Yaka Nasal Harmony: Spreading or Segmental Correspondence?*

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0. Introduction

This paper examines a nasal harmony among consonants (Cs) in Yaka, a Bantu language spoken in Zaire. Two key properties of the phenomenon are observed:

(1) i. Nasality agreement can occur between segments at a distance.
ii. Nasality agreement preferentially occurs between similar Cs.

I argue that this kind of nasal harmony comes about through a correspondence relation between Cs in a word rather than resulting from feature spreading. This proposal will be important in explaining the characteristics in (1) and also the neutrality of 'prenasal' NC complexes in the language. From a broader perspective, this approach has the potential to extend to other segmental harmonies that display similar characterizing properties (Walker 1999, to appear, Rose & Walker in prep.).

The analysis is couched in Optimality Theory (OT; Prince & Smolensky 1993). The paper is organized as follows. In §1 I present data illustrating Yaka nasal harmony. In §2 I bring evidence to bear on the question whether the pattern arises through correspondence or spreading, and I diagnose it as the former. §3 lays out a theoretical overview of the correspondence approach to long-distance harmony. In §4 I develop the details of the Yaka analysis, and §5 gives the conclusion.

1. Yaka Consonantal Nasal Harmony

Yaka presents a consonantal nasal harmony (CNH) discussed by Hyman (1995), whereby a nasal stop induces nasalization of voiced Cs occurring at any distance to its right in the stem (root and suffixes). CNH produces alternations, as illustrated with the perfective suffix /-idi/ in (2) (vowel alternations result from an independent height harmony). Observe that vowels (Vs) and voiceless stops can occur between the stops that agree in nasality, but these intervening segments remain unaffected.

(2)	yán-ini	'to cry out'	cf.	yád-idi	'to spread'
	kém-ene	'to groan'		kéb-ede	'to deforest'
	bún-ini	'to break wind'		búd-idi	'to break'
	hámúk-ini	'to give way'			
	nútúk-ini	'to slant'			
	míítuk-ini	'to sulk'			

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In Yaka, the phoneme /d/ is realized as [l] when oral, except after [n] or before [i]. For ease of exposition, I write this segment as [d] in all cases where it is oral. The potential for interaction between nasals and [l] will nevertheless be examined later.

As seen in (3), NC complexes that are composed of nasal and voiced oral stop elements neither trigger nor block nasality agreement.

(3) bíímb-idi ‘to embrace’
kúúnd-idi ‘to bury’
tááŋg-idi ‘to read, compute’
nááŋg-ini ‘to last’

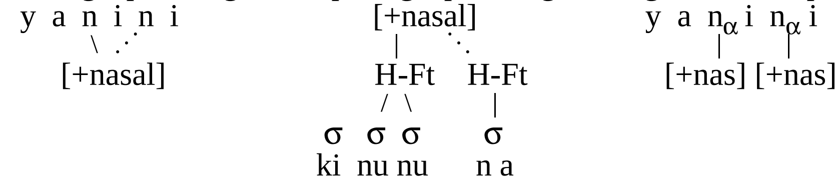
Yaka NC complexes have been referred to on occasion as prenasalized stops, but I will argue below that they actually have the status of NC clusters, and that this structure is connected to their neutrality.

CNH that targets voiced non-continuants across Vs is widespread in Bantu (Greenberg 1951). The Yaka-type pattern, where the triggering nasal can occur at any distance in the word, is also found in Kikongo (Ao 1991, Odden 1994, Piggott 1996). CNH displays two main characteristics that must be addressed in the analysis. First is the potential for action at a distance: the interactions are non-local in the sense that the Cs agreeing for [+nasal] are not root-adjacent, and intervening Vs and Cs can occur without undergoing or blocking nasality agreement. Second, CNH presents a similarity effect, that is, the nasalization preferentially targets segments that are similar to the nasal trigger, namely, voiced Cs. Segments that are considerably different, i.e. Vs and voiceless Cs, do not participate in the harmony. (The neutrality of NC complexes will also be examined in this connection in §4.)

2. Spreading or Correspondence?

Before developing the details of analysis, we must first diagnose the phonological mechanism that brings about CNH. Two common means of producing featural agreement are feature spreading and segmental correspondence. Previous accounts of CNH have assumed a spreading approach, whereby [+nasal] is linked across the agreeing segments. Subsegmental spreading accounts have proposed that [+nasal] is linked at some site subsidiary to the root, as in (4a) (Ao 1991, Odden 1994, Hyman 1995). Alternatively, Piggott (1996) proposes a suprasegmental spreading, where [+nasal] spreads at the level of a syllable-organizing node that he calls the *harmony foot* (H-Ft)—a unit distinct from the stress foot. This structure is shown in (4b) (with a Kikongo form). In contrast, under a correspondence approach, CNH would arise via a correspondence relation that is established between similar segments, as in (4c). A requirement of identity for [nasal] specifications in corresponding Cs produces agreement—no long-distance linkage across segments is posited. I will argue that it is the latter mechanism that gives rise to CNH.

(4) a. Subseg. spreading b. Supraseg. spreading c. Segment correspondence



Let us begin by considering support for the correspondence mechanism underlying CNH. In other recent research on consonantal harmony, Walker (1999, to appear) argues that correspondence is at work in a pattern of voicing agreement between obstruents that are not root-adjacent in Kera and Ngbaka. Interestingly, the long distance voicing harmony also displays a similarity effect such that the more similar a segment is to the trigger, the more likely it is to be targetted, and segments that are substantially dissimilar from the trigger pattern as neutral. Support for a correspondence mechanism in this kind of harmony is noted on three fronts. First, correspondence relations are typically not limited to root-adjacent segments. For example, in reduplication, corresponding segments are often separated by one or more intervening segments, as in [RED-kɔlat] -> [k$_1$ɔ$_2$l$_3$a$_4$-k$_1$ɔ$_2$l$_3$a$_4$t] 'spoon' (West Tarangan; Spaelti 1997). Further, though in reduplicative correspondence segments are most often copied starting at the edge at which affixation takes place (producing a kind of locality effect), various studies of reduplication have shown that edge-anchoring is violable (Gafos 1996, 1998, Spaelti 1997, Walker 1998). The second point is that correspondence explains the lack of effect on intervening segments. As seen in (4c), nasal identity is checked in corresponding stops. Since no linkage of [+nasal] is posited between the stops, the neutrality of the intervening V is straighforward. Third, the correspondence approach offers the potential for explanation of the similarity effect. In the voicing harmony study, Walker proposes that a correspondence relation is established <u>because</u> the segments are similar. I will argue below that in the case of CNH, this point also has potential to bring understanding to the neutrality of NC complexes.

Let us turn now to the spreading alternatives in (4a-b). Though the spreading-based approaches represented important developments in research on long-distance segmental interactions, their status in the theory has since grown to be questionable on several counts. A growing body of work supports a theory of spreading under which features spread only between root-adjacent segments. A theory that admits representations in which feature linkage may gap across segments is argued to be too permissive—it predicts a range of feature spreading phenomena that are simply not borne out (Padgett 1995a, Ní Chiosáin & Padgett to appear, Walker 1998, cf. Gafos 1996). In connection with this notion of locality, spreading is viewed as the result of extending a feature span, where features represent unitary and continuous entities. As discussed by the above researchers, this understanding of spreading has foundation in concepts of Articulatory Phonology (Browman & Goldstein 1986). Extending a continuous feature cannot produce an outcome in which the span of the spreading property contains interruptions; hence it must obey root-level locality.

Another problematic aspect arises from the underspecification or other representational inertness that must be assumed for neutral NC elements under spreading. The structure in (5) illustrates an example discussed by Hyman (1995), where neutrality of NC complexes is obtained via underspecification of [+nasal] and the target node in these segments. However, this must provoke the question why the target node would be underspecified in [nd] but not [n] or [d] alone.

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(5)       n  V  nd  V  d
          |            |
          •            •
          |         .·
          [+nasal]
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More generally, Hyman points out that several ad hoc representational solutions are capable of achieving the neutrality of NC. What remains unanswered by these accounts is the important question of why NC patterns as neutral.

Spreading at a suprasegmental level also engenders concerns. In order for this approach to be feasible, a number of assumptions must be adopted that complicate aspects of the theory. First, it must be allowed that feature spreading can take place at more than one structural level, either segmental or prosodic. This moves beyond the more restrictive assumption that features spread only within or below the root node, where they are located in the segment structure. Hence, the account is subject to many of the overgeneration objections that have been raised in connection to gapping of feature linkage. A related point arises in regard to the targets of CNH. The suprasegmental analysis attributes the neutrality of Vs to Structure Preservation —nasal Vs do not occur underlyingly in the language (Piggott 1996: 156). However, this account misses the similarity generalization, rendering the cross-linguistic limitation of CNH to voiced Cs accidental. Finally, this approach introduces a new functional foot-type. If suprasegmental spreading were obviated by the independently-motivated correspondence mechanism for featural agreement, then the set of foot-types needed in the theory would be accordingly simplified. In what follows I thus pursue a correspondence analysis of CNH.

3. Long-Distance Segment Agreement via Correspondence

I formalize the analysis in OT, along with the Correspondence model of faithfulness, as elaborated by McCarthy & Prince (1995). I assume a basic familiarity with the formalisms and underpinnings of these theories.

At the core of the present proposal is the claim that correspondence can hold between segments in the output of a word (Walker 1999, to appear; for related proposals see Suzuki 1999, Zuraw 2000, cf. Yip to appear). In general, correspondence is established between structures that are recognized as related. Familiar examples of corresponding structures include input-output, base-reduplicant, and morphologically-related outputs. In the case at hand, the correspondence relation is suggested to stem from similarity, in other words, segments that are recognized as alike in many ways are prone to be identified as related, and thus correspondence is established between them.

As discussed by Walker (1999), the notion that similar segments in an output may be identified as related, and hence interact, has basis in the processing of phonological structure. Psycholinguistic studies of the phonological encoding and production of words reveal that the production of a given C activates or primes other Cs that share a large number of features. The effects are evidenced in speech errors and tongue twisters, whereby Cs that are identical in all but one feature are found to be more likely to induce slips of the tongue (e.g. MacKay 1970, Fromkin 1971, Shattuck-Hufnagel & Klatt 1979). It is observed that similar but different sounds frequently shift to identical ones; examples include *<u>sh</u>oes and <u>s</u>ocks* pronounced as *<u>sh</u>oes and <u>sh</u>ocks* and *the <u>p</u>ast <u>f</u>ive years* as *<u>p</u>ast <u>p</u>ive* (Shattuck-Hufnagel 1987). (Note also that a recent study by Pouplier et al. (1999) finds evidence that speech errors can occur at the subsegmental level, i.e. at the gestural or featural level.) Other work has identified gradient perceived similarity as a factor that contributes to the potential for interaction between segments (see Frisch 1996, Frisch et al. 1997 and citations therein). Taken together, this research suggests that the occurrence of segments that are only slightly different in an utterance presents production and perception difficulties, a point reflected in spreading activation models of speech processing (Stemberger 1985, Dell 1986), and it provides support for the claim that speakers construct a relation between similar segments.

I propose that the formal actualization of such relations arises via a set of violable constraints in the grammar. The schema for a constraint requiring that correspondence be established between Cs in an output is given in (6)—generalized over all Cs—the matter of similarity will be addressed presently.

(6) Consonantal Correspondence Constraint: CORR-$C_1 \leftrightarrow C_2$
Given an output string of segments S, and consonants $C_1 \in S$ and $C_2 \in S$, where C_2 follows C_1 in the sequence of segments in S, then a relation is established from C_1 to C_2, that is, C_1 and C_2 are correspondents of one another.

The above formulation makes reference to ordering, since the nasality interaction is directional in Yaka. However, some other cases of long distance agreement could be handled by a non-directional version of the constraint (Walker to appear).

We have noted that the degree of similarity between Cs is a key factor in triggering a relation between them. I propose to implement this formally by arraying CORR-C↔C constraints in a hierarchy such that the more similar the pair of Cs, the higher ranked the constraint requiring that they be in correspondence. The relevant portion of the hierarchy for CNH among stops is given in (7).

(7) Relevant portion of similarity-based Correspondence Hierarchy:
CORR-$N_1 \leftrightarrow N_2$ >> CORR-$N_1 \leftrightarrow D_2$ >> CORR-$N_1 \leftrightarrow B_2$

The constraints are interpreted as follows. CORR-$N_1 \leftrightarrow N_2$ enforces correspondence between any pair of identical nasals ([n…n], [m…m], etc.). CORR-$N_1 \leftrightarrow D_2$ holds over the superset of voiced stops that match in place, i.e. ones that are at least as similar as [n] and [d] ([n…d], [b…m], [n…n], etc.). CORR-$N_1 \leftrightarrow B_2$ expands to any pair of voiced stops.

Let us now consider how the constraints in (7) will be evaluated with respect to a hypothetical demonstration form [nidi]. As represented in (8), the standard Faith-IO correspondence constraints will hold between the input and output. Within the output, CORR-C↔C constraints can cause a relation to be established between the two stops. Faith-CC constraints will enforce identity between these segments.

(8) Consonantal Correspondence model:

Input	/nidi/	
	↕	*Faith-IO*
Output	[nidi]	
	↔	*Faith-CC*

The relevant Faith-CC constraint is given in (9). It requires that if a C in the output is [+nasal], its correspondent C must also be [+nasal].

(9) IDENT-CC(+nasal)
Let C_1 and C_2 be consonants in the output, and let there be a correspondence relation from C_1 to C_2. If C_1 is [+nasal], then C_2 is [+nasal].

The tableau in (10) illustrates the violations incurred by various candidates (constraints are unranked here). Subscripts annotate CC-correspondence. I assume in this tableau and henceforth that IO relations in the candidates shown are such that segments with matching positions in the input and output strings are in correspondence.

(10) Consonantal correspondence in different output candidates

/nidi/	IDENT-CC (+nas)	IDENT-IO (-nas)	CORR-$N_1 \leftrightarrow N_2$	CORR-$N_1 \leftrightarrow D_2$	CORR-$N_1 \leftrightarrow B_2$
a. $n_\alpha id_\beta i$				*	*
b. $n_\alpha id_\alpha i$	*				
c. $n_\alpha in_\alpha i$		*			
d. $n_\alpha in_\beta i$		*	*	*	*

Candidates (10a-b) do not display CNH. In (a) the Cs are not in correspondence, violating CORR-$N_1 \leftrightarrow D_2$, and by implication, CORR-$N_1 \leftrightarrow B_2$ as well. In (b), the Cs are correspondents, but they fail to agree in nasality, violating IDENT-CC(+nas). Candidate (c) exemplifies the CNH outcome: correspondence is established between the two Cs, and they obey IDENT-CC(+nas). This candidate violates IDENT-IO(-nas), which requires that if a segment in the input is [-nasal], its correspondent in the output must also be [-nasal]. Candidate (d) represents an instance of sporadic change. The second C in (d) becomes [+nasal], but without being in correspondence with the first nasal. This unmotivated introduction of nasalization is sub-optimal under any ranking of these constraints.

4. Analysis of CNH in Yaka

I turn now to the details of the rankings for CNH in Yaka. The rankings in question must achieve an outcome in which voiced stops become nasal when preceded by a nasal in the stem. Since the requirement of identity for [+nasal] between corresponding stops in the output has the capacity to override [-nasal] identity with the input, IDENT-CC(+nas) must dominate IDENT-IO(-nas), as shown in (11). I assume that MAX-IO outranks IDENT-IO(-nas) to prevent deletion of Cs.

(11) IDENT-CC(+nas) >> IDENT-IO(-nas)

/yan-idi/	IDENT-CC(+nas)	IDENT-IO(-nas)
a. ☞ $yan_\alpha in_\alpha i$		*
b. $yan_\alpha id_\alpha i$	*!	

Next, since all voiced Cs are subject to CNH, the constraint requiring correspondence between any pair of voiced stops must also dominate IDENT-IO(-nas) in order to compel a relation between voiced Cs in the output. The ranking of CORR-$N_1 \leftrightarrow B_2$ over IDENT-IO(-nas) is illustrated in (12). IDENT-IO(voice) is also assumed to outrank IDENT-IO(-nas) to rule out a devoicing alternative, and the preservation of input place specifications indicates IDENT-IO(Place) >> IDENT-CC (Place). Note that the occurrence of vowel harmony is assumed in the output candidates here.

(12) CORR-$N_1 \leftrightarrow B_2$ >> IDENT-IO(-nas)

/kem-idi/	IDENT-CC (+nas)	CORR-$N_1 \leftrightarrow N_2$	CORR-$N_1 \leftrightarrow D_2$	CORR-$N_1 \leftrightarrow B_2$	IDENT-IO (-nas)
a. kem$_\alpha$ed$_\beta$e				*!	
b. ☞ kem$_\alpha$en$_\alpha$e					*
c. kem$_\alpha$ed$_\alpha$e	*!				

The winner in (12) is (b), in which the voiced stops correspond and satisfy IDENT-CC(+nas). The alternative candidates lose either because the voiced stops do not correspond (a) or because they correspond but violate CC nasal identity (c).

The tableau in (13) shows an example where this ranking applies to a schematic input form that contains a voiceless stop intervening between a nasal and a suffix containing /d/. The voiceless stop patterns as neutral, because it is not sufficiently similar to the nasal to be subject to CORR-C↔C constraints. As a result, in the optimal output (a), /n/ and /t/ are not correspondents, and there is no nasality agreement between them. The alternatives in (b) and (c) establish correspondence between /n/ and /t/. However, since there is no constraint to drive this relation, each incurs a superset of the violations incurred by (a). Notice that the lack of correspondence between /n/ and /t/ in (a) does not prevent nasal agreement from holding between /n/ and suffixal /d/. Hence the long-distance interaction is straightforward.

(13) Voiceless Cs do not participate in nasal agreement:

/nVt-VdV/	IDENT-CC (+nas)	CORR-$N_1 \leftrightarrow N_2$	CORR-$N_1 \leftrightarrow D_2$	CORR-$N_1 \leftrightarrow B_2$	IDENT-IO (-nas)
a.☞ n$_\alpha$Vt$_\beta$Vn$_\alpha$V					*
b. n$_\alpha$Vn$_\alpha$Vn$_\alpha$V					**!
c. n$_\alpha$Vt$_\alpha$Vn$_\alpha$V	*!				*

Recall that the pattern of CNH is such that nasals only trigger nasalization in voiced Cs to their right. This outcome is illustrated in (14) with an input in which a nasal is flanked by syllables containing oral voiced stops. The directionality of CNH comes about from the direction of correspondence mapping. The CORR-C↔C formulation in (6) states that a relation is established from C_1 to C_2, where C_2 *follows* C_1 in the sequence of segments. This means that in a form [$C_1VC_2VC_3V$], the following relations hold: $C_1 R C_2$, $C_1 R C_3$, and $C_2 R C_3$. These match the relations determined by the relevant CORR-C↔C constraints in the output in (14): all of the voiced stops stand in a left-to-right relation. Because of the directionality of the dependency, IDENT-CC(+nas) requires that if the first C of a related pair is [+nasal], the second one must be [+nasal], but not vice versa, i.e. in evaluating the pair of Cs in [b$_\alpha$un$_\alpha$…], IDENT-CC(+nas) is satisfied, since [b] is [-nasal].

In the optimal output in (a), only the voiced stop that is preceded by a nasal, becomes nasal itself. In (b) the first voiced stop also becomes nasal, but this candidate is ruled out on the basis of an extra IDENT-IO(-nas) violation. Candidate (c) displays denasalization. This candidate is eliminated by ranking IDENT-IO(+nas) over IDENT-IO(-nas). The alternatives in (d) and (e) do not establish correspondence between all voiced stops. These lose on the basis of CORR-C↔C violations.[1]

(14) Nasals trigger nasalization only in succeeding voiced stops

/bun-idi/	IDENT-IO (+nas)	IDENT-CC (+nas)	CORR-$N_1 \leftrightarrow N_2$	CORR-$N_1 \leftrightarrow D_2$	CORR-$N_1 \leftrightarrow B_2$	IDENT-IO (-nas)
a.☞ $b_\alpha un_\alpha in_\alpha i$						*
b. $m_\alpha un_\alpha in_\alpha i$						**!
c. $b_\alpha ud_\alpha id_\alpha i$	*!					
d. $b_\alpha un_\beta in_\beta i$					*!*	*
e. $b_\alpha un_\beta id_\alpha i$				*!	*	

For a complete picture of CNH in Yaka, it should be noted that Hyman's study revealed that nasal agreement targets not just voiced stops, but also approximant Cs (1995: 16; see Piggott 1996 for a related observation regarding CNH in Kikongo). This point had previously escaped notice because voiced Cs besides [d] (and its allophones) do not occur in the relevant suffixes, so other alternations are not seen. However, on the basis of an electronic dictionary search, Hyman established the distributional generalization that the voiced Cs [d/l, b, w, y] do not appear after nasals in a stem. This pattern suggests that a constraint requiring correspondence between nasal and approximant Cs should be added to the portion of the CORR-C↔C hierarchy that is relevant for nasals. The constraint in question, which I will refer to as CORR-$N_1 \leftrightarrow L_2$, must dominate IDENT-IO(-nas). I tentatively posit that CORR-$N_1 \leftrightarrow L_2$ is situated alongside CORR-$N_1 \leftrightarrow B_2$ in the hierarchy.

The range of targets identified for CNH is consistent with the similarity basis proposed to underlie C-correspondence. The acoustic properties of nasals and approximants are similar in their intensity and in displaying well-defined formant structures. This similarity has been argued elsewhere to produce phonological effects, for example, the auditory similarity between [n] and [l] has been suggested to induce the substitution of [n] for /l/ in fortition environments in Korean and Cuna (Flemming 1995). On the other hand, voiced oral stops are close to nasals in their articulatory configuration. They also share the acoustic correlates of voicing, and produce similar formant transitions in neighboring Vs. The resulting similarity scaling is represented in (15). Nasal stops are similar to both approximant Cs and voiced stops, so these are the segments with which they are expected to stand in correspondence. Voiceless Cs and Vs are substantially different, hence they are not expected to participate in CC correspondence-based interactions with nasals.[2]

(15) Similarity scaling

Vowel   Approximant C ← Nasal Stop → Voiced Stop   Voiceless C

[1] The precedence of [+nasal] over [-nasal] (attributed to IDENT-IO(+nas) >> IDENT-IO(-nas)) might be obtained via a privative view of [nasal] (Steriade 1995). I leave this matter for further research.

[2] It is interesting to note that Nbgaka (Thomas 1963) presents an example of CNH that exacts a stricter similarity requirement than Yaka. In Ngbaka, CNH is restricted to homorganic stops. This language is distinguished from Yaka by ranking IDENT-IO(-nas) at the point between the CORR-C↔C constraint for homorganic stops and the CORR-C↔C constraints for heterorganic stops and approximants, thereby preventing nasalization of the latter segments.

Before closing the analysis of Yaka, it is necessary to address one further matter, namely, the status of 'prenasal' NC complexes. In what follows, I diagnose NC as a segmental cluster in Yaka, and argue that this structure renders them sufficiently dissimilar from simple stops to cause them to behave neutral in CNH.

Padgett (1995b) examines the question of the phonological structure of 'prenasalized' NCs in general. Drawing on support from various sources, he argues that they correspond to a two-root structure, as in (16), rather than a single segment containing [+nasal] and [-nasal] (Sagey 1986).[3] Any special properties of prenasalized NCs are suggested to stem from their potential to syllabify as an onset.

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(16)          n        d
            Root    Root
             /    \    /
        [+nas]  Place
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Studies of Bantu have confirmed that there is good evidence that prenasalized NCs consist of two segments. Support from phonological patterning is reviewed by Padgett (1995b) and Piggott (1996). For example, Clements (1986) argues that prenasalized NCs in Luganda are demonstrably clusters underlyingly. See also Herbert (1986). The presence of a nasal feature in the structure is verified by NC triggering phonological nasalization of Vs in some languages. Browman & Goldstein (1986) bring an instrumental study to bear on the issue. They compare timing in English NC clusters with prenasal NCs in Chaga and find no systematic difference. They conclude that the distinction is purely distributional in these cases.

In addition to these more general arguments, there is distributional evidence from Yaka for the two-root representation. Although nasals and voiced oral stops can occur both initially and medially in stems, NC complexes occur independently only in medial position. NC is found initially only when a nasal from a preceding prefix is structurally present (e.g. 1 sg. prefix, 9/10 prefix; Hyman 1995). If prenasals were unitary segments, this distributional gap would be unexpected. The cluster representation of NC is also supported by its neutrality in Yaka nasal agreement. If medial NC is syllabified across two syllables, then its neutrality can be attributed to a syllable role identity effect, that is, the failure of NC to participate in CNH can be understood as resulting from its place-linked heterosyllabic status in contrast to the monosegmental occurrences of nasals and voiced stops in onsets.[4] (Note that analysts of CNH in Kikongo, who have addressed the representation of NC in that language, assume a two-root structure also; Ao 1991, Piggott 1996.)[5]

The relevant constraint is given in (17) (McCarthy & Prince 1993, applications

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[3] A monosegmental structure in which prenasalization is manifested only as a phonetic realization of voicing or sonorancy is discussed by Piggott (1992) and acknowledged in Padgett's work. These segments are not of the type with which we are concerned here.

[4] Recall that prefix material stands outside of the stem domain, so the nasal in a word onset NC is not expected to trigger CNH.

[5] Hyman also considers the two-root structure for Yaka. He notes that since a V length opposition can be maintained before NC, it must be posited that the nasal is non-moraic (1995: 20). A conceivable alternative is to view NC complexes in Yaka as represented by two root nodes both syllabified into an onset. This would explain the lack of V shortening before NC, and the neutrality of NC could then be analyzed as a result of the contrast in the structural role of place-linked clusters versus simple onsets. The viability of this alternative requires further research.

include Gafos 1996, 1998, Suzuki 1999). The preference for a relation to be established between segments with matching syllabic positions has correlates in the psycholinguistic literature: segments with the same structural role are found to be more likely to participate in speech errors (Shattuck-Hufnagel 1983, 1987).

(17) σ–ROLE-CC: Corresponding consonants must have identical syllable roles.

The analysis is illustrated in (18) with a schematic form. σ–ROLE-CC is top-ranked. Since each segment in the NC cluster has a least a portion of its content affiliated with a coda, neither corresponds with the non-cluster Cs occupying onsets in the optimal output (a). As a result, [nd] behaves neutral and simple /n/ and /d/ participate in CNH. The alternatives in (b-c), where an NC segment corresponds with a non-cluster stop, are ruled out by σ–ROLE (one * for each violating C-pair).

(18) NC does not participate in nasal agreement:

/nVnd -VdV/	IDENT-CC (+nas)	σ–ROLE-CC	CORR-$N_1 \leftrightarrow N_2$	CORR-$N_1 \leftrightarrow D_2$	CORR-$N_1 \leftrightarrow B_2$	IDENT-IO (-nas)
a.☞ σ σ σ / | \ /\ /\ $n_\alpha V n_\beta d_\gamma V n_\alpha V$ \ / Place			**	*****	*****	*
b. σ σ σ / | \ /\ /\ $n_\alpha V n_\alpha d_\beta V n_\alpha V$ \ / Place		*!*		***	***	*
c. σ σ σ / | \ /\ /\ $n_\alpha V n_\alpha n_\alpha V n_\alpha V$ \ / Place		*!*****				**

A ranking summary for CNH in Yaka is given in (19):

(19) a. CNH targets voiced Cs: ID-IO(+nas), ID-CC(+nas), CORR-$N_1 \leftrightarrow N_2$ >> CORR-$N_1 \leftrightarrow D_2$, >> CORR-$N_1 \leftrightarrow B_2$, CORR-$N_1 \leftrightarrow L_2$ >> ID-IO(-nas)
b. NC is neutral: σ–ROLE-CC >> CORR-$N_1 \leftrightarrow N_2$

5. Conclusion

The result that I have argued for here is that Yaka CNH is the product of a correspondence relation between segments in the output. This analysis brings explanation to its signature properties: the long distance interaction, the preferential targetting of similar segments, and the neutrality of voiceless Cs, Vs, and NC. From a wider standpoint, this work distinguishes two sources of featural agreement: spreading and correspondence. In investigating a given agreement phenomenon, locality and similarity effects can be utilized as diagnostics. For example, Walker (1998) examines variations in a kind of nasal harmony that always includes Vs among its set of targets. Since the trigger nasal stop is quite different from Vs, this pattern is not consistent with correspondence. In these instances, Walker argues that the basis for preferred targets is their compatibility with superimposed nasalization. Further, it is observed that nasalization in these patterns propagates only among root-adjacent segments. Both of these properties are consistent with spreading. In contrast, the long distance interaction and similarity effect seen in the nasal agreement studied here is diagnostic of correspondence.

The findings of the present work invite re-examination of other long-distance interactions. Research under way by Rose & Walker (in prep.) is directed towards exploring a typology of C agreement at a distance. A central issue is understanding why only certain features display agreement at a distance; in particular, major C-place agreement at a distance is not observed. Continued investigation into the psycholinguistic factors involved may prove fruitful in this direction.

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