	✓	
s-x		
x-tz		✓
x-ch		✓
x-s	✓	✓
x-x		
l-l	✓	
l-n	✓	✓
n-l		
n-n	✓	✓

	ZEN	TAT
y-ly		
y-y		
w-w	✓	
w-kw		
m-m		
m-w		
m-kw		
p-w		
p-kw		
kw-w		
kw-kw	✓	
kw-k	✓	
k-kw	✓	✓
k-k	✓	✓
ʔ-ʔ		
ʔ-j		
j-j		

The co-occurrences in ZEN and TAT are illustrated by the following words. (In the orthography used for the ZEN database, palatalization of certain consonants is indicated with a *y* written before the consonant; [tʰ], for example, is written *yt*.) For ZEN: *-chachiʔ* ‘P.shrink,’ *-chatō* ‘P.stand up,’ *ntatē* ‘lower leg,’ *teyta yla* ‘every time,’ *ntitzu* ‘H.explode,’ *-ʔne ytoyta* ‘baptize,’ *ytozta* ‘to place sth. upright,’ *nte ytusu* ‘H.catch,’ *ytaxi kō* ‘arm,’ *tzanto: naʔ* ‘for me,’ *tzan-chati* ‘capable,’ *-sōtza* ‘to sit (sth.),’ *-sesu* ‘to turn,’ *xesu* ‘to turn (sth.),’ *lola tza* ‘price,’ *lanaʔa* ‘weak,’ *naneʔ* ‘belly,’ *wajwa* ‘board,’ *kwekwaʔ* ‘*ataja caminos* (a type of bird),’ *kwikeʔ* ‘violet (color),’ *kikwā* ‘iron, metal,’ *kuka* ‘forest.’

For TAT: *chatzū* ‘warm,’ *tatya* ‘shrimp,’ *tachaa* ‘firm, secure,’ *tyata* ‘P.plant,’ *tyaatsu* ‘P.move,’ *tyixi* ‘sweet,’ *tsatūū* ‘P.stand (sth.) up,’ *xatsi* ‘P.bury,’ *xquicha* ‘language,’ *xasu* ‘P.turn,’ *lini* ‘right,’ *naʔni* ‘animal,’ *cacua* ‘close (adj.),’ *cacu* ‘P.eat.’

Pride & Pride’s (1997) word list for PAN does not contain any words that violate the consonant co-occurrence constraints that exist for YAI. These constraints thus group ZEN and TAT together and PAN and YAI together. The cognate forms in the following table illustrate some of the correspondences that relate to the presence of the consonant co-occurrence constraints in YAI versus their absence in ZEN and TAT:

Table 7: cognate sets illustrating the effect of consonant co-occurrence constraints in YAI

ZEN	TAT	YAI	
1) <i>ykaka</i>	---	<i>tyka</i> [tʰʷka]	‘crow’
2) <i>kukwē7</i>	<i>cuiʰ, cucuiʰ</i>	<i>kwi7n</i> [kwīʔ]	‘armadillo’
3) <i>kukwa7</i>	<i>cuaʰ, cucuaʰ</i>	<i>jkwa7</i> [hkwaʔ]	‘dew’
4) <i>kikwā</i>	<i>chcuaā</i>	<i>tykwan</i> [tʰʷkwā]	‘iron’
5) ---	<i>cocū</i>	<i>kun</i> [kū]	‘owl’
6) <i>titō</i>	<i>tyū</i>	<i>tyun</i> [tyū]	‘many’
7) ---	<i>tatya</i>	<i>ta</i> [ta]	‘shrimp’

The existence of variant forms for TAT in numbers 2 and 3 (*cuiʰ* ~ *cucuiʰ* ‘armadillo’ and *cuaʰ* ~ *cucuaʰ* ‘noise’) suggests that TAT is in the process of losing or altering some of the forms that violate the consonant co-occurrence constraints found in YAI.

This section has shown that the consonant co-occurrence constraints found in YAI also apply to PAN but do not exist in ZEN and TAT. The presence of consonant co-occurrence constraints therefore correlates with greater phonetic reduction and greater predictability of unstressed vowels. In the following section, I summarize the discussion so far and indicate its theoretical significance.

5. Discussion

McCarthy (1986) relates the constraint against the co-occurrence of homorganic consonants as the first two consonants of a root in Semitic languages to the Obligatory Contour Principle (OCP), which he formulates in these terms: ‘at the melodic level, adjacent identical elements are prohibited’ (1986:208). The data I have presented from the Chatino dialects provide a diachronic perspective on a similar phenomenon, outlining its development in one language family. In effect, consonant co-occurrence constraints developed along with, and depending on, reduction of unstressed vowels.

In Semitic languages, the OCP applies in a non-linear context, in that the relevant segments need not be contiguous—they can be separated by vowels. In the Chatino case, the applicability of the OCP to onset consonants depends on the nature of the intervening unstressed vowel, in particular, on whether or not the unstressed vowel has been reduced—cross-dialectally, a greater reduction of unstressed vowels correlates with greater presence of consonant co-occurrence constraints. As mentioned in Section 2, one class of words that retains two unreduced vowels

are verbs featuring the causative prefix *xi-/x-/s-*. The following table illustrates the allomorphic variation presented by the prefix (all examples are given in the Potential Aspect):

Table 8: The allomorphy of *xi-/x-/s-*

<i>xi-</i>	<i>x-</i>	<i>s-</i>
<i>xi-kʔan</i> ‘P. move from one place to another’	<i>x-jaʔ</i> ‘P.put to sleep’	<i>s-kaʔn</i> ‘P.tie (something)’
<i>xi-sna</i> ‘P.cause to run’	<i>x-ka</i> ‘P.destroy’	<i>s-kwaʔ</i> ‘P.shell (something)’
<i>xi-styi</i> ‘P.cause to laugh’	<i>x-ki</i> ‘P.bend (something)’	<i>s-kwen</i> ‘P.submerge (something)’
<i>xi-sun</i> ‘P.provoke’	<i>x-ku</i> ‘P.feed’	<i>s-kwin</i> ‘P.sift (something)’
<i>xi-tzen</i> ‘P.frighten’	<i>x-laʔ</i> ‘P.dissolve (something)’	<i>s-la</i> ‘P.open (something)’
<i>xi-xen</i> ‘P.roll (something)’	<i>x-naʔ</i> ‘P.make (something) wither’	<i>s-lu</i> ‘P.throw out’
<i>xi-tun</i> ‘P.stand (something) up’	<i>x-oʔ</i> ‘P.wrinkle (something)’	<i>s-ta</i> ‘P.break (something)’

The motivation for the selection between *x-* and *s-* is not clear from the table and indeed has not been explained. However, the motivation for selecting *xi-* as opposed to *x-* or *s-* is related to both the phonological word template as shown in Figure 1 and the consonant co-occurrence constraints. In most cases, the vowel is retained (*i.e.*, *xi-* is selected) when reduction of the vowel would lead to a sequence of three onset consonants, as in the case of *xi-kʔan*, in which if the *i* were reduced, a sequence of *x-kʔ* would result, or to a disallowed pair of consonants, as in the case of *xi-sun*, in which if the *i* were reduced, a sequence of *x-s* would result. The hypothesis proposed here is that the vowel is retained in most cases to avoid violations of the phonological word template and of the consonant co-occurrence constraints. The verbs that select the causative prefix *xi-* YAI are thus analogous to words in ZEN and TAT, in which vowels are not reduced (or are reduced to a lesser degree) and in which the consonant co-occurrence constraints are not found. (There is one unexplained exception in the database to this pattern, *xi-tun* ‘P.stand (something) up.’)

Taking ZEN and TAT as more conservative than YAI with regard to reduction of unstressed vowels, the history of YAI can be seen to involve vowel loss in many cases. For example, in ZEN, there are no words with onset clusters such as *st-*, *sk-*, or *tl-*. Therefore, such clusters in YAI are most likely the result of the loss of intervening historical vowels. Between consonants that could not be pronounced as true clusters, such as *t* and *k*, vowels were reduced

but not lost entirely. Simultaneously, they lost much of their contrastive quality, so that in YAI, there is now only a two-way contrast between [°]/[°] and [i]/[i]. Also simultaneously, consonants were lost or changed as co-occurrence constraints came into effect.

Unsolved issues requiring further investigation include the precise specification of the features that are involved in the onset consonant co-occurrence constraints and a thorough description of the historical changes in word forms that these constraints involved.

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NOTES

- 1) Chatino is a language spoken in Oaxaca, Mexico, by approximately 18,000 speakers. This paper is based on my presentation of the same name to the 1998 SSILA Conference, New York City.
- 2) I wish to thank three native speakers of Yaitepec Chatino, Modesto, Martín, and José Suárez, for providing the data and translations found in this paper. Most of the data for this paper were gathered while I was working as a member of the Project for the Documentation of the Languages of Meso-America, headed by Terrence Kaufman, whom I wish to thank for his invaluable suggestions regarding the analysis of Yaitepec Chatino. The abbreviations used in this paper are: *P* ‘Potential Aspect,’ *N* ‘Continuative Aspect,’ *H* ‘Habitual Aspect,’ *C* ‘Completive Aspect,’ *ZEN* ‘Zenzontepec Chatino,’ *TAT* ‘Tataltepec Chatino,’ *PAN* ‘Panixlahuaca Chatino,’ and *YAI* ‘Yaitepec Chatino.’
- 3) *p* occurs in only a few words in YAI, most of which appear to be borrowed forms. It never occurs as the second in a sequence of consonants.
- 4) *tt*, *tty*, *kk*, and *kkw* are identical to *t*, *ty*, *k*, and *kw*, with the exception that the latter sounds, unlike the former ones, do not become voiced between nasals and voiced vowels. The two series of sounds are not treated separately below.
- 5) *d* occurs in only one word, *da*, a clitic that marks the irrealis mood.
- 6) *g* occurs in only a few words. It is not included in the following discussion.
- 7) *n* and *l*, like their palatalized variants *ny* and *ly*, are conditioned variants of the same phoneme in most environments and are therefore listed together in Table 3 below.
- 8) *r* occurs in only a few words, most of which are borrowings, and is never the first in a sequence of consonants.
- 9) The orthographic conventions used in Pride & Pride (1970) approximate those of Spanish and therefore differ significantly from those I use for YAI. TAT *b* apparently represents a voiced bilabial fricative, which corresponds to YAI *w*; TAT *scu’be*, YAI *s7we* ‘Juquila.’ [k] is represented in TAT by *c* before the vowels *a*, *o*, and *u*, and by *qu* before the vowels *i* and *e*. *cu* before a vowel in TAT represents the sound [kw]. The glottal stop is written with an apostrophe ‘.

(Jeffrey Rasch 外国語学部助教授)