

Variation in p-phrasing in Bengali*

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This paper presents an optimality theoretic analysis of the variation in phonological phrasing in Bengali found in Hayes and Lahiri (1991) and Fitzpatrick-Cole (1994, 1996). In this account, the variation in the phrasing in Bengali is analyzed in terms of free ranking of constraints (Ito and Mester 1997). It is argued that the variation in Bengali supports a new approach to the relation between syntactic and phonological phrases: internal phonological phrase boundaries are seen to result from output-to-output faithfulness to phrase boundaries of maximal projections occurring in isolation. Further, it is also argued that variation in complex forms may be inherited from simpler forms via output-to-output faithfulness, supporting a suggestion of Elenbaas (1999).

Keywords: Bengali, free ranking, Optimality Theory, OO-faithfulness, phonological phrases, syntax-phonology mapping

o. Introduction

In this paper, I develop an analysis of two patterns of optionality in the assignment of phonological phrases (p-phrases) in Bengali, drawing on the data and description of Hayes and Lahiri (1991) and Fitzpatrick-Cole (1994, 1996). I am interested in the theoretical evaluation of this optionality in the formalization of the syntax-phonology mapping in Optimality Theory (OT; see Prince and Smolensky 1993). In OT, the standard way of analyzing optionality has come to be what Itô and Mester (1997) call *free ranking*: two constraints A and B that crucially interact are not in a fixed ranking relation in a given language. The free ranking allows the results of two constraint evaluations, one in which A dominates B, and the other in which B dominates A.

Earlier accounts of the syntax-phonology mapping in OT include Selkirk (1995b, 2000), and Truckenbrodt (1995, 1999). It will be seen that the optionality

in Bengali cannot be derived by the constraints of the syntax-prosody mapping of these proposals, even assuming a free ranking. The patterns of optionality will instead be seen to motivate the incorporation of output-to-output faithfulness (OO-faithfulness) into the analysis of the construction of p-phrases.

This shift in the analysis has possible applications beyond the scope of this paper. P-phrases generally show a partial similarity to syntactic constituents. While Selkirk (1986, 1995b, 2000) and Truckenbrodt (1995, 1999) see this as arising from constraints explicitly demanding such similarity, the OO-faithfulness analysis derives the similarity in a different way. Smaller constituents, when in isolation, are exhaustively phrased, a process by which their edges inevitably coincide with edges of p-phrases. These p-phrases are then retained in a larger structure by OO-faithfulness, and thus come about without any explicit demand for similarity between syntactic and prosodic constituents. An analysis for Bengali that formalizes this perspective is developed in this paper. Extensions to other languages are left for future research.

The Bengali case, in the present analysis, also bears on the interaction of optionality with OO-faithfulness. What happens in cases in which a structure S_1 must show OO-faithfulness to S_2 , but in which S_2 is subject to optionality between two phonological forms $\emptyset(S_2)$ and $\emptyset'(S_2)$? Is there one 'preferred' form, say $\emptyset(S_2)$, that serves as the reference point? Does OO-faithfulness have to take both outputs into consideration simultaneously? Or, as suggested by Elenbaas (1999), can either phonological form separately serve as the reference point? I will show that the Bengali data suggests that the latter is the case, thus supporting the suggestion of Elenbaas (1999). Formally, then, there are in fact two sources of variation: free ranking, and inheritance of the effects of free ranking through OO-faithfulness.

1. The optionality in Bengali

The present paper draws on the study of Bengali intonational phonology in Hayes and Lahiri (1991), which includes a discussion of the formation of phonological phrases relative to syntax, with the two patterns of optionality that are relevant to this article. The present paper also draws on Fitzpatrick-Cole's (1994, 1996) studies of Bengali phrasal reduplication, which crucially interacts with phonological phrasing. In these works, the patterns of phrasing described by Hayes and Lahiri (1991) are confirmed and shown to have further applications. An additional reference is the study of focus clitics in connection with the prosodic system of Bengali in Lahiri and Fitzpatrick-Cole (1999).

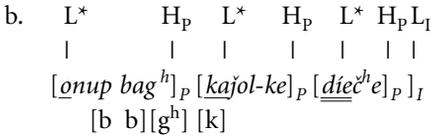
Hayes and Lahiri (1991) argue that evidence from two sources converges on the patterns of p-phrases in Bengali. One source is the tones of the intonational system. A H_p boundary tone marks the right edge of the p-phrase. At the same time, the strongest stress of the p-phrase is marked by an L^* pitch accent. Since word-stress is leftmost in Hayes and Lahiri's account, and the strongest stress within the p-phrase is in turn assigned to the leftmost word (exempting clitic elements), the L^* pitch accent is typically found initial in the p-phrase. The other source of evidence for p-phrasing is provided by two segmental spreading phenomena, /r/ Assimilation and Voicing Assimilation, both of which are sensitive to the edges of the p-phrase.

(1) *Reference to p-phrases in Bengali*

- a. In p-phrases preceding the nuclear accent of an intonational phrase, an $L^* H_p$ tonal contour is assigned, where L^* associates to the syllable with strongest prominence within the each p-phrase, and H_p associates with the last syllable of the p-phrase (with some variation).¹
- b. Optional total assimilation of [r] to a following coronal consonant is blocked at p-phrase boundaries.
- c. Optional regressive voicing assimilation among adjacent stops is blocked at p-phrase boundaries.

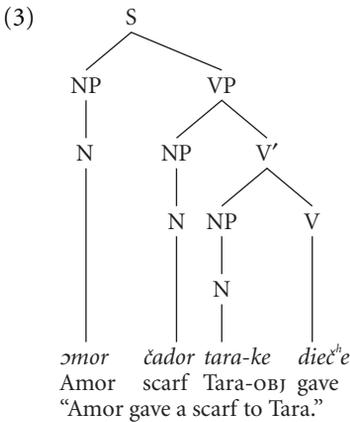
An example from Hayes and Lahiri (1991:85) with narrow focus on the verb is shown in (2). In a deliberate rendition of this example, the phrasing in (2a) is observed, in which each argument of the verb as well as the verb form separate p-phrases. The p-phrases are seen by the L^* and H_p tones assigned relative to them (and their heads of prominence, underlined in (2), that serve as the anchors of L^*). In this example, the p-phrases also have the effect of blocking regressive voicing assimilation across the edge of first and second p-phrase, and across the edge of second and third p-phrase, as indicated. In faster speech, the phrasing in (2b) becomes possible, with the subject and first object forming a larger p-phrase together. The phrasing can be inferred from the tonal structure, as well as from the applicability of regressive voicing assimilation across subject and first object.

- (2) a. $L^* H_p \quad L^* H_p \quad L^* H_p \quad L^* H_p L_I$
 | | | | | | | | | |
 [onup]_p [bag^h]_p [kaʃol-ke]_p [diec^he]_p]_I
 [p] [b][g^h] [k]
 Anup tiger Kajol-OBJ gave
 "Anup gave a tiger to Kajol." (focus on the verb)



Hayes and Lahiri (1991) shows that the pattern of phrasing for a verb and its arguments is different from the pattern of phrasing found inside of an NP or PP (postpositional phrase). I will refer to the two cases as phrasing in the verbal system and phrasing in the nominal system, respectively. Both cases show optionality of a certain kind, though the optionality between verbal and nominal system differ both in the way they are conditioned by non-structural factors such as rate of speech, and in the patterns allowed and disallowed under the optionality. I will begin with the verbal system.

Bengali shows head-final word order in the projections of V, N, A and P. At a normal rate of speech, the arguments of a verb each form separate p-phrases, and the final verb forms a p-phrase of its own. This phrasing was seen in (2a) above, an example in which the verb has narrow focus.² It is also observed where no narrow focus is involved, as shown in (3a), from Hayes and Lahiri (1991:90f).



- a. (Amor)_p (čador)_p (tara-ke)_p (dieč^he)_p normal rate of speech
- b. i. (Amor čador)_p (tara-ke)_p (dieč^he)_p additional options with
- ii. (Amor)_p (čador tara-ke)_p (dieč^he)_p faster speech and
- iii. (Amor čador tara-ke)_p (dieč^he)_p under givenness
- c. *(Amor)_p (čador)_p (tara-ke dieč^he)_p generally impossible

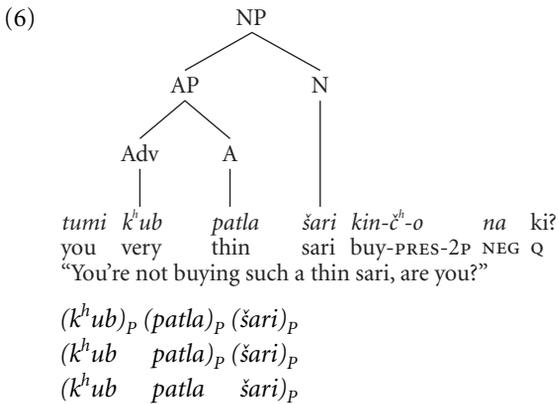
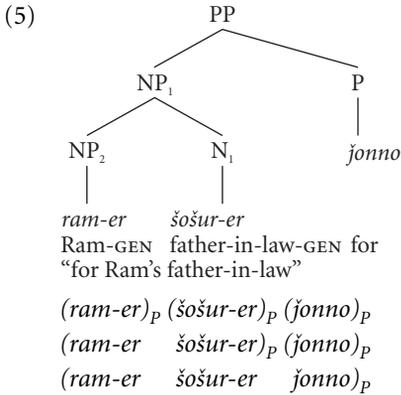
At a normal rate of speech and when all constituents are contextually new, these phrase-breaks are not optional. However, at a faster rate of speech, or if a constituent is contextually given, p-phrase boundaries between the arguments

can be omitted. An example of this was seen in (2b). The possibilities and limits of the optionality are illustrated in (3b,c). Two or more adjacent arguments may join into a larger p-phrase, as shown in (3b). However, the final verb does not participate in the optionality. The phrase-break to its left is always obligatory, as shown in (3c). Notice that the larger p-phrases formed in (3b) are not syntactic constituents.

In the nominal system, optionality is available regardless of rate of speech. Further, the optionality is restricted in such a way that only syntactic constituents may form larger p-phrases. This is shown in (4), with an example from Hayes and Lahiri (1991:88f). In (4a), each p-phrase matches a syntactic word. In (4b–d), the larger constituents NP₂, PP, and NP₁ are p-phrases. These constituents are followed by separate p-phrases around each remaining word, if any. This separate phrasing corresponds to the syntactic structure, in which none of the strings of words following an internal p-phrase edge are constituents. (4e–g) show that such strings cannot form p-phrases in the nominal system.

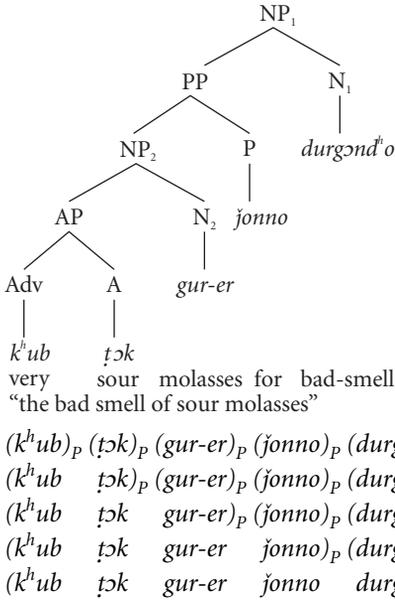
- (4)
-
- a. (tɔk)_P (gur-er)_P (jonno)_P (durgɔndʰo)_P
 b. (tɔk gur-er)_P (jonno)_P (durgɔndʰo)_P
 c. (tɔk gur-er jonno)_P (durgɔndʰo)_P
 d. (tɔk gur-er jonno durgɔndʰo)_P
 e. *(tɔk)_P (gur-er)_P (jonno durgɔndʰo)_P
 f. *(tɔk gur-er)_P (jonno durgɔndʰo)_P
 g. *(tɔk)_P (gur-er jonno durgɔndʰo)_P
 sour molasses for bad-smell
 “the bad smell of sour molasses”

Additional examples of the optionality in the nominal system are given in Fitzpatrick-Cole (1994, 1996) and are reproduced here, with the syntactic analysis of Fitzpatrick-Cole. (5) and (6) show left-branching structures of three words, composed of different syntactic constituents, but both showing the same optionality.

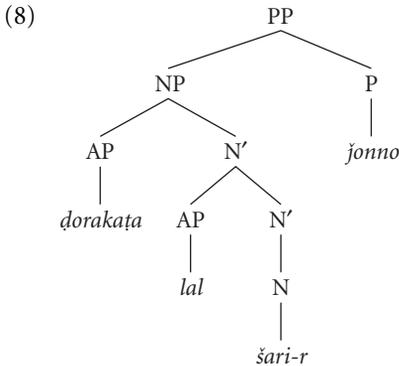


A left-branching structure with five words from Fitzpatrick-Cole (1994, 1996) is shown in (7). The optionality observed above extends to this case.

(7)

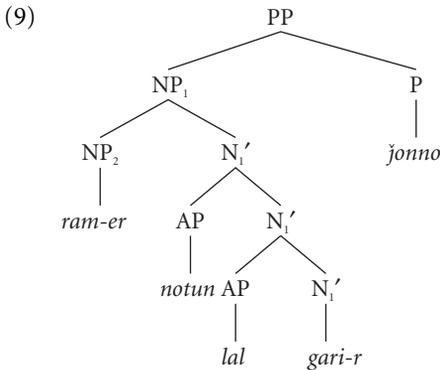


Fitzpatrick-Cole (1994, 1996) also shows right-branching structures, which display an analogous optionality — syntactic constituents may be phrased together or phrased in smaller units, while strings that are not constituents may not be phrased together. (8) is an example in which a right-branching structure with three words is embedded in a postpositional phrase. In (9), a postpositional phrase embeds a right-branching structure with four words.



striped red sari-GEN for
 “for a striped red sari”

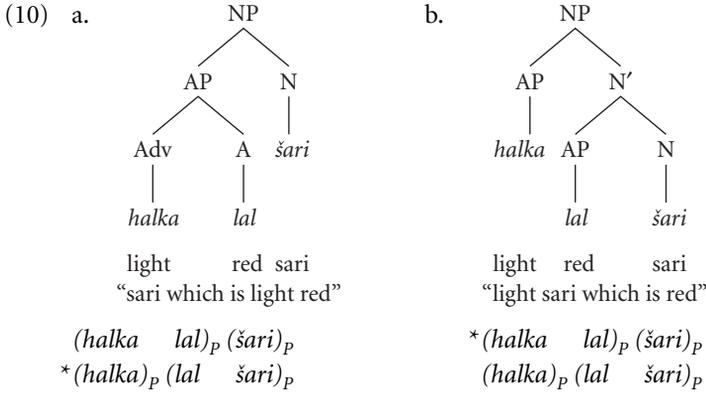
- $(\dot{d}orakata)_P (lal)_P (\dot{s}ari-r)_P (\dot{j}onno)_P$
- $(\dot{d}orakata)_P (lal \ \dot{s}ari-r)_P (\dot{j}onno)_P$
- $(\dot{d}orakata \ lal \ \dot{s}ari-r)_P (\dot{j}onno)_P$
- $(\dot{d}orakata \ lal \ \dot{s}ari-r \ \dot{j}onno)_P$



Ram-GEN new red car-GEN for
 “for Ram’s new red car”

- $(ram-er)_P (notun)_P (lal)_P (gari-r)_P (\dot{j}onno)_P$
- $(ram-er)_P (notun)_P (lal \ gari-r)_P (\dot{j}onno)_P$
- $(ram-er)_P (notun \ lal \ gari-r)_P (\dot{j}onno)_P$
- $(ram-er \ notun \ lal \ gari-r)_P (\dot{j}onno)_P$
- $(ram-er \ notun \ lal \ gari-r \ \dot{j}onno)_P$

Consider also the minimal contrast between a left- and a right-branching structure from Fitzpatrick-Cole (1994, 1996) in (10). In both cases, two words may form a p-phrase together if they constitute a syntactic constituent, but not otherwise.



The descriptive generalizations characterizing the patterns of optionality in the verbal and nominal system are summed up in (11).

(11)	<i>Verbal system</i>	<i>Nominal system</i>
applies to:	VP, IP	NP, PP, AP
external conditions:	fast speech, givenness	none
syntax:	forms non-constituent p-phrases stops at V	only syntactic constituents are p-phrases

2. Problems with an application of earlier OT analyses to Bengali

In this paper, I am interested in developing the consequences of this variation in an optimality theoretic account (Prince and Smolensky 1993) of the syntax-phonology mapping (Selkirk 1995b, Truckenbrodt 1995, 1999). The account of Hayes and Lahiri (1991) extends suggestions made by Nespor and Vogel (1986) for Italian and other languages and by Hayes (1989) for English. I am not aware of a proposal to reconstruct these proposals in Optimality Theory.

In this section, I will show the problems that the theory of Selkirk (1986, 1995a) and Truckenbrodt (1995, 1999) encounters when confronted with the optionality in the Bengali nominal system. This will show the necessity of a different account of Bengali phrasing in OT.

Consider again the phrasing options for (4), repeated here in (12). For the sake of the argument, I assume, with Fitzpatrick-Cole (1994, 1996), that Bengali adjectives project an AP.

contained in p-phrases. (It is immaterial that a single p-phrase does this for all three XPs here.) On the other hand, the excluded phrasings $[(NP)_p (NP)_p (V)_p]_{VP}$ and $[(NP)_p (NP V)_p]_{VP}$ would violate Wrap-XP in not furnishing a p-phrase at least the size of the entire VP — the VP is not prosodically wrapped in a p-phrase.³

Wrap-XP might in principle be seen as a plausible constraint for suppressing one or more of the internal p-phrase edges demanded by Align-XP,R in the Bengali case in (12). Thus, in (12a), the fine-grained phrasing fully satisfies Align-XP,R; however, it maximally violates Wrap-XP, in that neither of NP_2 nor PP nor NP_1 have a p-phrase that contains them without an internal p-phrase break. One might then see a trade-off relation between Align-XP,R and Wrap-XP in the patterns of optionality in (12). In (12b), there are less violations of Wrap-XP than in (12a), because (12b) allows not only AP but also NP_1 to be wrapped in a p-phrase. The cost of this improvement in (12b) is the failure of AP to right-align with a p-phrase, in violation of Align-XP,R. (12c) additionally allows wrapping of PP, though at the cost of not right-aligning NP_1 with a p-phrase edge. In (12d), finally, additional wrapping of NP_2 is bought at the price of additional failure to right-align PP.

We may then seek to implement this trade-off relation by not fixing the ranking between Align-XP,R and Wrap-XP. Accounts of optionality in terms of variable ranking have been argued for by Anttila (1997), Elenbaas (1999), Itô and Mester (1997), Kager (1994), Kiparsky (1993), Reynolds (1994), among others. These works converge on a particular way of deriving variation, by which different possible outputs result from different constraint evaluations where the grammar permits more than one ranking of the constraints. In particular, given two crucially unranked constraints A and B, the results of two constraint evaluations are allowed, one due to $A \gg B$, the other due to $B \gg A$. Itô and Mester (1997) refer to constraints that may be ranked in either order to derive different outputs as constraints in *free ranking*, a terminology adopted here.

Crucially, however, the relation of trade-off between Align-XP,R and Wrap-XP cannot be derived by free ranking between Align-XP,R and Wrap-XP. Thus, if the free ranking is resolved to *Align-XP,R* \gg *Wrap-XP* as in (15), the most fine-grained phrasing is chosen. If the free ranking is resolved to *Wrap-XP* \gg *Align-XP,R* as in (16), the most coarse-grained phrasing is chosen. The free ranking between Align-XP,R and Wrap-XP thus derives an optionality between the most fine-grained and the most coarse-grained phrasings. However, the intermediate options (12b,c) are not derived on either resolution of the free ranking.

(15)	[[[[[ʈɔk] gur-er] jonno] durgɔnd ^h o]	Align-XP,R	Wrap-XP
a.	 (ʈɔk) _P (gur-er) _P (jonno) _P (durgɔnd ^h o) _P		***
b.	(ʈɔk gur-er) _P (jonno) _P (durgɔnd ^h o) _P	*!	**
c.	(ʈɔk gur-er jonno) _P (durgɔnd ^h o) _P	*!*	*
d.	(ʈɔk gur-er jonno durgɔnd ^h o) _P	*!***	

(16)	[[[[[ʈɔk] gur-er] jonno] durgɔnd ^h o]	Wrap-XP	Align-XP,R
a.	(ʈɔk) _P (gur-er) _P (jonno) _P (durgɔnd ^h o) _P	*!***	
b.	(ʈɔk gur-er) _P (jonno) _P (durgɔnd ^h o) _P	*!*	*
c.	(ʈɔk gur-er jonno) _P (durgɔnd ^h o) _P	*!	**
d.	 (ʈɔk gur-er jonno durgɔnd ^h o) _P		***

It seems that the problem that the Bengali optionality raises for an optimality theoretic account is more general, and does not reside with the choice of constraints. Thus, if we seek to represent the optionality as resulting from free ranking of conflicting constraints, one favoring a fine-grained phrasing, the other favoring a coarse-grained phrasing, a global evaluation of the phrasing will always result in one or the other extreme, not deriving the intermediate options. What this case suggests, then, is that the choice between fine-grained phrasing and coarse-grained phrasing is made locally for each syntactic constituent. This is illustrated with Hayes and Lahiri's original account of the default phrasing in Bengali in (17). The phrasing options are repeated in (18) for convenience.

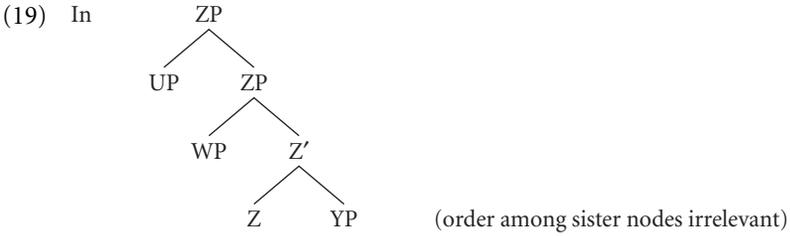
- (17) Default P-phrasing
- a. Every phonological word may be a P-phrase.
 - b. For consecutive constituents X, Y: if
 - i. X forms a legal P-phrase
 - ii. Y is a head c-commanding X
 - iii. Y ≠ V
 then [X Y] may form a P-phrase.

phrasing will import the p-phrases of the subconstituent $[[tɔk] gur-er]$. Here the optionality multiplies in the correct fashion if OO-faithfulness may take as a point of departure either of the output variants allowed for this smaller constituent, $(tɔk)_p(gur-er)_p$ or $(tɔk gur-er)_p$. Choosing the former as a reference point for OO-faithfulness will derive $(tɔk)_p(gur-er)_p(jonno)_p$, choosing the latter as a reference point will derive $(tɔk gur-er)_p(jonno)_p$ — the intermediate options that cannot be derived by the combination of Align-XP,R and Wrap-XP. In this account, then, the optionality multiplies with syntactic complexity as desired: at each syntactic level, a choice is made between coarse-grained and fine-grained phrasing. The variation for smaller constituents is passed on to larger ones though OO-faithfulness in the options derived for fine-grained phrasings of the larger constituents.

The invocation of OO-faithfulness in phrasal phonology changes the perspective on the syntax-phonology interface in ways that may well go beyond the addition of a constraint (OO-faithfulness) to the theory that is already in place. Essentially, much of the work on the syntax-phonology interface has explored partial similarities between syntactic and prosodic structure. For example, Align-XP,R demands that syntactic and prosodic phrases coincide at their right edges. Similarly, Wrap-XP will usually have the effect of enforcing that a larger syntactic phrase must become a p-phrase as a unit. As the analysis of Bengali below will show, OO-faithfulness likewise has the effect of deriving similarity between syntactic and prosodic constituents. This raises the more general question of to what extent OO-faithfulness can replace other constraints of the syntax-prosody mapping. I will leave this question with regard to other languages for future research. For Bengali, the analysis presented below does in fact derive all such similarities from OO-faithfulness. A sense of this was given in the outline of the account in the preceding paragraph.

In the formalization of OO-faithfulness on the phrasal level, I adopt three premises that are shared by many, though not all, contributions in this regard. First, in the computation of the phonological form of an element X, OO-faithfulness will target only subconstituents of X that are proper parts of X (Benua 1997, Itô and Mester 1997, Kager 1999, 2000, Kenstowicz 1996). For example, for Kager (1999), these subconstituents have to be *compositionally related* to the larger form *in a morphological and semantic sense*. (Though see Kenstowicz (1996, 1997) for arguments that in addition to such a notion of Base-Identity, a notion of Uniform Exponence in paradigms must be acknowledged that does not rely on the part-whole relation; see also McCarthy (2000) for a proposal where the part-whole relation does not hold.) Second, the relation of the part to

the whole has to be in a certain sense local. For example, the relevant parts are directly or indirectly limited to immediate daughters of the whole in Benua (1997), Duanmu (1997), Itô and Mester (1997), and Kenstowicz (1996) (but see Kager (2000) for a different proposal). Third, OO-faithfulness is limited to those subconstituents of X that have free-standing forms, thus excluding morphologically bound elements (see for example Itô and Mester (1997), Kager (2000), and Kenstowicz (1996) for motivation). With these premises, I formalize the application of OO-faithfulness on the phrasal level in (19).



or a substructure thereof, the computation of the phonological output of ZP takes into account OO-correspondence of UP, WP and YP to free-standing variants of these.

Only proper parts of the full structure enter into OO-faithfulness relations. The notion of locality employed limits this to sisters of the syntactic line of projection of ZP (UP as a semi-sister of ZP, WP as a sister of Z', YP as a sister of Z). XPs are assumed to be free-standing syntactic elements by definition. The formulation limits OO-faithfulness to XPs. This is the present implementation of the finding that syntactic XPs crucially enter into the formation of phonological phrases (as in the constraints *Align-XP* and *Wrap-XP*, discussed above). Some evidence for not including OO-faithfulness to the head X in the computation of the phonological form of the phrase XP will be seen at the end of this paper. The present account is also comparable to earlier cyclic accounts of metrical structure (Chomsky and Halle 1968, Halle and Vergnaud 1987, Cinque 1993) in construing the role of syntax as defining a cycle, or, here, defining where OO-faithfulness comes into play. It also has parallels in the cyclic formation of phrasal tone sandhi domains in Mandarin Chinese in Shih (1986), and in the analysis of the same tone sandhi phenomenon in Wee (2000).

Given OO-correspondence relations as defined in (19), (20) then insists that p-phrases are 'inherited' in the phrasing of a larger constituent.

- (20) Max_{OO} : If the syntactic constituent α has an output correspondent α' , then each p-phrase in α' has a corresponding p-phrase in α .

Other than that, the analysis of Bengali makes use of the constraints in (21).

- (21) *P Don't form p-phrases.
 *P_{NOM} Don't form p-phrases between a nominal category (here: N, A, P) and the left edge of its maximal projection.
 Exhaust(ivity) Every terminal element is contained in some p-phrase.

*P is a constraint punishing p-phrases, also advocated in Truckenbrodt (1999). It may be seen as comparable to generally used featural constraints such as *[-high], or, more generally, as an instantiation of a general ban on structure, *Struc in Prince and Smolensky (1993). *P_{NOM} punishes p-phrases to the left of a syntactic head in the nominal system, which is here taken to include nouns, adjectives, and postpositions. This is the constraint used in the present account to distinguish between the nominal and the verbal system in Bengali. The constraint takes some inspiration with the proposals of Nespor and Vogel (1986) and Cinque (1993), whose accounts lead to relatively less prosodic structure on the non-recursive side of a head. The formulation of the constraint here, however, unlike Nespor and Vogel's and Cinque's proposals, transports the hypothesis that prosodic structure to the left of a nominal head is generally marked, regardless of the direction of syntactic branching. In English, for example, the phrasing diagnosed by Hayes (1989) on the basis of rhythm-rule judgments contrasts the joint phrasing in the nominal system, (*Toscanini's ice cream*)_p with the separate phrasing in the verbal system, (*Mississippi*)_p (*outlawed it*)_p. In these examples, the diagnosis is a tendency for stress-retraction within *Toscanini*, but not within *Mississippi*. Hayes (1989), using the syntactic theory of the time, accounted for this prosodic distinction in terms of a distinction between the VP-external status of the subject of the clause, as opposed to an NP-internal status of the possessor. More recent syntactic analyses have postulated functional structure that would place the possessor in a functional projection outside of NP, thus eliminating this possible source of the prosodic difference (Abney 1987 and later literature). *P_{NOM} may extend to cases of this kind, punishing a phrasing in the nominal system that parallels the phrasing of subject and verb phrase, #(*Toscanini's*)_p (*ice cream*)_p. It will do so on a formulation in which the scope of *P_{NOM} extends to the left edge of the functional structure above NP, such as the left edge of DP (see also the following section). The hypothesis resulting from *P_{NOM}, then, is that the different phrasing of the Bengali nominal and verbal systems reflect a more general ban on prosodic structure to the left of a class of heads, a class including nouns, but excluding verbs. However, the implications of this particular formulation will not be

further developed here. Finally, Exhaust (or Exhaustivity) in (21) is a member of a constraint family proposed in Selkirk (1995b) that also comprises the constraint Parse-Syllable from McCarthy and Prince (1993a). Exhaustivity demands exhaustive parsing on the level of the p-phrase.

3.2 Variation in the nominal system

Beginning with the simplest case, consider the constituent $[tɔk]$ in (4), which I here take to be an AP. We want the AP to be a p-phrase when standing on its own, which is derived by ranking Exhaust above *P, as shown in (22).

(22)

	$[tɔk]_{AP}$	Exhaust	*P _{NOM}	*P
a.	$(tɔk)_P$			*
b.	$tɔk$	*!		

Next, consider the NP $[[tɔk] gur-er]$. The fine-grained phrasing $(tɔk)_P(gur-er)_P$ is derived by OO-faithfulness to $(tɔk)_P$, completed to an exhaustive parse by adding a second p-phrase. The constraint that implements OO-faithfulness, and thus favors the fine-grained phrasing, is Max_{OO} , as defined in (20). The coarse-grained phrasing is favored by *P. However, to properly separate the nominal and verbal systems, the constraint crucially invoked here in deriving the coarse-grained phrasing is *P_{NOM}. The account thus postulates a free ranking between the OO-faithfulness constraint Max_{OO} and the constraint *P_{NOM}. The resolution of the free ranking to *P_{NOM} » Max_{OO} derives coarse-grained phrasing, as in (23), while Max_{OO} » *P_{NOM} derive fine-grained phrasing shown in (24).⁴ A particular resolution of a free ranking is indicated in the tableaux by shaded lines.

(23)

	$[[tɔk] gur-er]$ O: $(tɔk)_P$	Exhaust	*P _{NOM}	Max_{OO}	*P
a.	$(tɔk gur-er)_P$			*	*
b.	$(tɔk)_P(gur-er)_P$		*!		**
c.	$(tɔk)_P gur-er$	*!	*		*

(24)	[[<i>ʈɔk</i> gur-er] O: (<i>ʈɔk</i>) _P	Exhaust	Max _{OO}	*P _{NOM}	*P
a.	(<i>ʈɔk</i> gur-er) _P		*!		*
b.	☞ (<i>ʈɔk</i>) _P (gur-er) _P			*	**
c.	(<i>ʈɔk</i>) _P gur-er	*!		*	*

Note that (24) establishes that the constraints in free ranking must be ranked above *P, as the winning candidate (b) would otherwise be eliminated by *P in favor of candidate (a). No crucial ranking is added for Exhaust. However, its crucial ranking above *P, already seen in (22), is confirmed in (24), where the inverse ranking would lead to candidate (c) as the winner. The crucial ranking relations are summed up in (25).

(25) Exhaust, { *P_{NOM} <> Max_{OO} } » *P

Consider then the next higher level, at which [[*ʈɔk* gur-er] *jonno*] is phrased. Where the free ranking is resolved in favor of *P_{NOM}, a single large p-phrase is derived, despite Max_{OO}. This is shown in (26).

(26)	[[<i>ʈɔk</i> gur-er] <i>jonno</i>] O: (<i>ʈɔk</i>) _P (gur-er) _P or (<i>ʈɔk</i> gur-er) _P	Exhaust	*P _{NOM}	Max _{OO}	*P
a.	☞ (<i>ʈɔk</i> gur-er <i>jonno</i>) _P			*(*)	*
b.	(<i>ʈɔk</i> gur-er) _P (<i>jonno</i>) _P		*!		**
c.	(<i>ʈɔk</i>) _P (gur-er) _P (<i>jonno</i>) _P		*!*		***
d.	(<i>ʈɔk</i>) _P (gur-er <i>jonno</i>) _P		*!	*	**

What, then, of the case in which Max_{OO} leads to faithfulness to the phonological form of the subconstituent [[*ʈɔk* gur-er]? Since two phrasings, (*ʈɔk*)_P(gur-er)_P and (*ʈɔk* gur-er)_P, were derived for this form, the question arises as to how this optionality is treated by Max_{OO}. The Bengali optionality can be derived if, following Elenbaas (1999), each of the smaller outputs in variation provides a possible reference point for the OO-faithfulness constraint. Thus Max_{OO} may either enforce similarity to (*ʈɔk*)_P(gur-er)_P or to (*ʈɔk* gur-er)_P. Where the output

form $(\text{t}\text{ɔk})_p(\text{gur-er})_p$, derived in (24), is taken as the reference-point for OO-faithfulness, a maximally fine-grained phrasing results, as shown in (27).

(27)

	[[[$\text{t}\text{ɔk}$ gur-er] ɔ no]] O: $(\text{t}\text{ɔk})_p(\text{gur-er})_p$	Exhaust	Max _{OO}	*P _{NOM}	*P
a.	$(\text{t}\text{ɔk gur-er } \text{ɔ}$ no)] _p		*!		*
b.	$(\text{t}\text{ɔk gur-er})_p(\text{ɔ}$ no)] _p		*!	*	**
c.	☞ $(\text{t}\text{ɔk})_p(\text{gur-er})_p(\text{ɔ}$ no)] _p			**	***
d.	$(\text{t}\text{ɔk})_p(\text{gur-er})_p \text{ɔ}$ no]	*!		**	**
e.	$(\text{t}\text{ɔk})_p(\text{gur-er } \text{ɔ}$ no)] _p		*!	*	**

On the other hand, if the coarse-grained phrasing $(\text{t}\text{ɔk gur-er})_p$, derived in (23), serves as the reference-point of OO-faithfulness, a phrasing intermediate between maximally fine-grained and maximally coarse-grained is derived, as shown in (28).

(28)

	[[[$\text{t}\text{ɔk}$ gur-er] ɔ no]] O: $(\text{t}\text{ɔk gur-er})_p$	Exhaust	Max _{OO}	*P _{NOM}	*P
a.	$(\text{t}\text{ɔk gur-er } \text{ɔ}$ no)] _p		*!		*
b.	☞ $(\text{t}\text{ɔk gur-er})_p(\text{ɔ}$ no)] _p			*	**
c.	$(\text{t}\text{ɔk})_p(\text{gur-er})_p(\text{ɔ}$ no)] _p		*!	**	***
d.	$(\text{t}\text{ɔk gur-er})_p \text{ɔ}$ no]	*!		*	*
e.	$(\text{t}\text{ɔk})_p(\text{gur-er } \text{ɔ}$ no)] _p		*!	*	**

Crucially, both $(\text{t}\text{ɔk})_p(\text{gur-er})_p$ and $(\text{t}\text{ɔk gur-er})_p$ must be available as possible reference-points, since each leads to an attested phrasing of the larger constituent for which there is no other source in the present account.

Note also that the last candidate in (26), (27), and (28) is the impossible phrasing $(\text{t}\text{ɔk})_p(\text{gur-er } \text{ɔ}$ no)]_p. This candidate is ruled out on either resolution of the free ranking. Where *P_{NOM} is decisive, as in (26), this only partially coarse-grained phrasing is no match for the more radically coarse-grained phrasing that wins the competition. On the other hand, where Max_{OO} is

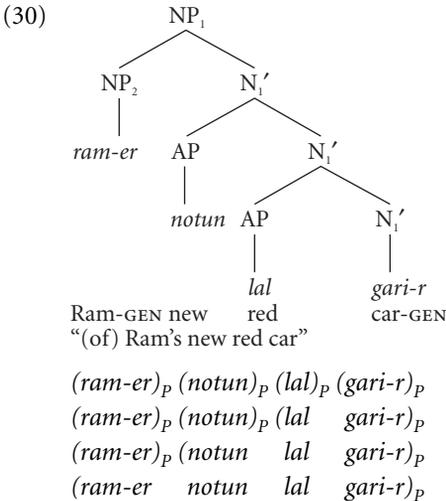
decisive, as in (27) and (28), it rules out the unattested phrasing by insisting on the importation of all p-phrase boundaries of the corresponding output form.

On the last level, then, the three outputs variants derived in (26), (27), and (28) each crucially serve as a reference point for OO-faithfulness in deriving one of the four possible phrasings of (4) above. This is schematically shown in (29).

(29)	<i>resolution of free ranking</i>	<i>reference point for OO-faithfulness</i>
	Max_{OO}	
	Max_{OO}	
	Max_{OO}	
	$*\text{P}_{\text{NOM}}$	

All other phrasings for this structure are correctly excluded. They cannot compete with the maximally coarse-grained phrasing in (29), which fully satisfies $*\text{P}_{\text{NOM}}$, and they would not fully satisfy Max_{OO} either — all phrasings satisfying this constraint are already among the possible phrasings in (29).

The account extends from left-branching structures in the nominal system to right-branching structures. The demonstration of this will involve a particular syntactic analysis of complex nominal projections, here adopted from Abney (1987) and Soh (2001). Consider (30), a substructure of (9) above, for which we want to derive the phrasings shown.



The syntax in (30) is taken from Fitzpatrick-Cole (1996). In the context of the present account, it does not lead to the desired results, as the account would

require OO-faithfulness to each intermediate complex constituent, including the nodes labeled N' in (30) that comprise [*lal gari-r*] and [*notun lal gari-r*]. However, (19) limits OO-faithfulness on the phrasal level to syntactic maximal projections. A partial remedy may be seen in adopting a DP-analysis with the structure [_{DP1} DP₂ [_{NP} AP [_{NP} AP NP]]]. In such a structure, there would be one category NP with three NP segments (Chomsky 1995). We might then rely on each NP segment to trigger OO-faithfulness. This account is rejected here on the grounds discussed in Truckenbrodt (1995, 1999) with regard to the application of Wrap-XP in an adjunction structure with multiple segments. There I argue, and formalize, that a category with multiple segments acts for the purposes of the syntax-prosody mapping as though it was represented by its lowest segment only.

The structure adopted here instead is an adaptation of suggestions of Abney (1987) for English and Soh (2001) for Hokkien Chinese. Soh (2001:70) offers an explanation for a fact of phrasing observed by Chen (1987). As shown in (31), prenominal adjectives in Hokkien (or Xiamen) Chinese are in a separate p-phrase when followed by 'e', but phrase with the following noun otherwise.

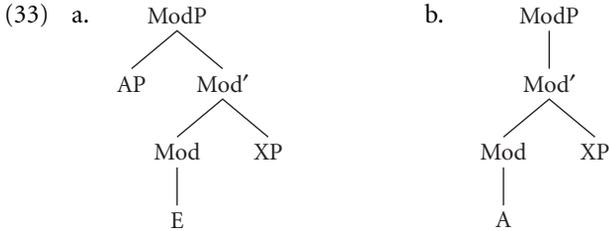
- (31) a. (*pin tuāh*)_p (*e gin-a*)_p
 lazy E boy
 'lazy boy'
 b. (*pin tuāh gin-a*)_p
 lazy boy
 'lazy boy'

Soh (2001), drawing on Duanmu (1998), argues that an adjective followed by 'e' is a maximal projection AP, while an adjective not followed by 'e' is not an AP. Her argument is that the former, but not the latter, allows modification:

- (32) a. (*ia pin tuāh*)_p (*e gin-a*)_p
 very lazy E boy
 'very lazy boy'
 b. *(*ia pin tuāh gin-a*)_p
 very lazy boy

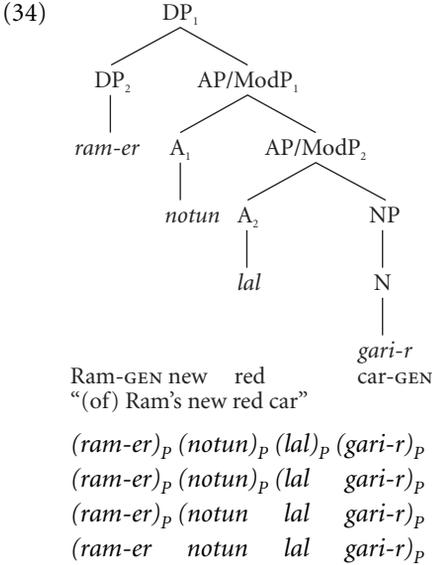
Soh's proposal ties in the presence of 'e' with the modification and phrasing facts. In the structure with 'e', shown in (33a), a Modifier phrase (ModP) is headed by 'e', with the adjective filling the specifier of ModP. Here the adjective constitutes a maximal projection AP. By contrast, in the absence of 'e', the adjective itself heads the ModP, as in (33b). The modification facts in (32) now

follow if modification is limited to APs. The phrasing facts in (31) likewise follow: in Soh's general account, which is a modification of suggestions of Chen (1987) (see also Selkirk 1986), the right edge of the maximal projection AP will trigger the insertion of a p-phrase edge in (33a)/(31a), while the right edge of the head A of ModP will not in (33b)/(31b).



An analysis of prenominal adjectives as syntactic heads rather than maximal projections has also been suggested by Clements (1977) for Ewe and Selkirk and Tateishi (1991) for Japanese, in both cases similarly motivated — in essence, by the absence of the prosodic division that a maximal projection AP would be expected to trigger.

In Soh's proposal, the constituent labeled XP in (33) is a DP. I will adopt a modification of this proposal that merges with a related suggestion by Abney (1987), who presents arguments for the structure $[_{DP} D [_{AP} A [_{NP} N]]]$. Abney's structure shares with Soh's proposal that prenominal adjectives head maximal projections which contain the following noun. It is different from Soh's proposal, however, in locating the projections of the adjective below the projection of the determiner. The adjustment allows for an analysis for the Bengali word order in (30), with the possessor in the specifier of DP, as shown in (34).



The crucial consequence for the analysis of Bengali phrasing lies not with the status of the adjectives as heads (as in the phrasing of Hokkien, Ewe, and Japanese), but with the status of their immediate mother-nodes AP/ModP as maximal projections. These maximal projections will now invoke OO-faithfulness, and lead to the derivation of the correct phrasing options. The account is analogous to that given for left-branching structures. Thus, on the level of ModP₂ in (34), one phrasing option, $(lal)_p (gari-r)_p$, will import the p-phrasing edges around NP; the p-phrasing of the preceding A is due to Exhaustivity. The other phrasing option will phrase AP/ModP₂ as a single unit, $(lal\ gari-r)_p$. Optionality will then be inherited by the larger constituents through OO-faithfulness to AP/ModP₂. Phrasing behaves similarly on the level of AP/ModP₁. On the highest level in (34), the additional issue of OO-correspondence of the possessor DP₂ arises. This turns out to have no consequences: the maximally coarse-grained phrasing $(ram-er\ notun\ lal\ gari-r)_p$ suppresses the effects of OO-faithfulness for right daughters as well as left daughters of the higher DP₁. The fine-grained phrasings, on the other hand, will phrase the highest left branch separately. They will do so in satisfaction of OO-faithfulness for DP₂, though such separate phrasings would also result (due to OO-faithfulness to AP/ModP₁ and Exhaustivity) from a syntactic head in the same position. As in the right-branching structures above, then, the phrasing options that result are all and only those in which p-phrases larger than a single word are syntactic maximal projections.

The revised syntactic analysis of NP-structure requires an adjustment of the definition of $*P_{\text{NOM}}$ in (21). In the structure in (34), $*P_{\text{NOM}}$ must punish p-phrases to the left of N within the higher ModPs and the highest DP, in order for it to be effective in deriving coarse-grained phrasings of these projections. For cases involving a preceding complement of the noun as in (4) above, it must furthermore punish p-phrases within the NP itself. The revised definition makes use of the notion of *extended projection* from Grimshaw (1991). In (34), the extended projection of N is taken to be DP_1 . With this addition, the revised definition of $*P_{\text{NOM}}$ is given in (35).

- (35) $*P_{\text{NOM}}$ Don't form p-phrases between a nominal category (here: N, A, P) and the left edge of its extended projection.

The revised definition of $*P_{\text{NOM}}$ will furthermore correctly extend to the English possessor discussed in connection with the introduction of $*P_{\text{NOM}}$ in (21).

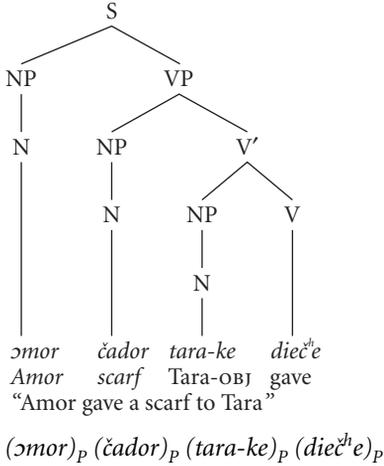
For left- as well as right-branching structures, the present account thus derives the attested phrasings in the nominal system, including the intermediate options, while excluding the impossible phrasings. OO-faithfulness crucially allows the choice between fine-grained and coarse-grained phrasings to be made locally, for each output constituent. The optionality derived at lower levels is passed on to higher levels through OO-faithfulness, which then leads to the attested multiple optionality. In this fashion, the case of Bengali provides evidence that OO-faithfulness plays a role in the construction of p-phrases, and that optionality derived for lower levels may be passed on to higher levels through OO-faithfulness.

It was further shown how an account that employs OO-faithfulness can more generally derive internal p-phrase boundaries from OO-faithfulness with almost no further ado. Where smaller constituents are derived, their edges coincide with p-phrase edges simply in response to the demands of exhaustive parsing (Exhaustivity); for the simplest case, this was shown in (22) above, and the effect is similar in the more complex cases in (23), (24), and (26)–(28). OO-faithfulness may then be seen as importing these boundaries into more complex structures.

3.3 The default of the verbal system

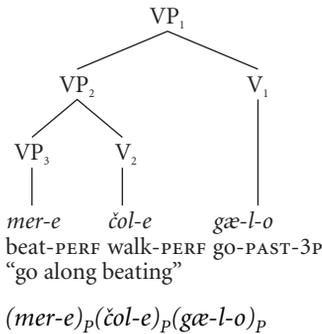
The default phrasing in the verbal system is exemplified in (36), repeated from (3a). Recall that this is the only option at a normal rate of speech, in the absence of contextual givenness.

(36) Hayes and Lahiri (1991:90f)



The account offered here distinguishes nominal and verbal systems in terms of the constraint $*P_{\text{NOM}}$. Before developing the account for the verbal system, I wish to address a possible alternative, a syntactic hypothesis about the distinction between nominal and verbal phrasing. One might wonder whether the verb has instead raised to a higher position in the clause (say, a head of TP or CP at the right), such that the high position of the verb might account for the differences between nominal and verbal systems. There are a number of reasons to discard that possibility. First, it would not explain why the optionality in the verbal system depends on rate of speech, while the optionality in the nominal system does not. Second, the account developed for the nominal system predicts that the verb will eventually come into the range of the ‘cyclic’ computation, no matter how high it has raised in the structure. The obligatory p-phrase boundary to the left of the verb would thus not be explained. Third, it would not explain why the verbal system, but not the nominal system, allows non-constituents as p-phrases. Even though such a syntactic analysis would allow one to maintain that some apparent non-constituents, such as in (3bii,iii), are in fact constituents (assuming the verb raises out of VP), other non-constituent p-phrases, such as in (3bi), could not be reanalyzed as constituents. Finally, Fitzpatrick-Cole (1994, 1996) observes that the p-phrase boundary preceding the verb is also obligatorily present to the left of each verb in a series of verbs, as in (37).

(37) Fitzpatrick-Cole (1994:167, 1996:321) (syntactic structure mine, H. T.)



If, in this structure, only the final verb were raised, its structural distance might explain the second internal p-phrase boundary in (37), but would not explain the first internal p-phrase boundary. If, on the other hand, all verbs were raised, it is not clear how the structural distance between all of them could increase in such a way as to enforce p-phrase boundaries between them.

The present analysis, then, distinguishes nominal from verbal phrasing in the syntax-phonology mapping, such that nominal but not verbal projections are subject to $*P_{\text{NOM}}$. Verbal projections are subject only to the general constraint $*P$. The default phrasing in verbal projections is derived by the ranking relations established above, *Exhaust*, $\{*P_{\text{NOM}} \langle \text{Max}_{\text{OO}} \rangle \} \gg *P$. (38) establishes that this derives the desired result in a sequence of object and verb. The choice between the prosodically well-formed candidates in (b) and (c) is now crucially made by Max_{OO} , in favor of retaining all p-phrases from independently phrased XPs. The outranked general constraint $*P$ is systematically violated. Its cousin $*P_{\text{NOM}}$ does not apply to the verbal projection, and so cannot derive a coarse-grained free variant to the fine-grained phrasing for the verbal system.

(38)	[[tara-ke] dieč ^h e] O: (tara-ke) _p	Exhaust	$*P_{\text{NOM}}$	Max_{OO}	$*P$
a.	(tara-ke) _p dieč ^h e	*!			*
b.	☒ (tara-ke) _p (dieč ^h e) _p				**
c.	(tara-ke dieč ^h e) _p			*!	*

The account further correctly derives the separate phrasing in a series of verbs, on the standard assumption that each of them heads a VP, as in (37) above. The

the present account. However, it will have crucial consequences in the account of variation in the verbal system below. It is therefore interesting that Bengali offers some independent support for making such a distinction between XPs and heads in the phrasing. This independent support comes from the phrasing of complex predicates, to which I now turn.

3.4 The phrasing of complex predicates

Bengali complex predicates can be of the form NV or VV. Fitzpatrick-Cole (1996) and Lahiri and Fitzpatrick-Cole (1999) distinguish complex predicates from phrasal syntactic collocations on the basis of their meanings: where phrasal syntactic constructions have a compositional meaning, complex predicates will take on an idiosyncratic meaning specific to a particular collocation. For example, *b^hut*, ‘ghost’, and *dæk^h-a*, ‘see’, in the sequence *b^hut dæk^h-a* are ambiguous between the object-verb reading ‘to see a ghost’ and the complex predicate reading ‘to be surprised’.

Syntactically, the analysis of Fitzpatrick-Cole (1996) is adopted here, by which a complex predicate joins two syntactic words into a larger syntactic word. Thus, in the example at hand, the complex predicate is analyzed as $[[b^hut]_N [dæk^h-a]_V]_V$, while the object-verb sequence has the phrasal analysis, $[[b^hut]_{NP} [dæk^h-a]_V]_{VP}$ in the case discussed here.

There is indirect prosodic evidence for an analysis of complex predicates in which the members of the complex predicate are still separate words syntactically. Fitzpatrick-Cole (1994, 1996) discusses various phonological consequences of a minimal word requirement, formulated relative to the prosodic word. She argues that the members of a complex predicate are separate prosodic words, since they are each separately subject to the minimal word requirement. Further evidence for the prosodic word status of the members of a complex predicate comes from the placement of clitics. Bayer and Lahiri (1990), Fitzpatrick-Cole (1996), Lahiri and Fitzpatrick-Cole (1999) argue that Bengali clitics are attached to prosodic words. In complex predicates, emphatic clitics may attach to the right of each member of the complex predicate, thus giving further evidence for the prosodic word status of the members of the complex predicates. Given the prosodic word status of the members of a complex predicate, we can make a plausible inference back to their syntax. It is a general and plausible cross-linguistic assumption that separate lexical words generally correspond to separate prosodic words, allowing for some variability in the prosodic attachment of affixes, clitics, and other functional elements at their

edges (see, for example, the constraint $Lex \approx PWD$ of Prince and Smolensky (1993), or the edge-alignment suggestions of McCarthy and Prince (1993b), Selkirk and Shen (1990), Selkirk (1995b)). This relation between syntactic and prosodic words suggests that the separate prosodic words in Bengali complex predicates also form separate syntactic words, as in the analysis of Fitzpatrick-Cole (1996).⁵

As noted in Hayes and Lahiri (1991) and further discussed in Fitzpatrick-Cole (1994, 1996) and Lahiri and Fitzpatrick-Cole (1999), complex predicates differ in their phonological phrasing from object-verb sequences: while an object and a verb must be phrased separately, as was seen above, a complex predicates must form a single p-phrase, as illustrated in (41), from Hayes and Lahiri (1991:90).

- (41) a. $L^* H_P$ L^* $H_P L_I$
 | | | | |
 [(ami)_p (b^hut dek^hlam)_p]_I
 [d d]
 I ghost saw
 I ghost-saw = I was startled.
- b. $L^* H_P$ $L^* H_P$ L_I
 | | | | |
 [(ami)_p (b^hut)_p (dek^hlam)_p]_I
 [t d]
 I ghost saw
 I saw a ghost.

The difference follows from the present analysis. As was seen in connection with (38) above, the separate phrasing of an XP and a following head results from OO-faithfulness to the p-phrase of the XP. In the complex predicates, however, the first member is not an XP. The fact that p-phrase edges are not imported into the complex predicate thus supports the formulation in (19) by which only maximal projections will show OO-faithfulness. A tableau for this case is shown in (42). It can be seen that the joint phrasing of the members of the complex predicate is here compelled by *P, in the absence of a motivation for an internal p-phrase boundary.

(42)

	[b ^h ut dek ^h lam]	Exhaust	Max _{OO}	*P
a.	(b ^h ut) _P dek ^h lam	*!		*
b.	(b ^h ut) _P (dek ^h lam) _P			**!
c.	☞ (b ^h ut dek ^h lam) _P			*

If, by contrast, syntactic heads, like syntactic phrases, would lead to the importation of p-phrase boundaries by OO-faithfulness, the separate phrasing characteristic of phrasal constructions would wrongly be derived, as shown in (43).

(43)

	[b ^h ut dek ^h lam] O: (b ^h ut) _P	Exhaust	Max _{OO}	*P
a.	(b ^h ut) _P dek ^h lam	*!		*
b.	☞ (b ^h ut) _P (dek ^h lam) _P			**
c.	(b ^h ut dek ^h lam) _P		*!	*

The contrast between complex predicates and phrasal combinations thus supports the formulation in (19) by which heads that do not form XPs on their own do not invoke OO-faithfulness on the phrasal level in general, and more specifically in Bengali, do not lead to the importation of p-phrase edges. Indirectly, then, this also supports the aspect of the present analysis highlighted in (40) above: the final verb is phrased separately not because it would itself be subject to OO-faithfulness, but because of Exhaustivity. The latter distinction will be crucial in the account of variation of phrasing in the verbal system, developed in the following section.

3.5 Variation in the verbal system

The optionality in the verbal system is repeated in (44) from (3). (44a) shows the default at a normal rate of speech, as derived in the preceding section. At faster rates of speech, the alternatives in (44b) are allowed. The final verb does not participate in such optionality, as shown in (44c).

- (44)
- | | | | | | |
|-------|------------------------------|--------------------|----------------------|-------------------------------|-------------------------|
| | NP | NP | NP | V | |
| a. | $(\text{ɔmor})_P$ | $(\text{čador})_P$ | $(\text{tara-ke})_P$ | $(\text{dieč}^{\text{h}}e)_P$ | normal rate of speech |
| b. i. | $(\text{ɔmor}$ | $\text{čador})_P$ | $(\text{tara-ke})_P$ | $(\text{dieč}^{\text{h}}e)_P$ | additional options with |
| ii. | $(\text{ɔmor})_P$ | $(\text{čador}$ | $\text{tara-ke})_P$ | $(\text{dieč}^{\text{h}}e)_P$ | faster speech and |
| iii. | $(\text{ɔmor}$ | čador | $\text{tara-ke})_P$ | $(\text{dieč}^{\text{h}}e)_P$ | under givenness |
| c. | $^*(\text{ɔmor})_P$ | $(\text{čador})_P$ | $(\text{tara-ke}$ | $\text{dieč}^{\text{h}}e)_P$ | generally impossible |
| | Amor | scarf | Tara-OBJ | gave | |
| | “Amor gave a scarf to Tara.” | | | | |

Since the optionality in the verbal system depends on external factors such as rate of speech, while the optionality in the nominal system does not, the two cases of variation are plausibly attributed to different sources. It is therefore important that the variation of the nominal system, which is independent of speech rate, not carry over to the verbal system. As already seen above, this comes out of the present account, where $^*P_{\text{NOM}}$, responsible for deriving the coarse-grained variants in the nominal system, is trivially satisfied in the verbal system. Thus, the verbal system as developed so far only shows the fine-grained variants.

What, then, is the nature of fast speech variation in the verbal system? The only structural cue available is the non-participation of the final verb in the restructuring process. This behavior of the verb is difficult to understand if we take the default surface patterns of phrasing in (44a) as a starting point. If we think of the larger p-phrases in (44b) as resulting from restructuring of (44a), there is no reason why the p-phrases of the arguments should undergo restructuring while the p-phrase of the final verb does not. However, a distinction can be made if we look at the options in (44b) in relation to the OO-correspondents postulated in the present account, as in (45). Where restructuring is allowed, as in (45a), the two strings merged into a larger p-phrase each have p-phrases as OO-correspondents. On the other hand, where restructuring is not allowed, as in (45b), the final verb, syntactically a head rather than a phrase, does not have a phrased output correspondent in the present account.

- (45)
- | | | | |
|----|-------------------------------------|--------------------------------------|-----------------------------|
| | p-phrases in out- | restructuring | |
| | put correspondents | options | |
| a. | $(\text{NP})_P (\text{NP})_P \dots$ | $\rightarrow (\text{NP NP})_P \dots$ | possible in fast speech |
| b. | $(\text{NP})_P V$ | $\rightarrow ^*(\text{NP V})_P$ | not possible in fast speech |
| | $(\text{VP})_P V$ | $\rightarrow ^*(\text{VP V})_P$ | |

This distinction can be derived if fast speech restructuring is OO-coalescence of p-phrases: the two p-phrases in (45a) are coalesced into a larger one, while the

mapping in (45b) cannot be seen as one of coalescence, as the verb to the left of the arrow does not have a p-phrase to enter into the coalescence relation.

The idea is formalized by adding the constraints Ident_{OO} and $\text{Uniformity}_{\text{OO}}$ in (46) and (47) to the constraint Max_{OO} used above. These three constraints are, by name and intent, extensions of standard faithfulness constraints in the segmental domain of McCarthy and Prince (1999). They differ from the latter in targeting p-phrases rather than segments, and are defined over output-output pairs. They also incorporate the element of existential quantification in faithfulness constraints from Struijke (2000). Struijke applies this suggestion to cases of multiple output correspondents of a single input element. She argues that it is sufficient if faithfulness to an element is satisfied in one output correspondent (not necessarily in all of them, in case there are more). This is here extended to coalescence in such a way that a coalesced element satisfies an Ident constraint if each of its properties can be traced back to some corresponding element in the non-coalesced structure (not necessarily to all). The formulation of Ident_{OO} in (46) then prohibits p-phrases with single correspondents from changing size, but allows coalescence of two p-phrases if each part of the coalesced p-phrase can be traced back to one of the p-phrases that fuse in the coalesced structure. $\text{Uniformity}_{\text{OO}}$ punishes such coalescence of p-phrases.

- (46) Ident_{OO}
 If P is in OO-correspondence with one or more P', then each element X in P has a correspondent X' in some correspondent P'.
- (47) $\text{Uniformity}_{\text{OO}}$
 No p-phrase has multiple correspondents in other outputs.

We may assume that Ident_{OO} is undominated throughout; p-phrases only qualify as correspondents if they meet this requirement. Max_{OO} and Ident_{OO} jointly distinguish between allowable coalescence (where they are both met) and non-allowable extension of p-phrases (where one of them is violated) as shown in (48).

- (48) a. $(\text{NP})_{\text{P}_1}$ meets Max_{OO} and Ident_{OO}
 $(\text{NP})_{\text{P}_2} \dots$
 $(\quad)_{\text{P}_{1/2} \dots}$
 $[\text{NP}_B [\text{NP}_D \dots \text{V}]_C]_A \rightarrow [\text{NP}_B [\text{NP}_D \dots \text{V}]_C]_A$
- b. $(\text{NP})_{\text{P}_1}$ violates Ident_{OO}
 $(\quad)_{\text{P}_1}$
 $[\text{NP} \quad \text{V}] \rightarrow * [\text{NP} \quad \text{V}]$

- c. (NP)_{P1} ()_{P2} violates Max_{OO}
 [NP V] → * [NP V]

(48a) satisfies Max_{OO} if we understand the restructured p-phrase as a correspondent of both p-phrases from the independent outputs. At the same time it satisfies Ident_{OO} because each NP in the larger restructured p-phrase has a corresponding NP in one of the two corresponding p-phrases. As shown in (48b,c), the formation of a larger p-phrase that includes the final verb violates either Ident_{OO} or Max_{OO}. If the larger p-phrase is a correspondent of the p-phrase of the output object in isolation, as in (48b), Ident_{OO} is violated; the verb in the larger p-phrase has no match in a corresponding p-phrase. If, on the other hand, the larger p-phrase is not a correspondent of the p-phrase of the object, as in (48c), Max_{OO} is violated, as the p-phrase of the corresponding object is not retained in the larger structure.

(48a) thus conforms to Max_{OO} and Ident_{OO}, though it violates Uniformity_{OO}. Max_{OO} and Ident_{OO} are then seen as circumscribing what is possible in the verbal system, where they are unviolated: neither omission nor extension of p-phrases related by OO-faithfulness is allowed, while coalescence is not punished by either Max_{OO} or Ident_{OO}. Uniformity_{OO} makes further decisions in the range of possibilities thus circumscribed. At a normal rate of speech, Uniformity_{OO} is obeyed and coalescence is impossible, while speech at a faster rate allows violations of Uniformity_{OO} and tolerates coalescence.

How is the distinction between normal and fast speech implemented? Yip (1999) offers two analyses of speech rate effects on the size of domains of tone deletion in Nantong, drawing on Ao (1993) and on ideas of Drescher and van der Hulst (1998) about correlations between prosodic constituents and units of timing. In the first account, a phonological analysis, the domain of tone deletion is the foot, regardless of speech rate. Different speech rates are distinguished by different constraint rankings that decrease the size of the foot at slower than normal rates, and increase it at faster than normal rates. In the second account, a more phonetic analysis, the domains of tone deletion are defined in terms of a speech-rate independent representation of timing, intermediate between phonology and phonetics. In this second account, the prosodic representation does not change with rate of speech. Rather, tone-deletion seeks an approximately time-invariant prosodic domain for its application, with the choice of domain then indirectly conditioned by rate of speech. In Bengali, the rate of speech effect does not appear to be located in the phonology-phonetics mapping, as the restructuring is sensitive to the distinction between syntactic heads

and phrases, captured here in the sensitivity of OO-faithfulness to this distinction. This suggests an analysis of the former kind, in terms of re-ranking.⁶ In the analysis offered here, the relevant constraints are $Uniformity_{OO}$ and $*P$. The analysis postulates the ranking in (49a) below for a normal rate of speech; coalescence of p-phrases is ruled out, even if this means having a larger number of p-phrases in the output. At faster rates of speech, re-ranking takes place, allowing, in this case, free ranking between $Uniformity_{OO}$ and $*P$

- (49) a. normal speech rate: $Uniformity_{OO} \gg *P$
 b. faster speech $\{Uniformity_{OO}, *P\}$

The free ranking then derives the optionality seen at faster rates of speech, as shown in the tableaux in (50) and (51). The ranking $Uniformity_{OO} \gg *P$ in (50) chooses the non-coalesced candidate. This ranking also derives the correct result at a normal rate of speech, where coalescence is not possible. The ranking $*P \gg Uniformity_{OO}$ in (51), possible only at faster rates of speech, derives the coalesced variant.

(50)

	(čador) _{P1} (tara-ke) _{P2} ... [NP [NP]]	Max _{OO}	Uniformity _{OO}	*P
a.	(čador tara-ke) _{P3} ...	*!		*...
b.	ESP (čador) _{P1} (tara-ke) _{P2} ...			**...
c.	(čador tara-ke) _{P1/2} ...		*!	*...

(51)

	(čador) _{P1} (tara-ke) _{P2} ... [NP [NP]]	Max _{OO}	*P	Uniformity _{OO}
a.	(čador tara-ke) _{P3} ...	*!	*...	
b.	(čador) _{P1} (tara-ke) _{P2} ...		**!...	
c.	ESP (čador tara-ke) _{P1/2} ...		*...	*

The tableaux also demonstrate that the constraints in free ranking have to be ranked below Max_{OO} , for they will otherwise rule out candidates (b) and (c), incorrectly predicting (a) to be the winner in both (50) and (51). This is a

formal demonstration of what was informally discussed earlier as the role of Max_{OO} as circumscribing the options available in the verbal system. Furthermore, it is compatible with the independently established ranking $Max_{OO} \gg *P$ in the nominal and verbal systems.

Consider then the case of the final verb. The formation of a large p-phrase with the preceding object is ruled out by $Ident_{OO}$ and Max_{OO} , as shown in (52a,b), corresponding to (48b,c) above. Thus, regardless of the resolution of the free ranking between $*P$ and $Uniformity_{OO}$ in faster speech, the only structure derived is that of a separate phrasing of the two objects, in (52c).

(52)

	(tara-ke) _{P1} dieč ^h e [NP V]	$Ident_{OO}$	Max_{OO}	*P	$Uniformity_{OO}$
a.	(tara-ke dieč ^h e) _{P1}	*!		*	
b.	(tara-ke dieč ^h e) _{P2}		*!	*	
c.	 (tara-ke) _{P1} (dieč ^h e) _{P2}			**	

Notice that the separate phrasing of the final verbs, in the present account, supports the formulation in (19) by which phrasal subconstituents, but not syntactic heads, invoke OO-faithfulness. It is by virtue of this distinction that the final head in Bengali has no OO-faithfulness relation that could sponsor coalescence.

A formal issue then arises for the derivation of verbal projections. Once the verb has obtained its separate p-phrase, as in (52c), could it not then coalesce with the preceding object in the phrasing of a larger constituent that takes (52c) as its reference point? A reasonable assumption here would be that the correspondence relation is transitive, so that multiple coindexation (P1/2) is not allowed. Coalescence would then be possible from the separate independent outputs (*čador*)_{P1} and (tara-ke)_{P1} to (*čador tara-ke*)_{P1}. The input for coalescence with the verb at a later cycle would then have to be (tara-ke)_{P1} (dieč^he)_{P1}. This structure would independently be prevented from arising by $Ident_{OO}$ in (46). With these provisos, the verb cannot coalesce with its object initially when they are joined, as derived in (52), and coalescence of object and verb is excluded on general grounds in the computation of larger prosodic constituents.

Consider then again the optionality in the verbal system, repeated in (53).

(53)

	NP	[NP NP V] _{VP}	
a.	(ɔmor) _P	(čador) _P (tara-ke) _P (dieč ^h e) _P	normal rate of speech

- b. i. (omor $\check{\text{cador}}$)_P (tara-ke)_P ($\text{die}^{\check{\text{h}}e}$)_P additional options with
 ii. (omor)_P ($\check{\text{cador}}$ tara-ke)_P ($\text{die}^{\check{\text{h}}e}$)_P faster speech and
 iii. (omor $\check{\text{cador}}$ tara-ke)_P ($\text{die}^{\check{\text{h}}e}$)_P under givenness

The default pattern in (53a) is derived in the absence of coalescence. In (53bi), subject and first object are coalesced in the computation of the phrasing of the entire clause. In (53bii), the two objects are coalesced in the computation of the phrasing of VP. The coalesced structure is then retained in the phrasing of the clause by OO-faithfulness to the phrasing of VP. In (53biii), finally, the two objects are coalesced in the calculation of the phrasing of VP. Subsequently, the subject is coalesced with the already coalesced objects, in the computation of the phrasing of the clause. Notice, then, a parallel to the account of optionality in the nominal system: the account must crucially allow the inheritance of optionality derived for a lower constituent, through OO-faithfulness, to the phrasing of a larger constituent. Thus, the distinction between (53a) and (53bii) is derived at the level of VP by the free ranking of $\text{Uniformity}_{\text{OO}}$ and *P in the present account — the two objects may or may not be coalesced at this level. The distinction must crucially be allowed to carry over to the entire clause by OO-faithfulness to VP.

In conclusion, the default phrasing in the verbal system follows from the account introduced for the nominal system. All arguments of the verb are phrased separately, since they inherit the p-phrase boundaries at their edges from independent occurrences of those arguments. The final verb receives a separate p-phrase due to Exhaustivity. On the account motivated above, fast speech restructuring in Bengali involves coalescence of p-phrases defined on OO-correspondence relations. This is possible among adjacent arguments, which have independent OO-correspondents that constitute p-phrases, but may not involve final heads in the verbal system, which do not have independent OO-correspondents that could be p-phrases in the present account.

4. Independent motivation for the special status of syntactic heads

The account of the special status of the final verb in Bengali relies on its syntactic status as a head, and on the postulate in (19) that syntactic phrases, but not syntactic heads, have OO-correspondents: with no OO-correspondent, the final verbal head is ineligible for coalescence of p-phrases, so that the p-phrase edge preceding it is obligatory. Some independent support for the

While Bengali and German are similar in that the verb's arguments (here, the subject and object) are phrased separately, they differ in the phrasing of the final verb, which occupies a separate p-phrase in Bengali, but not in German. A further reflection of this difference is the position of the strongest stress of the clause. In both languages, the strongest stress of the intonational phrase is assigned to the rightmost beat on the next lower level, following, for Bengali, the account of Hayes and Lahiri (1991), and for German, the account of Uhmann (1991). Due to the different assignment of p-phrases, the sentence stress thus falls on the final verb in Bengali as shown in (54), but on the preverbal object in German, as in (55).

An account of the German and Dutch pattern in terms of OO-faithfulness makes use of the insight of Cinque's (1993) cyclic account. Cinque (1993) construes the greater syntactic complexity of the verb's argument, relative to the verb, as the triggering factor for stress attraction on the argument. The present account adopts this idea, though in a different formalization: it is the status of the verb's argument as a syntactic phrase that is crucial here, in contrast to the status of the final verb as a syntactic head. The distinction is crucially drawn by (19) above, which was seen to be relevant in Bengali as well.

The difference between Bengali phrasing and Dutch/German accentuation may be seen with respect to what is preserved by OO-faithfulness. In Bengali, as was seen, Max_{OO} crucially preserves the p-phrases of phrasal output correspondents. In German and Dutch, the present extension of this analysis postulates preservation of the stress or accent that is assigned instead. The difference is shown in (56).

- | | | | |
|---------|--|----|---|
| (56) a. | Bengali | b. | Dutch/German |
| | preserves phrasing | | preserves stress/accent |
| | (x) _P | | (x) _P |
| | [or bari] _{NP} | | [ihr Haus] _{NP} |
| | (x) _P (x) _P | | (x) _P |
| | [[or bari] _{NP} d ^h ukec ^h ilo] _{VP} | | [[ihr Haus] _{NP} betrat] _{VP} |
| | her house entered | | her house entered |

In the account of Dutch and German, the constraint preserving p-phrases will be low ranked and ineffective ($*P \gg Max_{OO}$). Instead, a constraint on preserving p-phrase prominence will be crucial in determining the accentual pattern, as in (57). This is an extension of proposals for a constraint that preserves word-stress between outputs in Duanmu (1997), Kager (2000), Kenstowicz (1997), and McCarthy (2000).

- (57) Max-prom_{OO}: If the syntactic constituent α has an output correspondent α' , then each p-phrase prominence in α' has a corresponding p-phrase prominence in α .

Crucially ranked above *P, Max-prom_{OO} will lead to the desired phrasing of the object-verb sequence, as shown in (58) and (59).

(58)

	[ihr Haus] _{NP}	Exhaust	*P
a.	☞ (ihr <u>Haus</u>) _P		*
b.	ihr Haus	*!	

(59)

	[[ihr Haus] betrat] O: (ihr <u>Haus</u>) _P	Exhaust	Max-prom _{OO}	*P	Max _{OO}
a.	(ihr <u>Haus</u>) _P betrat	*!		*	
b.	(ihr <u>Haus</u>) _P (betrat) _P			**!	
c.	☞ (ihr <u>Haus</u> betrat) _P			*	*
d.	(ihr Haus <u>betrat</u>) _P		*!	*	

Notice that it is crucial here that the final verb does not invoke phrasal OO-faithfulness. If it did, the verb would come to be in correspondence with a verb in isolation, which would form a p-phrase by Exhaustivity. It would also receive phrasal stress, which would then be imported into the object-verb collocation.

To complete the analysis for the case at hand, the separate arguments will correctly be phrased and stressed/accented separately, preserving the stress and accent they are assigned when phrased in isolation:

(60)	... [Shamoli] [[ihr Haus] betrat] O: (Shamoli) _p O: (ihr Haus betrat) _p	Ex- haust	Max- prom _{OO}	*P	Max _{OO}
a.	☞ (Shamoli) _p (ihr Haus betrat) _p			**	*
b.	(Shamoli ihr Haus betrat) _p		*!	*	**
c.	(Shamoli ihr Haus betrat) _p		*!	*	**

On the level of the intonational phrase, the rightmost such phrasal stress, here on the object, is strengthened to intonational phrase prominence.

The account can thus capture why the final verb is special in the assignment of prosodic structure in both Bengali and Dutch/German. In Bengali, the final verb is special in that it forms a separate p-phrase that may not coalesce. In Dutch/German, it is special because it does not receive an accent. In the present account, both instances are reduced to (19), by which syntactic phrases, but not syntactic heads, have OO-correspondents in the calculation of OO-faithfulness on the phrasal level. This strengthens the invocation of (19) in the account of the phrasing of the final verb in Bengali.

5. Conclusion

This paper has shown that the multiple optionality in Bengali phrasing motivates an account of Bengali phrasing in terms of a combination of free ranking and OO-faithfulness. Crucially, these interact in the way suggested by Elenbaas (1999): variation derived for a smaller constituent is inherited in the phrasing of a larger constituent through OO-faithfulness.

It was also seen that the introduction of OO-faithfulness into the theory of phonological phrasing leads to a new perspective on similarities between syntactic and prosodic structure. For Bengali, in particular, such similarities can be analyzed as arising from demands of exhaustive phrasing for smaller constituents in isolation, and from the incorporation of the p-phrases thus obtained into larger structures via OO-faithfulness.

Notes

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1. The star-notation in L^* is adopted by Hayes and Lahiri from Pierrehumbert (1980). The star indicates that this tone is associated with a prominent syllable. The subscript on H_p indicates that this H tone is a boundary-tone of P, the p-phrase, in the notation of Hayes and Lahiri (1991). No tones are assigned between the L^* and the H_p of each p-phrase in Hayes and Lahiri's account, so that phonetic interpolation derives a gradually rising tonal pattern between each L^* and H_p .

2. The example with narrow focus on the verb is chosen for its homogeneity of tone assignment across all p-phrases. Without narrow focus, the final p-phrase is identical in extension, but is assigned different tones.

3. An interesting issue of subordinate relevance in the present context is the role of the distinction between lexical and functional projections for the phrasing. Truckenbrodt (1999), following up on Selkirk and Shen (1990) and Selkirk (1995b), argues that functional projections do not invoke the mapping constraints Align-XP and Wrap-XP. A crucial consequence is that Wrap-XP does not suppress edge-alignment internal to functional projections, thus allowing those utterance-internal p-phrase edges that give evidence for edge-alignment in the first place. In the Bengali data of Hayes and Lahiri (1991) there is no evidence for a distinction between lexical and functional projections. Since neither Align-XP nor Wrap-XP will be a part of the analysis proposed here, the issue is not pursued here.

4. The present demonstration of the theory takes the syntactic phrases as in $[[t\check{a}k] gur-er]$ as a starting-point. This analysis will be adjusted later in this section, in favor of $[t\check{a}k [gur-er]]$. The logic and the result here remain the same. In the case of fine-grained phrasing, in particular, the lower syntactic phrase receives a separate p-phrase due to OO-faithfulness, and the remaining head element receives a separate p-phrase due to Exhaustivity.

5. The syntax of complex predicates is investigated by Butt (1995) in the related language Urdu. For Urdu aspectual complex predicates, Butt argues for a comparable syntactic structure that joins two lexical heads into a constituent (V' for Butt). One argument for this close syntactic coherence is the impossibility of separating the members of aspectual complex predicates by syntactic movement. However, complex predicates in Urdu do not form a homogeneous class syntactically. Thus, if complex predicates are identified as those constructions in which two heads combine their thematic and morphological (agreement-related) properties, at least two classes of complex predicates exist that are distinct in their syntactic behavior from aspectual complex predicates. One such class, the N-V complex predicates, allow syntactic topicalization of the V member alone, though not of the N member alone. Butt suggests a syntactic combination of N with V' for these cases, $[N V']_{V'}$. Yet another syntactic behavior is exhibited by the more specific case of permissive complex predicates, which share the (yet different) word-order facts of phrasal constructions. The

discussion in the text proceeds on the assumption that Bengali complex predicates share with the Urdu aspectual complex predicates and N-V complex predicates that the members of the complex predicate are not syntactic maximal projections.

6. In analyzing rate of speech effects by reranking, one may think of the link between prosodic constituents and timing as an extragrammatical factor restricting possible rerankings: Rate of speech motivated reranking must lead to a better match of prosodic constituents to their preferred temporal durations.

7. The non-accentuation of a final verb that follows an (unscrambled) object in German has also been discussed in connection with the assignment of main stress in German by Cinque (1993), Höhle (1979), Jacobs (1993), Selkirk (1984), von Stechow and Uhmman (1986), and others.

References

- Abney, Steven 1987. *The English Noun Phrase in Its Sentential Aspect*. Ph.D. Dissertation, Massachusetts Institute of Technology.
- Anttila, Arto 1997. *Variation in Finnish Phonology and Morphology*. Ph.D. Dissertation, Stanford University.
- Ao, Benjamin 1993. *Phonetics and Phonology in Nantong Chinese*. Ph.D. Dissertation, The Ohio State University.
- Bayer, Josef & Aditi Lahiri 1990. "Bengali Emphatic Clitics in the Lexicon-Syntax Interface". *Contemporary Morphology* ed. by Wolfgang U. Dressler, Hans C. Luschutzky, Oskar E. Pfeiffer & John R. Rennison, 3–16. Berlin: Mouton.
- Benua, Laura. 1995. "Identity Effects in Morphological Truncation". *Papers in Optimality Theory. University of Massachusetts Occasional Papers 18* ed. by Jill Beckman, Laura Walsh Dickey & Suzanne Urbanczyk, 77–136. Amherst, Mass: GLSA.
- Benua, Laura. 1997. *Transderivational Identity: Phonological Relations between Words*. Ph.D. Dissertation, University of Massachusetts.
- Butt, Miriam 1995. *The Structure of Complex Predicates in Urdu*. Stanford, California: CSLI Publications.
- Chen, Matthew. Y. 1987. "The Syntax of Xiamen Tone Sandhi". *Phonology Yearbook* 4.109–149.
- Chomsky, Noam & Morris Halle 1968. *The Sound Pattern of English*. New York: Harper and Row.
- Chomsky, Noam 1995. *The Minimalist Program*. Cambridge, Mass.: MIT Press.
- Cinque, Guglielmo 1993. "A Null Theory of Phrase and Compound Stress". *Linguistic Inquiry* 24:2.239–297.
- Clements, George N. 1977. "Tone and Syntax in Ewe". *Harvard Studies in Phonology, Vol I* ed. by George N. Clements, 75–185. Cambridge, Mass: Department of Linguistics, Harvard University.
- Dresher, Elan B. & Harry van der Hulst 1998. "Head-Dependent Asymmetries in Phonology: Complexity and Visibility". *Phonology* 15:3.317–352.

- Duanmu, San. 1997. "Recursive Constraint Evaluation in Optimality Theory: Evidence from Cyclic Compounds in Shanghai". *Natural Language and Linguistic Theory* 15:3.465–507.
- Duanmu, San. 1998. "Wordhood in Chinese". *New Approaches to Chinese Word Formation: Morphology, Phonology and the Lexicon in Modern and Ancient Chinese*. ed. by Jerome Packard, 135–196. Berlin: Mouton de Gruyter.
- Elenbaas, Nine 1999. A Unified Account of Binary and Ternary Stress. Considerations from Sentani and Finnish. Ph.D. Dissertation, Universiteit Utrecht.
- Fitzpatrick-Cole, Jennifer. 1994. The Prosodic Domain Hierarchy in Reduplication. Ph.D. Dissertation, Stanford University.
- Fitzpatrick-Cole, Jennifer. 1996. "Reduplication Meets the Phonological Phrase in Bengali". *The Linguistic Review* 13.305–356.
- Grimshaw, Jane 1991. "Extended Projection". Ms., Brandeis University.
- Gussenhoven, Carlos. 1983. "Focus, Mode and the Nucleus". *Journal of Linguistics* 19:2.377–417.
- Gussenhoven, Carlos. 1992. "Sentence Accents and Argument Structure". *Thematic Structure. Its Role in Grammar* ed. by Iggy Roca, 79–106. Berlin, New York: Foris Publications.
- Hale, Kenneth & Elisabeth Selkirk 1987. "Government and Tonal Phrasing in Papago". *Phonology Yearbook* 4.151–183.
- Halle, Morris & Jean-Roger Vergnaud 1987. *An Essay on Stress*. Cambridge, Mass.: MIT Press.
- Hayes, Bruce 1989. "The Prosodic Hierarchy in Meter". *Rhythm and Meter* ed. by Paul Kiparsky & Gilbert Youmans, 201–260. Orlando: Academic Press.
- Hayes, Bruce & Aditi Lahiri 1991. "Bengali Intonational Phonology". *Natural Language Linguistic Theory* 9:1.47–96.
- Hayes, Bruce 1995. *Metrical Stress Theory: Principles and Case Studies*. Chicago: The University of Chicago Press.
- Höhle, Tilman N. 1979. "'Normalbetonung' und 'Normale Wortstellung': Eine pragmatische Explikation". *Leuvense Bijdragen: Tijdschrift voor Germaanse Filologie* 68.385–437.
- Itô, Junko & Armin Mester 1997. "Correspondence and Compositionality: The Ga-Gyo Variation in Japanese Phonology". *Derivations and Constraints in Phonology* ed. by Iggy Roca, 419–462. Oxford: Clarendon Press.
- Jacobs, Joachim 1993. "Integration". *Wortstellung und Informationsstruktur* ed. by Marga Reis, 63–116. Tübingen: Niemeyer.
- Kager, René. 1994. "Ternary Rhythm in Alignment Theory". Ms., Universiteit Utrecht.
- Kager, René. 1999. "Surface Opacity of Metrical Structure in Optimality Theory". *The Derivational Residue in Phonological Optimality Theory* ed. by Ben Hermans & Marc van Oostendorp, 207–245. Amsterdam & Philadelphia: John Benjamins.
- Kager, René. 2000. "Stem Stress Peak Correspondence in Dutch". *Optimality Theory: Phonology, Syntax, and Acquisition* ed. by J. Dekker, F. van de Leeuw & J. van de Weijer, 121–150. Oxford: Oxford University Press.
- Kenstowicz, Michael. 1995. "Cyclic vs. Non-Cyclic Constraint Evaluation". *Phonology* 12:3.397–436.

- Kenstowicz, Michael. 1996. "Base-Identity and Uniform Exponence: Alternatives to Cyclicity". *Current Trends in Phonology: Models and Methods*. ed. by Jaques Durand & Bernard Laks, 363–393. Salford: University of Salford.
- Kenstowicz, Michael. 1997. "Uniform Exponence: Extension and Exemplification". *Selected Papers from the Hopkins Optimality Workshop 1997, University of Maryland Working Papers in Linguistics 5* ed. by Miglio V. & Bruce Moren, 139–154.
- Kiparsky, Paul. 1993. "Variable Rules". Handout, Rutgers Optimality Workshop.
- Kiparsky, Paul. To appear. "Opacity and Paradigm Effects". Stanford: CSLI.
- Lahiri, Aditi & Jennifer Fitzpatrick-Cole 1999. "Emphatic Clitics and Focus Intonation in Bengali". *Phrasal Phonology* ed. by René Kager & Wim Zonneveld, 119–144. Nijmegen: Nijmegen University Press.
- McCarthy, John 2000. "The Prosody of Phase in Rotuman". *Natural Language and Linguistic Theory* 18:1.147–197.
- McCarthy, John & Alan Prince 1993a. "Generalized Alignment". *Yearbook of Morphology 1993* ed. by Geert Booij & Jaap van Marle, 79–153. Dordrecht: Kluwer.
- McCarthy, John & Alan Prince 1993b. "Prosodic Morphology I". Ms., University of Massachusetts, Amherst, and Rutgers University.
- McCarthy, John & Alan Prince 1999. "Faithfulness and Identity in Prosodic Morphology". *The Prosody Morphology Interface* ed. by René Kager, Harry van der Hulst & Wim Zonneveld, 218–309. Cambridge: Cambridge University Press.
- Nespor, Marina & Irene Vogel 1986. *Prosodic Phonology*. Dordrecht: Foris.
- Orgun, Cemil Orhan 1996. *Sign-Based Morphology and Phonology*. Ph.D. Dissertation, University of California.
- Pierrehumbert, Janet B. 1980. *The Phonology and Phonetics of English Intonation*. Ph.D. Dissertation, Massachusetts Institute of Technology.
- Prince, Alan & Paul Smolensky 1993. "Optimality Theory: Constraint Interaction in Generative Grammar". Ms., Rutgers University and University of Colorado, Boulder.
- Reynolds, William 1994. *Variation and Phonological Theory*. Ph.D. Dissertation, University of Pennsylvania.
- Selkirk, Elisabeth. 1984. *Phonology and Syntax: The Relation between Sound and Structure*. Cambridge, Mass: MIT Press.
- Selkirk, Elisabeth. 1986. "On Derived Domains in Sentence Phonology". *Phonology Yearbook* 3.371–405.
- Selkirk, Elisabeth. 1995a. "Sentence Prosody: Intonation, Stress, and Phrasing". *The Handbook of Phonological Theory* ed. by John Goldsmith, 550–569. Cambridge, Mass: Blackwell.
- Selkirk, Elisabeth. 1995b. "The Prosodic Structure of Function Words". *Papers in Optimality Theory. University of Massachusetts Occasional Papers 18* ed. by Jill Beckman, Laura Walsh Dickey & Suzanne Urbanczyk, 439–469. Amherst: GLSA, University of Massachusetts.
- Selkirk, Elisabeth. 2000. "The Interaction of Constraints on Prosodic Phrasing". *Prosody: Theory and Experiment* ed. by Merle Horne, 231–261. Dordrecht: Kluwer.
- Selkirk, Elisabeth & Tong Shen 1990. "Prosodic Domains in Shanghai Chinese". *The Phonology-Syntax Connection* ed. by Sharon Inkelas & Draga Zec, 313–337. Chicago: The University of Chicago Press.

- Selkirk, Elisabeth & Koichi Tateishi 1991. "Syntax and Downstep in Japanese". *Interdisciplinary Approaches to Language: Essays in Honor of S.-Y. Kuroda* ed. by Carol Georgopolous & Roberta Ishihara, 519–543. Dordrecht: Kluwer.
- Shih, Chilin 1986. The Prosodic Domain of Tone Sandhi in Chinese. Ph.D. Dissertation, University of California San Diego.
- Soh, Hooi Ling 2001. "The Syntax and Semantics of Phonological Phrasing in Shanghai and Hokkien". *Journal of East Asian Linguistics* 10.37–80.
- Steriade, Donca 2000. "Paradigm Uniformity and the Phonetics-Phonology Boundary". *Papers in Laboratory Phonology V: Acquisition and the Lexicon* ed. by Michael B. Broe & Janet B. Pierrehumbert, 313–334. Cambridge: Cambridge University Press.
- Struijke, Caro 2000. "Why Constraint Conflict Can Disappear in Reduplication". *Proceedings of the North East Linguistic Society 30* ed. by Masako Hirotoni, Andries Coetzee, Nancy Hall & Ji-yung Kim, 613–626. Amherst: GLSA, University of Massachusetts.
- Truckenbrodt, Hubert. 1995. Phonological Phrases: Their Relation to Syntax, Focus, and Prominence. Ph.D. Dissertation, Massachusetts Institute of Technology.
- Truckenbrodt, Hubert. 1999. "On the Relation between Syntactic Phrases and Phonological Phrases". *Linguistic Inquiry* 30:2.219–255.
- Truckenbrodt, Hubert. 2002. "Upstep and embedded register levels". *Phonology* 19:1.77–120.
- Uhmman, Susanne 1991. *Fokusphonologie*. Tübingen: Niemeyer.
- von Stechow, Arnim & Susanne Uhmman 1986. "Some Remarks on Focus Projection". *Topic, Focus, and Configurationality* ed. by Werner Abraham & S. de Meij, 295–320. Amsterdam: John Benjamins.
- Wee, Lian-Hee 2000. "Faithfulness as Percolation—Evidence from Tone Sandhi in Mandarin". Ms., Rutgers University.
- Yip, Moira 1999. "Feet, Tonal Reduction and Speech Rate at the Word and Phrase Level in Chinese". *Phrasal Phonology* ed. by René Kager & Wim Zonneveld, 171–194. Nijmegen: Nijmegen University Press.