Prosodic Typology II

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The New Development in the Phonology of Intonation and Phrasing

Edited by
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Preface

Since the publication of *Prosodic Typology* in 2005, the Autosegmental-Metrical framework of intonational phonology has been applied to various languages. To expand the database for prosodic typology, a workshop on Intonational Phonology of Understudied or Fieldwork Languages was held in 2007, as a satellite meeting of the 16th International Congress of Phonetic Sciences in Saarbrücken, Germany. Nine languages presented at the workshop are included in the current volume. Five languages were solicited after the workshop either because the researcher could not participate in the workshop (Mongolian, Papiamentu) or because the language is relatively well-studied and thus did not meet the workshop theme (Portuguese, Catalan, Basque). The intonational phonological descriptions of two major languages which could not be included in the first volume (Spanish, French) are intentionally left out of the current volume as separate publications were already in progress to describe the intonational phonology and ToBI transcription systems of these languages: ten dialects of Spanish in Prieto and Roseano (eds. 2010, Lincom Europa) and French ToBI (Delais-Roussarie et al. forthcoming) in Prieto and Frota (eds. forthcoming, OUP) as part of a comparative intonational phonology survey of nine Romance languages.

I am grateful to all the participating authors for their patience and their valuable contributions to this long-term project. I am also grateful to the many people who have been involved in the process of editing this book and organizing the Intonation Workshop: to Janet Fletcher, Carlos Gussenhoven, and Bob Ladd for serving as Advisory Committee members; to Janet Fletcher and Carlos Gussenhoven for serving as discussants; to Chad Vicenik and Sameer ud Dowla Khan for helping at the workshop registration desk; to Amalia Arvaniti, Gorka Elordieta, Caroline Féry, Janet Fletcher, Sónia Frota, Matthew Gordon, Martine Grice, Carlos Gussenhoven, Sam Hellmuth, José Hualde, Sameer ud Dowla Khan, Pilar Prieto, Tomas Riad, Marina Vigário, and four anonymous reviewers for reviewing individual chapters of the book; to Aiko Hieda Hemingway for preparing the CD-ROM; to Sameer ud Dowla Khan for normalizing the sound files for the CD-ROM and for proofreading many chapters in the book. Finally, I would also like to thank the Linguistics Editors of Oxford University Press, John Davey and Julia Steer; the copy-editor, Lucy Hollingworth; and the Production Editor, Jennifer Lunsford, for their guidance, patience, and encouragement. This work was partially supported by a UCLA Senate grant.

Sun-Ah Jun

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List of Abbreviations

ABL	Ablative
ACC	Accusative
AM	Autosegmental-Metrical
AP	Accentual Phrase
BP	Brazilian Portuguese
BPM	Boundary Pitch Movement
B-ToBI	Bengali Tones and Break Indices System
C	Consonant
Cat.	Catalan
CatToBI	Catalan Tones and Break Indices System
CNJ	Conjugative
COM	Comitative
COP	Copula
D	Direct object
DAT	Dative
DIM	Diminutive suffix
EA	Egyptian Arabic
EFA	Egyptian Formal Arabic
eHa	Early high AP boundary tone
EMPH	Emphatic marker
EP	Standard European Portuguese
Fo	Fundamental frequency
FEM	Feminine
fH	Focus high tone
fHa	Focused high AP boundary tone
GEN	Genitive
GToBI	German Tones and Break Indices System
H	High
Ha	Non-focused high AP boundary tone
HNR	Honorific
I	Indirect object

IP	Intonational Phrase
ip	Intermediate Phrase
JC	Jamaican Creole
J-ToBI	Japanese Tones and Break Indices System
K-ToBI	Korean Tones and Break Indices System
L	Low
LA	Lebanese Arabic
LDA	Linear Discriminant Analysis
Lek. Bq.	Lekeitio Basque
LOC	Locative
Mac*R*_Var	Macro-rhythm Variation Index
M	Mid
MAE_ToBI	Mainstream American English Tones and Break Indices System
MaP	Major Phonological Phrase
MiP	Minor Phonological Phrase
MSA	Modern Standard Arabic
NBB	Northern Bizkaian Basque
NEP	Northern European Portuguese
NMR	Nominalizer
NOM	Nominative
NP	Noun Phrase
O	Object
OCP	Obligatory Contour Principle
PASS	Passive
PhP	Phonological phrase
POT	Potential
PRES	Present
PW	Prosodic Word/Phonological Word
Pwd	Prosodic Word
Q	Question marker
QUIS	Questionnaire on Information Structure
RC	Relative Clause
S	Subject
SD	Standard Deviation

SFP	Sentence Final Particle
Span.	Spanish
St. Bq.	Standard Basque
SUBJ	Subjunctive
TBU	Tone Bearing Unit
TEC	Trinidadian English Creole
ToBI	Tones and Break Indices System
TOP	Topic
uHa	Undershot high AP boundary tone
V	Verb
V	Vowel
VP	Verb phrase
VV	Phonologically long vowel
WHQ	Wh-question
XP	A syntactic maximal projection
YNQ	Yes-no question

Symbols

%	Boundary tone of an Intonational Phrase
–	Boundary tone of an Intermediate Phrase
a	Boundary tone of an Accentual Phrase
*	Pitch accent
$_{foc}$	Focal accent
→ or ←	Direction of the pragmatic projection of focal accent
μ	Mora
!	downstep tag
/. . . /	Phonological representation
?*	Accent uncertainty
<	Delayed pitch peak diacritic
^	Upstepped pitch accent diacritic

4

The intonational phonology of Bangladeshi Standard Bengali*

SAMEER UD DOWLA KHAN

4.1 Introduction

Bengali is a language without contrastive tone or stress, and in that sense is very different from stress accent languages such as English (Pierrehumbert 1980), Dutch (Gussenhoven 2005), German (Grice, Baumann, & Benzmüller 2005), Catalan (Prieto, this volume), and Greek (Arvaniti & Baltazani 2005), lexical tone languages such as Cantonese (Wong, Chan, & Beckman 2005) and Mandarin (Peng, Chan, Tseng, Huang, Lee, & Beckman 2005), lexical pitch accent languages such as Tokyo Japanese (Pierrehumbert & Beckman 1988, Venditti 2005), and stressed lexical pitch accent languages such as Swedish (Bruce 1977, 2005) and Serbo-Croatian (Godjevac 2005). It does, however, have predictable stress assignment and a robust intonational system, thus making it most similar to languages such as French (Jun & Fougeron 2000) and Finnish (Suomi, Toivanen, & Ylitalo 2003; Suomi & Ylitalo 2004), and also somewhat similar to the growing category of languages identified as having intonational systems without any type of stress assignment (lexical or postlexical), such as Seoul Korean (Jun 1996a, 2005a), Halh Mongolian (Karlsson, this volume), West Greenlandic (Arnhold, this volume), and the "one-pattern accent" and "accentless" dialects of Japanese (Igarashi, this volume). Because both stress and pitch in Bengali are entirely postlexical in nature, the language gives us a valuable glimpse into how prosody can be determined entirely independently of lexical information.

This chapter presents the model and transcription system of Bengali prosody first introduced in Khan (2008), adopting the framework of autosegmental-metrical (AM)

* The model presented in this chapter is based on my dissertation (Khan 2008), which could not have been completed without the generous guidance and support of my dissertation committee (in alphabetical order, Bruce Hayes; Sun-Ah Jun, chair; Patricia Keating; Jody Kreiman; Kie Ross Zuraw), my primary consultant (Farida Amin Khan), my colleagues at the UCLA phonetics laboratory, and the subjects of my study.

theory of intonational phonology (Pierrehumbert 1980; Pierrehumbert & Beckman 1988; Ladd 1996) and the ToBI-style method of prosodic annotation (Silverman, Beckman, Pitrelli, Ostendorf, Wightman, Price, Pierrehumbert, & Hirschberg 1992; Beckman & Ayers Elam 1997). The chapter begins in section 4.2 with a brief review of studies of two dialects of Bengali. In section 4.3, the major aspects of the current model of Bangladeshi Standard Bengali are presented, including the prosodic effects of focus. The B-ToBI transcription system used to annotate pitch tracks is presented in section 4.4 and the conclusions of the study, as well as directions for future research, are summarized in section 4.5.

4.2 Previous studies

The variety of Bengali described in the current model is the standard language spoken by those educated in urban areas of Bangladesh (especially in the capital, Dhaka) and exposed to various nonstandard dialects of the region. The prosody of this variety, which I call Bangladeshi Standard Bengali, has never before been studied. However, two related dialects—Kolkata Standard Bengali (prevalent in urban parts of Indian West Bengal) and Eastern Bengali (prevalent in central and eastern Bangladesh)—have been studied previously.

Despite the lack of proper pitch tracking technology at the time of their publication, three grammars of Kolkata Standard Bengali—Chatterji 1921, Ferguson & Chowdhury 1960, and Ray, Hai, & Ray 1966—describe many findings later confirmed using modern software. However, it was not until Hayes & Lahiri's (1991) model of Kolkata Standard Bengali that aspects of the AM theory of intonational phonology were introduced in descriptions of Bengali prosody, including the positing of exactly two tonal targets (i.e. H and L) and the distinction of pitch accents and boundary tones. Hayes and Lahiri describe a tonal frame—composed of a low pitch accent (L*) and high boundary tone (H_P)—on prenuclear ("head" in their terminology) phonological phrases (P-phrases) as well as on focused constituents, while separating nonfocused nuclear P-phrases into another tonal category. They also show that there are no sequences of two tones of the same type, as the Obligatory Contour Principle or OCP (Leben 1973; McCarthy 1986) prohibits underlying instances of two adjacent H tones from appearing on the surface. Later studies (Lahiri & Fitzpatrick-Cole 1999; Truckenbrodt 2003; Jun 2005c; Selkirk 2006) maintain the same basic structure of the Hayes & Lahiri model while highlighting additional aspects of the prosody, including focus enclitics, optionality in P-phrasing, and the derivation of tonal sequences using Optimality Theory (Prince & Smolensky 1993).

The first ToBI transcription system of Bengali was proposed in Michaels & Nelson's (2004) model of one speaker of the Eastern dialect spoken in east-central Bangladesh, proposing that concurrent boundary tone overriding triggers the

deletion of boundary tones of smaller prosodic units when coinciding with the boundary tones of larger prosodic units, a phenomenon also seen in Hindi (Harnsberger 1996, 1999), Tamil (Keane 2007), and Seoul Korean (Jun 2000, 2007), among other languages. The Michaels & Nelson (2004) model also finds that focus is realized in Eastern Bengali using a bitonal pitch accent (L*+H), instead of the tonal frame ($L^* \ldots H_P$) proposed in Hayes & Lahiri's (1991) model of Kolkata Standard Bengali.

Speakers of Bangladeshi Standard Bengali, especially those in Dhaka, are strongly influenced by Kolkata Standard and other prestigious varieties through the media as well as by the (nonstandard) Eastern dialect spoken in and around the capital (Khan 2009); it is thus not surprising that many of the findings of the current study show parallels with those of previous studies of Kolkata Standard and Eastern dialects.

4.3 Intonational phonology of Bangladeshi Standard Bengali

This section presents an intonational phonological model of Bangladeshi Standard Bengali, based on data collected in a series of experiments. I first begin with a description of the data collection methods in 4.3.1. The overall prosodic structure, tonal inventory, and non-tonal aspects of prosody are introduced in 4.3.2, particular tonal sequences and the sentence types they mark are identified in 4.3.3, and the prosodic effects of focus are described in 4.3.4.

4.3.1 *Data collection*

The current study examines data collected in three experiments conducted in 2006–2008; Experiments I and III were scripted production experiments, and Experiment II was a naturalistic production experiment. As the source of most of the data presented here, Experiment I is described in greater detail. The subjects included 20 fluent speakers of Bangladeshi Standard Bengali (9 male, 11 female).[1] Subjects were asked to read aloud 57 sentences that were carefully chosen to include mostly sonorant consonants and vowels to aid in pitch tracking. Furthermore, the following parameters were manipulated for each sentence: syllable count; the existence, choice, and location of sentence particles; the existence, choice, and location of focus

[1] In addition to Standard Bengali, the subjects were familiar with various nonstandard dialects spoken in Bangladesh. Ten subjects identified with the Eastern dialect (an Eastern Branch dialect according to Grierson 1928 and Shahidullah 2000). Nine subjects identified with the Northern dialect, and one identified with the Central dialect (Northern and Central dialects are classified by Grierson 1928 and Shahidullah 2000 as Western Branch dialects). While the number of speakers is evenly split across the Eastern–Western Branch divide, I am careful not to assume that the form of Standard Bengali spoken by these subjects is representative of the entire Bengali-speaking region, which also includes large parts of eastern India. Instead, I call this speech "Bangladeshi Standard Bengali".

enclitics; the addition of context sentences eliciting corrective focus and varying focus domain size for wh-answers; and special punctuation.

4.3.2 *Prosodic structure*

The data collected in the three experiments described above reveal an extensive prosodic system composed of three basic pitch accents—low (L*), high (H*), and rising (L*+H)—and several boundary tones, associated with three prosodic units above the word level: the accentual phrase (AP), the intermediate phrase (ip), and the intonational phrase (IP). While tone is presumably among the most salient cues for the boundaries between phrases, several other cues may help reveal the prosodic structure of an utterance.[2] Thus, in addition to describing the tones associated with each prosodic unit, this section also discusses non-tonal characteristics of the phrasing, including pause, final lengthening, and initial strengthening, which can be compared regardless of the phonological target (e.g. H vs. L) and phonetic realization of the tone present at the boundary in question.

(i) *The accentual phrase (AP)* The basic unit of Bengali prosody is the accentual phrase (AP), which is underlyingly composed of exactly two tones: a pitch accent (T*) and an AP boundary tone (Ta). Both of these tones are phonetically realized when the AP is prenuclear, i.e. non-final within the larger domain. Pitch accents are tones that attach to the most metrically prominent syllable in the AP; in Bengali, which does not have lexically contrastive stress, this is consistently the word-initial syllable.[3] In prenuclear APs, pitch accents can be either high (H*) or low (L*); the rising pitch accent (L*+H) is not seen in this position. At the right edge of each prenuclear AP sits another tone, whose function is presumably to mark the boundary between APs; this AP boundary tone, like the pitch accent, can also be either high (Ha) or low (La). The choice of AP boundary tone is entirely dependent on the type of pitch accent preceding it; the two tones of a single AP must always be of the opposite tonal target, as first proposed for Bengali in Selkirk (2006). Thus, low pitch accents (L*) must be paired with high AP boundary tones (Ha) and high pitch accents (H*) must be paired with low AP boundary tones (La). Of these two possibilities, the most common prenuclear AP tonal pattern is the rising AP (L* . . . Ha), shown in Fig. 4.1.

Note how the low pitch accent (L*) and high AP boundary tone (Ha) in the rising AP serve as the two endpoints for a relatively constant rise in pitch. Ignoring the

[2] See Carlson et al. (2005), Kreiman (1982), Wightman et al. (1992), and de Pijper & Sanderman (1994) for descriptions of the perception of cues to prosodic disjuncture by speakers of various languages.

[3] While the majority of studies of Bengali agree that stress is consistently word-initial, some studies claim otherwise. See Khan (2008) §6 for a review of the literature on Bengali stress as well as for a new phonological analysis of stress in Bengali.

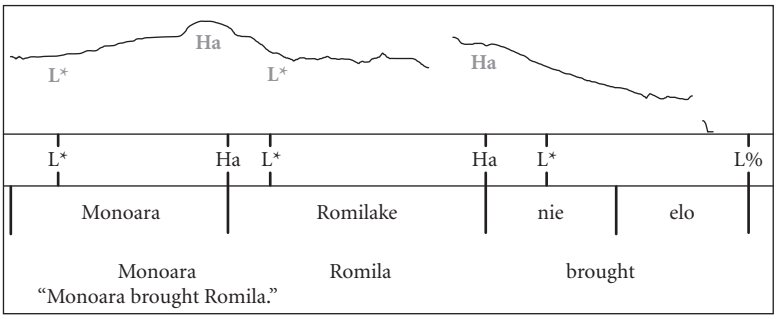


FIGURE 4.1 The subject [monoaɹa] "Monoara" and the object [ɹomilake] "Romila-ACC" both bear rising APs, composed of a low pitch accent (L*) and high AP boundary tone (Ha). [Tuo1][4]

effects of microprosody,[5] there are no major rises or falls deviating from this basic rise, suggesting that the pitch contour for a rising AP is determined primarily by pure interpolation of Fo between the two tonal targets (i.e. L* and Ha). (See 4.4 for examples of the rare cases in which deviations from pure interpolation can be identified and labeled as such.)

The less common prenuclear AP tonal pattern is the falling AP (H* . . . La), which can only occur before a nuclear high pitch accent (H*) (described below) or another falling AP (H* . . . La), as shown in Fig 4.2. The falling AP (H* . . . La) is often associated with sarcasm, affect, or unexpected information.[6] Like the rising AP (L* . . . Ha), the falling AP (H* . . . La) is composed of two opposing tonal targets, and the slope in pitch between the targets is the result of relatively smooth pitch interpolation.

The H components of the rising AP and falling AP (i.e. the high AP boundary tone Ha and high pitch accent H*, respectively) are subject to *downtrend*, where each AP-level H tone reaches a lower pitch than the preceding AP-level H tone, seen in both Fig. 4.1 and Fig. 4.2. As a more illustrative example, observe the six consecutive high AP boundary tones (Ha) in Fig. 4.3; starting from the leftmost AP [ɹumu] "Rumu (a name)," the Fo levels are 320Hz, 302Hz, 250Hz, 246Hz, 210Hz, and 166Hz. Although the slope is not uniform, the general downtrend of successive high AP

[4] Examples from the current study are arranged with the pitch track aligned with two labeling tiers: the tone tier includes labels for all pitch accents and boundary tones, and the word tier, which divides up the segmental string by either orthographic word boundaries or content word boundaries. The word tier uses a shorthand transcription system described in the Appendix of Khan (2008), based on the general phonemic system described in Khan (2010). Under the word tier is a rough English gloss of the sentence, followed by a more natural translation. Each example is also given a label in square brackets, with numbers and letters identifying the speaker, stimulus, and experiment.

[5] Microprosody is the term used to cover automatic phenomena such as the lowering of pitch during and immediately following voiced obstruents and the raising of pitch during and immediately following voiceless obstruents.

[6] If the information is particularly sudden or unexpected, speakers can also use the focused variant of the falling AP, described in 4.3.4.

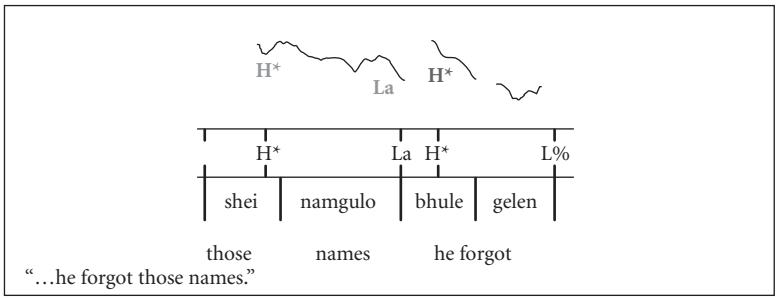


FIGURE 4.2 The AP [ʃej namgulo] "those names" bears a falling AP, composed of a high pitch accent (H*) and low AP boundary tone (La). [Ba51]

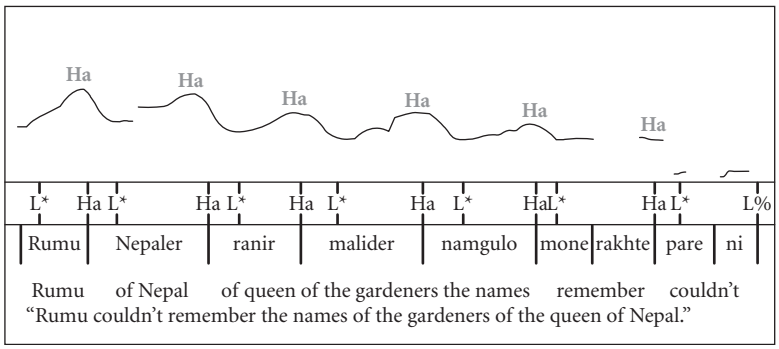


FIGURE 4.3 The pitch of the high AP boundary tone (Ha) of each rising AP (L* . . . Ha) reaches a lower pitch than the preceding AP, following downtrend. [Fa50]

boundary tones (Ha) is consistent. Downtrend shares similarities with intonational downstep as described in American English (Ladd 1990, 1996) and other Germanic languages, except that it is largely predictable and thus is not transcribed with the exclamation mark (!) used in the intonational transcription systems of such languages (Beckman & Ayers Elam 1997); in this way, Bengali downtrend is more similar to Japanese downstep (Pierrehumbert & Beckman 1988; Venditti 2005), which is also described as a predictable lowering of AP-level H tones following an accented AP. Downtrend in Bengali, however, can be affected by additional factors including word length and type: shorter words and function words often reach lower pitch than longer words and content words. Thus, a long content word following a shorter word or a function word may appear to violate downtrend. (See Khan (2008) pp. 102–104.)

As shown in Fig. 4.4, successive high pitch accents (H*) follow a pattern of downtrend similar to the pattern seen in high AP boundary tones (Ha).[7]

[7] Because long stretches of successive high pitch accents (H*) are uncommon in the current study's corpus of data, it is not possible to be certain of the regularity of H* downtrend.

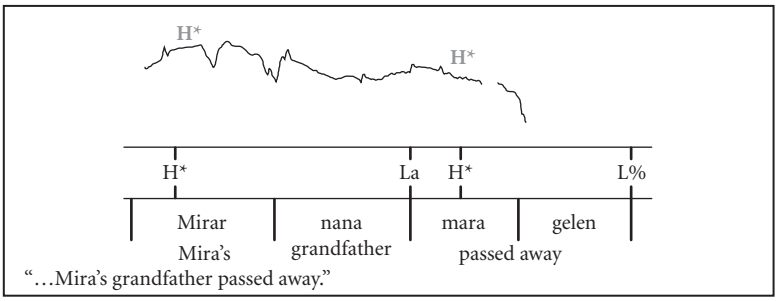


FIGURE 4.4 The nuclear AP [maɹa gelen] "passed away-HON" bears a high pitch accent (H*), possibly marking unexpected information. Note the downtrend across the two APs. [By37]

The reader may have noticed that the nuclear AP, i.e. the final AP in an ip, bears neither a rising AP nor a falling AP. This is because what would otherwise be a rising AP or falling AP is truncated due to *concurrent boundary tone overriding*, first described in Michaels & Nelson's (2004) model of Eastern Bengali. When nuclear, the underlying rising AP and falling AP patterns lose their AP boundary tones as they coincide with ip boundary tones, which take precedence. This leaves only the pitch accent in the nuclear AP. Nuclear APs can thus be composed of a low pitch accent (L*) or high pitch accent (H*), and the slope following the pitch accent is determined by the boundary tone of the higher prosodic domain (although see below for additional considerations, such as the locality constraint).

Nuclear APs can also bear a third pitch accent type not seen in prenuclear phrases: the rising pitch accent (L*+H). This pitch accent involves a low target during the AP-initial syllable, followed by a sharp rise in pitch, reaching a peak within the post-tonic (i.e. second) syllable or at the boundary between the second and third syllables. The pitch then interpolates from this peak to the next tone. Like the high pitch accent (H*), the rising pitch accent (L*+H) is far less frequently used than the default low pitch accent (L*). Its meaning is not entirely clear, but it is often seen when the nuclear AP is composed of a word with some increased level of salience in the sentence, such as new information, but this should not be confused with the pragmatic feature of focus described in 4.3.4. Two examples of the nuclear rising pitch accent (L*+H) are given in Fig. 4.5, where the nuclear APs [munimaɹ] "Muni-ma's" and [pɔtɕʰonḏo kɔɹen na] "doesn't like-HON" are presumably the most pragmatically salient words in each of their sentences. A detailed phonetic description of the rising pitch accent (L*+H) is given in 4.3.4, using its focused variant as a model.

The phenomenon of overriding is not restricted to the AP–ip boundary tone relationship; concurrent boundary tones of ip–IP levels are also subject to the phenomenon, leaving only the boundary tone of the higher prosodic category to be

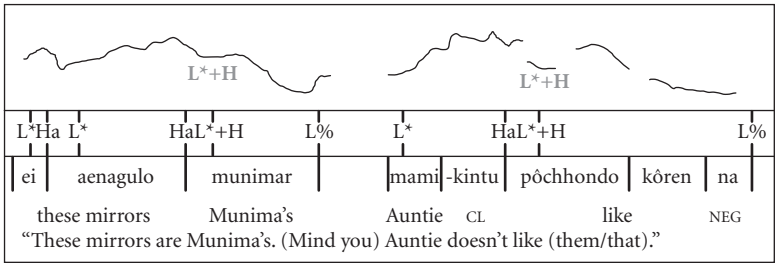


FIGURE 4.5 The nuclear APs [munimaɹ] "Munima's" and [pɔtɕʰonn̪o kɔɹen na] "doesn't like-HON" both bear rising pitch accents (L*+H), possibly marking them as the most salient information in their respective sentences. [Re57]

realized. This means that the final AP in an utterance will always end in an IP boundary tone on the surface.

Occasionally, either due to a pitch tracking error or in the case of ambiguous tonal cues, the pitch track may not be sufficient in revealing whether two words are parsed within a single AP, or across two separate APs. In such cases, non-tonal phenomena at the boundary, such as the presence or absence of lenition, can be of help. Intervocalic noncontinuants (i.e. stops, affricates, and nasals) are often lenited into their corresponding continuants (i.e. fricatives or approximants), even word-initially; however, lenition is blocked when the consonant is initial in a tonally-marked domain (i.e. AP-initial, ip-initial, IP-initial). Compare the following two examples of the NP [lina mamike] "Aunt Lina-ACC" in Fig. 4.6. In the first recording (left), the speaker parses the two words [lina] and [mamike] together into a single AP. Thus, since the first /m/ in [mamike] is intervocalic and not initial in a tonally-marked domain, it can lenite to [õ]. However, in the second recording (right), another speaker parses the two words [lina] and [mamike] into two separate APs. Thus, since the first /m/ in this production of [mamike] is AP-initial, it cannot undergo lenition to [õ]. This resistance to lenition can be considered a form of initial strengthening (Fougeron & Keating 1997; Jun 1998; Fougeron 1999; Cho & Keating 2001; Keating, Cho, Fougeron, & Hsu 2003).

Although lenition is not obligatory, the presence of a lenited stop or nasal is indicative of a lack of a boundary, or of a boundary smaller than that of an AP.

(ii) *The intermediate phrase (ip)* The intermediate phrase (ip) is a group of APs typically forming a tight syntactic unit, such as the topicalized element, a postpositional phrase, or an adverbial. The right edge of the ip is marked by lengthening of the final syllable, optional pitch reset and pause following the ip-final word, and one of four boundary tones: high (H-), low (L-), rising (LH-), or falling (HL-). The four ip boundary tones are distinguishable from other boundary tones by their observance of the *(ip boundary tone) locality constraint*, which restricts the realization of an ip

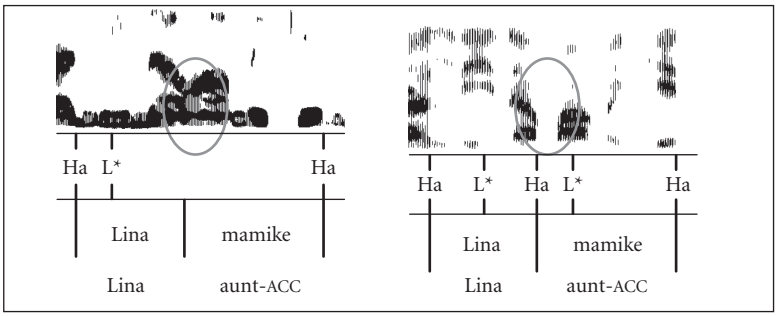


FIGURE 4.6 While the word-initial /m/ in the first speaker's production of [lina mamike] "aunt Lina-ACC" shows clear signs of lenition (i.e. evidence of strong formant structure during the consonant), the word-initial /m/ in the second speaker's production of the same phrase is not lenited (as evident in the overall lack of acoustic energy during the consonant), as optional lenition is blocked AP-initially. [To24], [Re24]

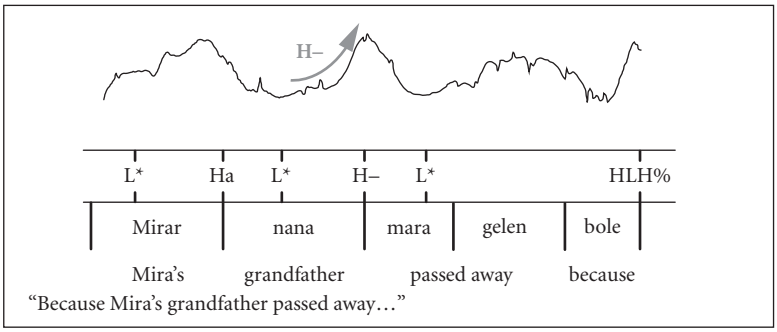


FIGURE 4.7 The subject [miɹaɹ nana] "Mira's grandfather" is marked on its right edge by a high ip boundary tone (H-), realized as a sharp F0 rise on the ip-final syllable. [To34]

boundary tone to the ip-final syllable. Thus, the rise in pitch towards a high ip boundary tone (H-) and the complex contour of the falling ip boundary tone (HL-) do not begin until the ip-final syllable. The preceding tone is largely flat, not straying far from the pitch of the immediately preceding pitch accent. This late realization of the ip boundary tone always results in an "elbow" in the pitch contour at the onset of the ip-final syllable.

Observe the high ip boundary tone (H-) in Fig. 4.7, marking the right edge of the topicalized element [miɹaɹ nana] "(as for) Mira's grandfather." Note how the rise in pitch for the high ip boundary tone (H-) is concentrated during the ip-final syllable [na] in [nana] "maternal grandfather," as opposed to the more consistent slope of the rising AP preceding it on [miɹaɹ] "Mira's."

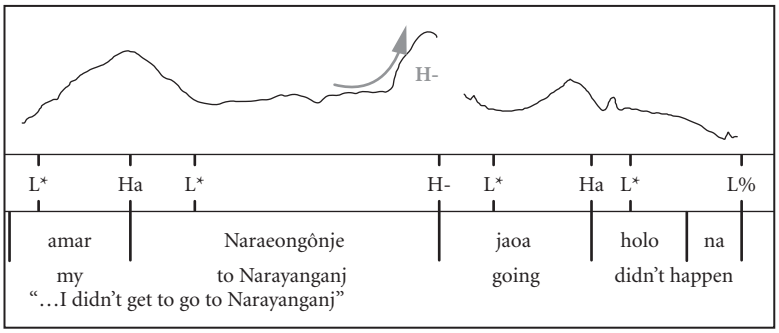


FIGURE 4.8 The ip [amaɹ naɹaɐ̯ongɔndʑe] "my [going] to Narayanganj" is marked by a high ip boundary tone (H-), realized as a sharp F0 rise on the ip-final syllable. [Sh35]

The ip boundary tone's pitch elbow is even more noticeable when the ip boundary is separated from the previous pitch accent by several syllables, as in the word [naɹaɐ̯ongɔndʑe] "to Narayanganj" (name of a city) in Fig. 4.8. Note how the pitch elbow for the high ip boundary tone (H-) occurs during the ip-final syllable [dʑe], and how the preceding pitch rises only slightly across the syllables between the low pitch accent (L*) and the pitch elbow.

The high ip boundary tone (H-) reaches a higher pitch than the high AP boundary tone (Ha), as illustrated in Fig. 4.9. By comparing the differences in pitch between the Fo minimum corresponding to the low pitch accent (L*) and the Fo maximum corresponding to the high boundary tone (Ha or H-) of identical words when AP-final and ip-final (measured within speaker),[8] it was found that the pitch of the high ip boundary tone (H-) is higher than that of the high AP boundary tone (Ha) [paired $t(5) = 10.90$, $p < 0.05$]. Depending on the speaker, the word measured was either the subject [monoaɹa] "Monoara" produced sentence-initially, or one of two proper name objects—[ɹomilake] "Romila-ACC" or [ninake] "Nina-ACC"—produced sentence-medially.

Because of the very local realization of the high ip boundary tone (H-), one may think that it should be analyzed as a rising tone. However, Bengali in fact has another tone described as a rising ip boundary tone (LH-). This tone occurs at the right edge of long phrases, typically denoting background or known information, and is realized as both a fall and a rise in pitch during the ip-final syllable. The sentence in Fig. 4.10 includes rising ip boundary tones (LH-) at the edges of the phrases [adʑ d̪upuɹ bɛlaɐ̯] "today in the early afternoon" and [dʑumːaɹ namadʑe ʃunlam] "I heard at Friday prayers."

[8] Pitch differences were measured between two words (one AP-final, one ip-final) per speaker, drawn from six speakers who produced such phrasing. It was possible to differentiate AP- and ip-final examples by looking for signs of ip boundaries, including final syllable lengthening and the pitch elbow associated with the ip boundary tone constraint.

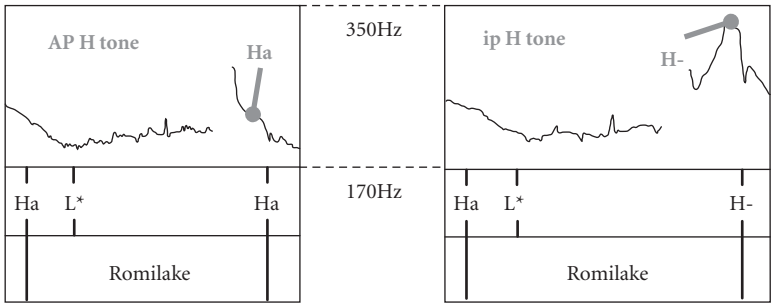


FIGURE 4.9 High boundary tones corresponding to the AP (Ha) and ip (H-) levels, produced on identical words in identical sentence position. [BM02], [BM01]

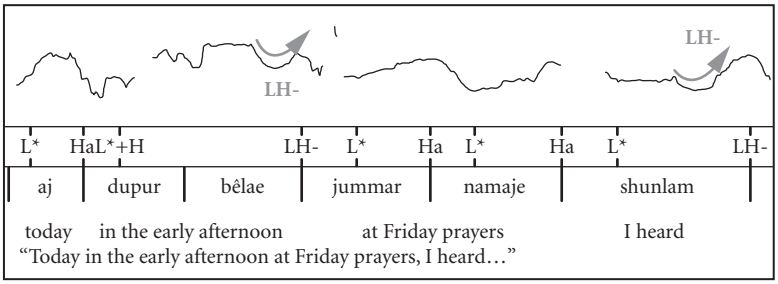


FIGURE 4.10 The ips [adʒ d̪upuɪ bɛlaɛ̯] "today in the early afternoon" and [dʒum:aɪ namadʒe ʃunlam] "I heard at Friday prayers" both bear rising ip boundary tones (LH-) at their right edge. [Fa49]

Note the dipping of pitch from the mid range to achieve the low (L) target of the bitonal boundary tone during the ip-final syllable, in accordance with the locality constraint. Also note how the first example of the rising ip boundary tone (LH-) is followed by a short pause before the start of the next ip.

Like the rising ip boundary tone (LH-), the falling ip boundary tone (HL-) occurs at the right edge of long phrases, also denoting background or known information. It is realized as a rise and fall in pitch during the ip-final syllable, as shown in Fig. 4.11.[9] Due to the locality constraint, pitch is *not* interpolated directly from the previous pitch accent to the H portion of the boundary tone; instead, the pitch of the nuclear pitch accent is either prolonged or slightly interpolated towards the mid range, until immediately preceding the ip-final syllable. As they both can mark topicalized

[9] In the data collected for the current study, the falling ip boundary tone (HL-) was found most frequently in the speech of one speaker from Kolkata, with dialect influences from Kushtia District—both Central Bengali dialects. It may be a variant of the falling IP boundary tone (HL%), which is used more frequently to denote topicalization. Further data from that and other regions can reveal the extent of the distribution of this ip boundary tone.

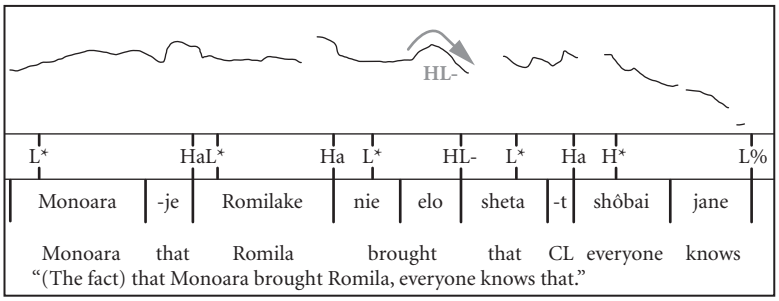


FIGURE 4.11 The topicalized clause [monoaɹa-dʑe ɹomilake nie elo] "(the fact) that Monoara brought Romila" bears a falling ip boundary tone (HL-) at its right edge. [D015]

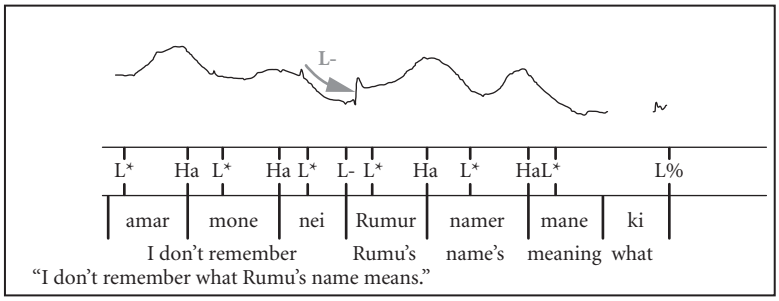


FIGURE 4.12 The ip [amaɹ mone nej] "I don't remember" (lit. "my mind-LOC not.exist" = "it isn't in my mind") is marked by a low ip boundary tone (L-). [BM32]

phrases, the falling ip boundary tone (HL-) may be reanalyzed as a reduced variant of the falling IP boundary tone (HL%) described further later in the chapter.

Lastly, the low ip boundary tone (L-) occurs at the ends of clauses; it is realized as falling pitch concentrated in the ip-final syllable, as in Fig. 4.12; note how this example also includes a clear illustration of pitch reset at the ip boundary.

In cases where it is unclear whether the boundary tone between words is an ip boundary tone or an AP boundary tone, it is beneficial to examine non-tonal phenomena to determine the boundary size. One crosslinguistically common property of the ends of prosodic units is the lengthening of the final syllable or segment (see Wightman et al. 1992; Jun 2005c). By comparing the relative durations of final syllables in identical words when occurring adjacent to the high ip- and AP-boundary tones (H-, Ha),[10] it is clear that ip-final syllables are longer than AP-final syllables [paired $t(8) = 3.05$, $p < .05$], as shown in Fig. 4.13. Despite the lengthening seen at the ip level, no evidence was found for AP-final lengthening. Indeed, lengthening

[10] Durational differences were made within ten pairs of AP-final and ip-final words, produced by six speakers in total (some speakers produced more than one pair).

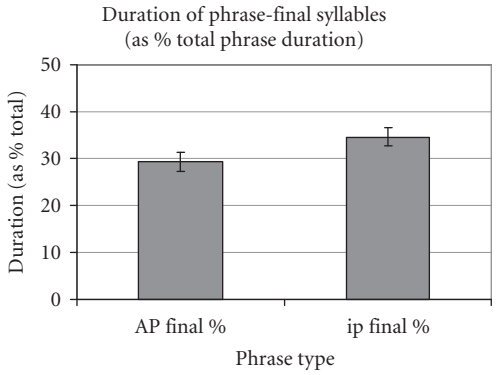


FIGURE **4.13** Relative duration of AP-final syllables compared to that of ip-final syllables. Error bars indicate standard error.

is often only used to mark boundaries of larger prosodic units crosslinguistically (Jun 1995).

Furthermore, ip boundaries can be distinguished from AP boundaries by the existence of a following pause and pitch reset; although pauses and pitch resets are not obligatory between ips, they are never seen between APs. The presence of either phenomenon indicates the disjuncture between units of the ip size or larger.

(iii) *The intonational phrase (IP)* The intonational phrase (IP) is a group of ips roughly spanning a clause or sentence; it is presumably the equivalent of the I-phrase of the Hayes & Lahiri (1991) model of Kolkata Standard Bengali and the IP of the Michaels & Nelson (2004) model of Eastern Bengali. The IP is the largest tonally-marked unit in the Bengali prosodic hierarchy, and its right edge is marked by final lengthening[11], a following pause, and one of five boundary tones—low (L%), high (H %), rising (LH%), falling (HL%), and dipping (HLH%)—which override the boundary tones of the IP-final ip and AP. The choice of IP boundary tone (e.g. H% vs. L%) is primarily dependent upon sentence type (e.g. yes-no question).

The most common IP boundary tone is of the low category (L%), occurring at the edges of almost all declaratives, as well as some wh-questions. Because IP boundary tones are not subject to the locality constraint associated with ip boundary tones, the low IP boundary tone (L%) is realized as steadily falling pitch beginning as early as the nuclear pitch accent, followed by sharply falling pitch during the IP-final syllable.

[11] Because the right edge of an IP is always also the right edge of an ip, we can expect ip-final lengthening to also be a feature of IP boundaries. However, due to the distributional differences between IP boundaries and independent ip boundaries, it was not possible to test for what may be additional IP-final lengthening independent of ip-final lengthening.

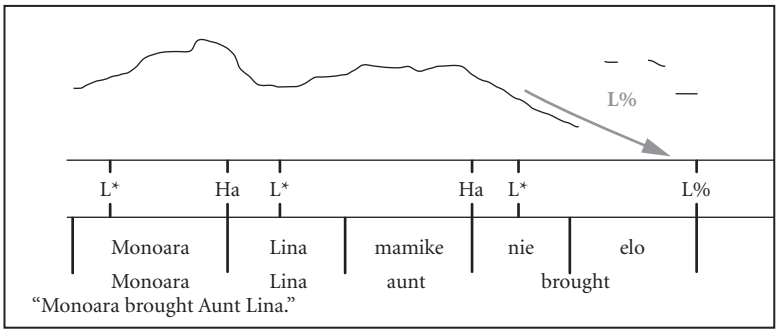


FIGURE 4.14 This declarative sentence bears a low IP boundary tone (L%). Note the irregularity of the pitch track during the last two syllable [elo] due to creaky phonation, common during extra-low pitch. [Fa24]

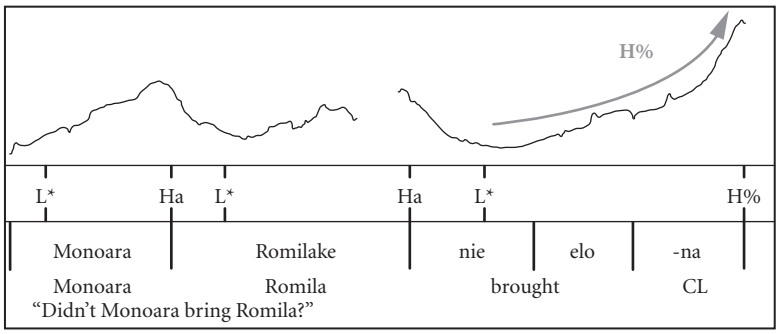


FIGURE 4.15 Structurally similar to a yes-no question, except for the use of enclitic -[na] instead of -[ki], this confirmation question bears a high IP boundary tone (H%), realized here with a slight elbow between the gradual rise and extreme final rise. [Fa06]

The pitch track between the nuclear pitch accent and the low IP boundary tone (L%) is almost always obscured by the effects of creaky voice, as in Fig. 4.14.

The high IP boundary tone (H%) is the phonetic inverse of the low tone (L%); it is characterized by steadily rising pitch starting from the nuclear pitch accent, followed by a sharper rise in pitch during the IP-final syllable. It is used on various sentence types suggesting non-finality, such as confirmation questions (as in Fig. 4.15), echo questions, polite requests, and the first member of a set of conjoined or correlative clauses.

Just as the high ip boundary tone (H-) reaches a higher pitch than the high AP boundary tone (Ha), the high IP boundary tone (H%) reaches a higher pitch than the high ip boundary tone (H-), as illustrated in Fig. 4.16.[12] By comparing the difference between the Fo minimum of the low pitch accent (L*) and the Fo max of the

[12] Comparisons between other ip- and IP-tones are provided in Khan (2008) §10.1.4, pp. 178–189.

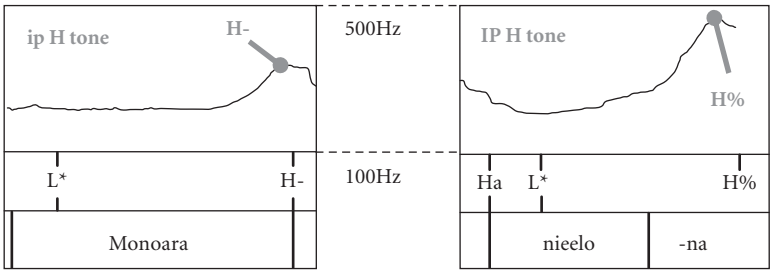


FIGURE 4.16 Comparison of the high boundary tones corresponding to the ip (H-) and IP (H%) levels, produced on structurally-equivalent words. [D001], [D006]

high boundary tone (H- or H%) in structurally-equivalent[13] words when ip-final and IP-final, it was found that the pitch of a high IP boundary tone (H%) rises more than that of the high ip boundary tone (H-) [paired $t(5) = 3.59$, $p < 0.05$].[14] The ip examples from the AP–ip comparison were measured against the IP-final verb [nie elo-na] "did not bring?", produced as four syllables [ni.e.lo.na] in running speech.

Like ip boundary tones, IP boundary tones can be composed of a contour; the falling IP boundary tone (HL%) is realized as steadily rising pitch from the nuclear pitch accent to the onset of the IP-final syllable, which bears sharply falling pitch. The falling IP boundary tone (HL%) is primarily used on yes-no (i.e. polar) questions, as in Fig. 4.17, as well as on topicalized phrases, as in Fig. 4.18. Because topicalized phrases are far more likely to take the falling IP boundary tone (HL%) than what is labeled as the falling ip boundary tone (HL-), it is possible that this particular ip-level tone is simply a less common, phonetically reduced variant of the corresponding IP-level tone.

The phonetic inverse of the falling IP boundary tone (HL%) is the rising IP boundary tone (LH%), realized as falling pitch beginning at the nuclear pitch accent followed by a rise in pitch beginning at the IP-final syllable. Like the high IP boundary tone (H%), it can be associated with non-finality, in that it is realized on certain kinds of wh-questions[15], as in Fig. 4.19, as well as non-sentence-final phrases, corresponding to the "continuation rise" of many other languages.

[13] Unlike the measurements made for Ha vs. H-, identical words could not be compared for H- vs. H%, as ip boundaries and IP boundaries do not occur in syntactically identical positions. AP boundaries and ip boundaries, however, show more variation and often occur in syntactically identical positions.

[14] The average difference in pitch between a low pitch accent (L*) and high ip boundary tone (H-) was found to be 115Hz, while the average difference in pitch between a low pitch accent (L*) and high IP boundary tone (H%) was found to be 202Hz, pooling across the six speakers who produced eligible word pairs. Of course, due to the huge variation across speakers' pitch ranges, it is more appropriate to consider the paired measurements.

[15] See 4.3.3 for a discussion of different wh-question types.

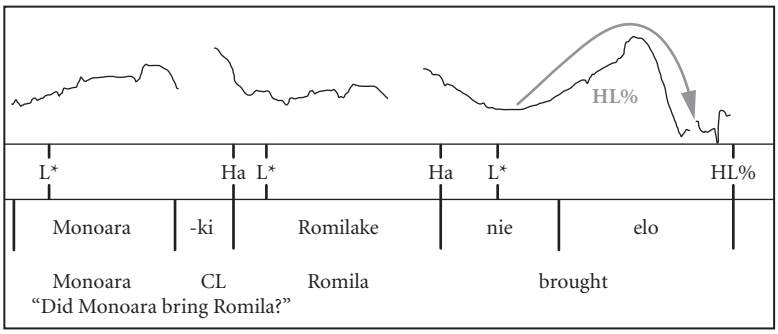


FIGURE 4.17 This yes-no question bears a falling IP boundary tone (HL%). When sentence-initial or -final, the presence of the enclitic -[ki] can indicate yes-no questions. The pitch track becomes choppy at the end of the syllable [lo] due to creaky phonation. [Fa03]

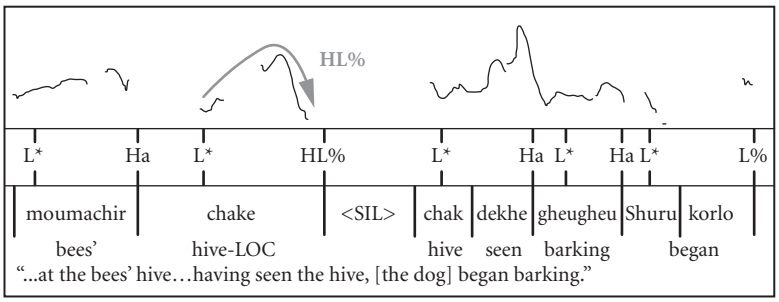


FIGURE 4.18 In this excerpt of naturalistic speech, the longer sentence [e̪ike oɹ kukuɹta-HL% paʃeɹ ɛkta gatɕʰe-HL% mowmatɕʰiɹ tɕake-HL% tɕak d̪ekʰe gɦewgɦew ʃuɹu koɹlo] "Over here his dog-HL% at a nearby tree-HL% at the bees' hive-HL% having seen the hive [the dog] begins to bark" includes three topicalized phrases (those delineated with "HL%" above), the third of which is shown here before the matrix clause. Each topicalized element bears a falling IP boundary tone (HL%). [FaS90]

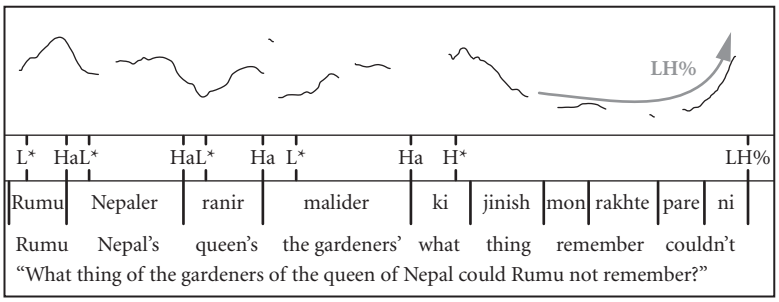


FIGURE 4.19 This wh-question is marked with a rising IP boundary tone (LH%). The lack of AP-level tones following the high pitch accent (H*) in this example clearly reveals the L component of the contour boundary tone. [SB47]

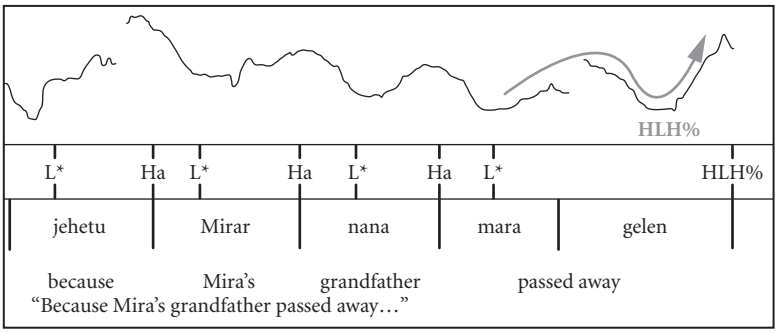


FIGURE 4.20 This non-sentence-final because-clause is marked on the right edge by a dipping IP boundary tone (HLH%), realized as an F0 rise after the final pitch accent and a fall and rise on the final syllable. [Fa35]

The current study finds only one tone made up of three targets: the dipping IP boundary tone (HLH%), composed of two H targets separated by an L target. Like the rising IP boundary tone (LH%), the dipping IP boundary tone (HLH%) is used on non-sentence-final phrases, and especially non-final dependent clauses: relative clauses, because-clauses, if-clauses, etc. It is realized as rising pitch beginning from the nuclear pitch accent and ending at the boundary between the penultimate and final syllables, followed by both a fall and a rise in pitch during the IP-final syllable, as in Fig. 4.20.

The findings of the current model of Bangladeshi Standard Bengali confirm those of previous models of Kolkata Standard Bengali and of Eastern Bengali in the characterization of the IP and its many boundary tones. In addition to the monotonal and bitonal boundary tones described in previous studies (i.e. L%, H%, LH%, HL%), the current study finds a tritonal boundary tone (i.e. HLH%).

(iv) *Role of the OCP* Previous studies show the OCP constrains all tonal sequences (Hayes & Lahiri 1991, later extended in Selkirk 2006) in Kolkata Standard Bengali, triggering the deletion of H tones of the P-phrase level (i.e. H_P) when concurrent with H-initial tones of the I-phrase level (i.e. H_I, H_IL_I). The current study, however, suggests a restricted role for the OCP in Bangladeshi Standard Bengali; while the OCP indeed constrains AP tonal patterns to rises (i.e. L*…Ha) or falls (i.e. H*…La), disallowing AP plateaus (i.e. L*…La, H*…Ha), it does not appear to affect the relation between pitch accents and higher level boundary tones. Compare for example the pitch tracks in Fig. 4.21 and Fig. 4.22, composed of the same string of words, with the first version representing the declarative sentence and the second representing the corresponding yes-no interrogative sentence. Notice how nuclear low pitch accent (L*) can co-occur with both the high IP boundary tone (H%) and

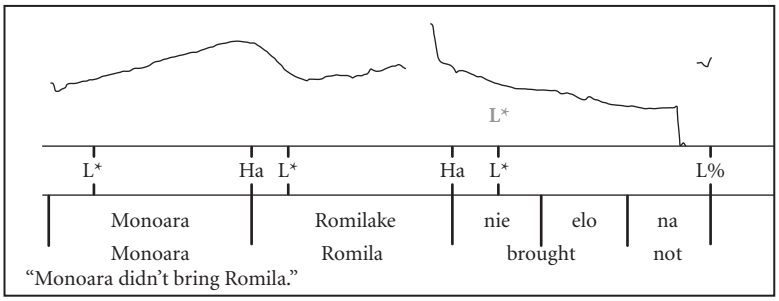


FIGURE 4.21 The nuclear AP [nie elo na] "didn't bring" bears a low pitch accent (L*), followed by the low IP boundary tone (L%) for declaratives. [Na06][16]

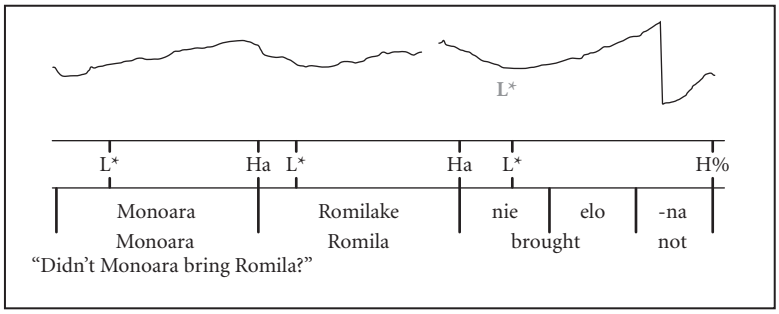


FIGURE 4.22 The nuclear AP [nie elo-na] "brought-CL" bears a low pitch accent (L*), followed by the high IP boundary tone (H%) for confirmation questions.[17] [Tu06]

the low IP boundary tone (L%), the latter of which would not be expected if the OCP were to affect all tonal sequences.

Considering the fact that tones of the same target can in fact co-occur sequentially in this variety of Bengali, as long as they are not both AP-level tones, it appears that the OCP has a much narrower scope for application in Bangladeshi Standard Bengali, i.e. within the AP domain.

[16] This sentence was written "মোনোয়ারা রমিলাকে নিয়ে এল না?" [monoaɹa ɹomilake nie elo na] in Bengali orthography, which can be read as a negative declarative (i.e. "Monoara didn't bring Romila") or a confirmation question (i.e. "Didn't Monoara bring Romila?"). A question mark was added to ensure that the confirmation question would be elicited. While the speaker in Fig. 4.22 produced the sentence as a confirmation question as expected, the speaker in Fig. 4.21 presumably missed the question mark, reading it as a negative declarative.

[17] What looks like a sharp drop-off in pitch during the final syllable of this sentence is actually pitch halving—the reduction of high pitch by 50% in pitch tracking software. Thus, the pitch is in fact rising to a super-high range in the final syllable as part of the high IP boundary tone (H%). The pitch range could not be adjusted for this example as the details of pre-IP edge tones would be blurred.

Table 4.1 Full inventory of pitch accents and boundary tones used in non-focused contexts in the current intonational phonological model of Bangladeshi Standard Bengali

Association	Target
Pitch accents	H*, L*, L*+H
AP boundary tones	Ha, La
ip boundary tones	H-, L-, HL-, LH-
IP boundary tones	H%, L%, HL%, LH%, HLH%

(v) *Summary of tonal inventory* The inventory of tones used in non-focused contexts includes three nuclear pitch accents, two AP boundary tones, four ip boundary tones, and five IP boundary tones, as summarized in Table 4.1.

4.3.3 *Sentence types*

Both declaratives and interrogatives end with IP boundary tones that are dependent on the particular sentence type. Of the five IP boundary tones (i.e. L%, H%, HL%, LH%, HLH%), all but the dipping IP boundary tone (HLH%) can be used at the end of a complete sentence. The remaining four IP boundary tones are used by both declaratives and interrogatives alike, with additional pragmatic details deciding exactly which tone will be used.

(i) *Non-interrogatives* Virtually all non-interrogatives, including declaratives (e.g. [monoaɹa ɹomilake nie elo] "Monoara brought Romila.") and imperatives, are marked by the low IP boundary tone (L%), as in Fig. 4.14; the few exceptions are polite or "softened" imperatives, such as [bɔlo t̪o] "(would you please) tell (me)?" ('tell-2 CL'), and certain exclamations, such as [aɹi] (roughly equivalent to "Wait a second!" or "What!?"), which bear the high IP boundary tone (H%) and could alternatively be analyzed as interrogatives.

(ii) *Interrogatives* Yes-no interrogatives and syntactically-similar sentences can bear one of two different IP boundary tones: falling HL% or high H%. Basic yes-no questions—those that do not indicate that the speaker has any prior knowledge of the situation (e.g. [monoara-ki ɹomilake nie elo] "Did Monoara bring Romila?")—are marked by the falling IP boundary tone (HL%), as in Fig. 4.17. These questions optionally bear the enclitic -[ki] (homophonous with the full word [ki] "what") either sentence-initially or -finally (i.e. attached to the right edge of the first or last word). Another type of yes-no question is overtly marked with the enclitic -[na] (homophonous with the full word [na] "no") instead of -[ki] in initial or final

position, and has different pragmatic meanings and often different tonal markings. Taken literally, the addition of the negative marker [na] should produce the meaning "Did Monoara not bring Romila?", but its exact meaning is largely determined by the choice of IP boundary tone. Use of the falling tone (HL%) in yes-no questions marked with -[na] can simply signify a yes-no question using a negated verb (i.e. "Did Monoara not bring Romila?"), but it more typically indicates that the speaker is reminding the listener of what should be a shared belief (i.e. "Monoara brought Romila, don't you remember?"). The more common use of yes-no questions marked with initial or final enclitic -[na] is to indicate that the speaker has prior knowledge that he or she is trying to confirm (i.e. "Didn't Monoara bring Romila?"); in this case, the question must bear the high IP boundary tone (H%), as in Fig. 4.15.

Wh-questions are divided into three types in Bengali based on their tonal marking; the contexts that distinguish these three wh-question types are very complex and depend heavily on what is considered given or shared information by the speaker. In the (near-) absence of shared information, speakers often mark wh-questions using the rising IP boundary tone (LH%), as in Fig. 4.19. In most situations, however, the speaker asks the wh-question with much of the information already shared; in this case, the new information is set apart from the given information by bearing focus realization (see 4.3.4), and the question is marked on the right edge by the low IP boundary tone (L%), as in Fig. 4.23.

It is not entirely predictable whether a wh-question will bear a low (L%) or rising (LH%) IP boundary tone. Michaels & Nelson (2004) divides wh-questions into "focused" and "non-focused," and states that "focused" wh-questions bear a low tone (L%) like focused declaratives, while "non-focused" wh-questions bear a rising tone (LH% in the current model; H% in the Michaels & Nelson model). Echo

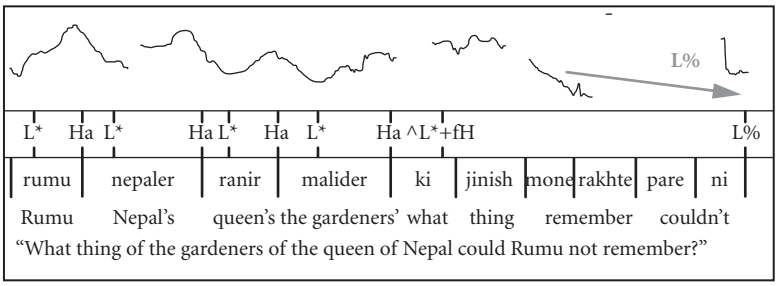


FIGURE 4.23 This wh-question is marked by a low IP boundary tone (L%), whose low pitch induces creaky voice, triggering pitch doubling by the tracking software.[18] [Fa47]

[18] See 4.3.4 for a discussion of the focus realization on [ki dʑiniʃ] "what thing" (i.e. use of the focused rising pitch accent, L*+fH) and the following tonal compression. The shallow mid rise (^L*+fH) is a variant of the focused rising pitch accent (L*+fH); see Khan (2008) §10.1.1 pp. 116–117.

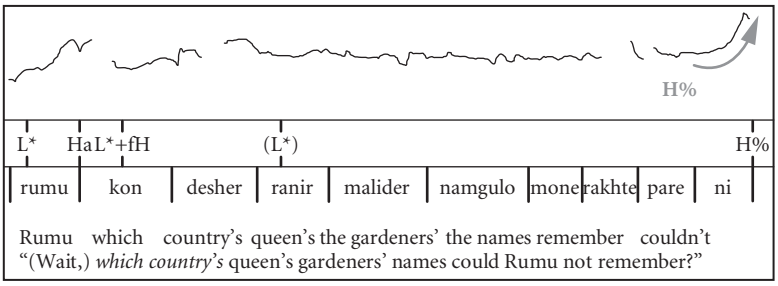


FIGURE **4.24** This echo wh-question begins with a focused rising pitch accent (L*+fH) and post-focal tonal compression (both described in 4.3.4), before plateauing into a long stretch of high pitch reaching the high IP boundary tone (H%) associated with echo wh-questions and other confirmation questions. [Fa38]

wh-questions, where the speaker seeks to confirm a part of an earlier sentence that was misheard, form a third category of wh-questions; these behave like confirmation yes-no questions, bearing a high IP boundary tone (H%) as shown in Fig. 4.24.[19]

4.3.4 *Focus realization*

Focus is realized prosodically in the use of a special high tone (fH).[20] Unlike other tones in the language, the focus high tone (fH) does not have one basic realization pattern; it is an abstract tone whose realization pattern depends on the type of focus (i.e. corrective/wh-answer, encliticized, or surprise, each of which is described in greater detail in this section) and the surrounding tones. Furthermore, fH is distinctive in that it is not subject to the phonological restrictions that govern other tones; neither does it follow the general downtrend pattern of the H tones, nor does it fall victim to overriding by concurrent boundary tones. It also triggers the compression or deletion of all following AP-level tones. With all of its peculiar qualities, fH helps the focused element stand out as the most salient part of the sentence.

Three fH realization patterns are observed; in all three, the fH tone docks to an AP-level tone, i.e. a pitch accent or AP boundary tone. It docks to the high AP boundary tone (Ha) in encliticized focus (i.e. words bearing the focus enclitics -[i]~[j] "only" or -[o]~[o̞] "also," "even") to the low pitch accent (L*) in corrective/wh-answer focus, and to the high pitch accent (H*) in surprise focus (i.e. unexpected information). Further variation comes about as a result of the influence of surrounding tones. As shown in the schematic in Fig. 4.25, fH docking can be realized as fusion

[19] As the Michaels & Nelson (2004) study does not describe echo wh-questions, it is unclear how they would distinguish them from other wh-question types.

[20] See Khan (2008) §12.1.1 pp. 260–265 for additional phrasing phenomena specific to focus constituents.

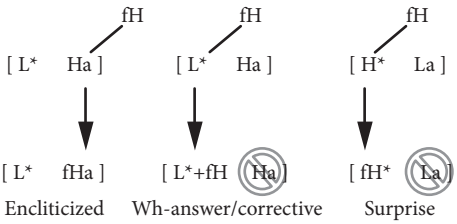


FIGURE 4.25 Schematic illustration of the three possible docking points of the underlying focus high tone (fH). Crossed circles represent deletion of post-focal AP-level tones.

with AP-level tones of the H category—the high AP boundary tone (Ha) in encliticized focus and the high pitch accent (H*) in surprise focus—to form the focused high AP boundary tone (fHa) and the focused high pitch accent (fH*), respectively, or as adjunction to the low pitch accent (L*) to form a focused rising pitch accent (L*+fH). All three realization patterns are followed by post-focal AP tone deletion/compression, meaning that all pitch accents and AP boundary tones following the fH docking point are either produced within a very compressed pitch range or totally deleted up until the next ip or IP boundary tone.

(i) *Encliticized focus (L*…fHa)* The focused rising AP (L*…fHa) is used on words bearing either of the focus enclitics -[i]~[j] "only" or -[o]~[o̯] "also," "even," which attach directly to the right edge of the word under focus (with the off-glide variants -[j] and -[o̯] predictably occurring after final vowels in polysyllabic words, and the syllabic variants -[i] and -[o] occurring elsewhere).[21] Thus, while the string [monoaɹa ɹomilake nie elo] can be translated as "Monoara brought Romila," the string [monoaɹa ɹomilakej nie elo] would be translated "Monoara (only) brought *Romila*" due to the presence of the focus enclitic -[j] "only" at the right edge of [ɹomila-ke-j] "Romila-ACC-FOC." These two sentences can be compared in the following two pitch tracks (Fig. 4.26 and Fig. 4.27); note how the focused high AP boundary tone (fHa) is distinguished from its corresponding non-focused equivalent (Ha) by its relative height.

In the previous two examples, the non-focused pattern (Fig. 4.26) includes two rising APs (L*…Ha) whose high AP boundary tones (Ha) follow downtrend, while the focus encliticized pattern (Fig. 4.27) includes the focused rising AP (L*…fHa) defying downtrend by reaching a higher pitch value than that of the preceding high AP boundary tone (Ha). Considering the regularity with which downtrend applies across APs of equivalent length, the violation of the downtrend pattern is presumably a salient cue for the focused high AP boundary tone (fHa).[22]

[21] See Lahiri & Fitzpatrick-Cole (1999) for a detailed analysis of focus enclitics.

[22] Of course, when the encliticized focused constituent appears sentence-initially, downtrend violation cannot serve as a cue for focus tone realization. As all AP-level tones following the focus tone docking point

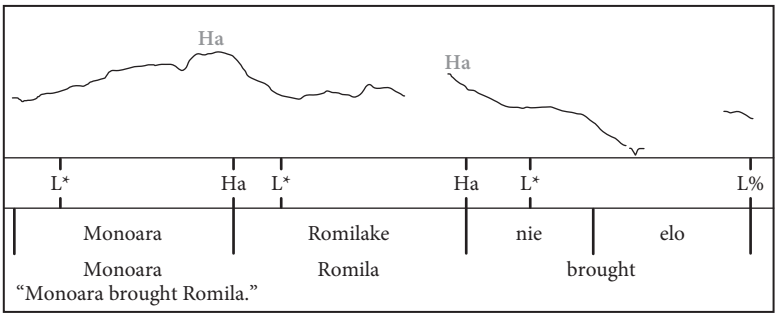


FIGURE 4.26. Without focus, downtrend requires that successive high AP boundary tones (Ha) progressively lower in pitch. Here, the F0 max of [ɪomilake] "Romila-ACC" is 245Hz, while that of [monoaɪa] "Monoara" is 299Hz. [Fa01]

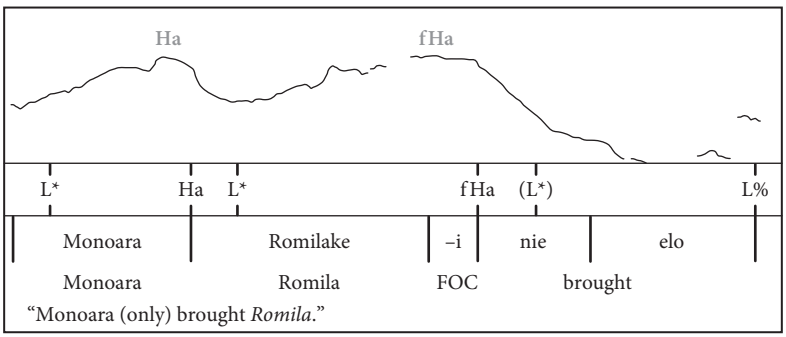


FIGURE 4.27 Under encliticized focus, the F0 max of the high AP boundary tone (Ha) following [ɪomilakej] "(only) Romila-ACC" is raised, violating downtrend. The F0 max is 297Hz, while that of [monoaɪa] "Monoara" is 295Hz. It is unclear whether the following AP [nie elo] "brought" bears a nuclear low pitch accent (L*). [Fa12]

(ii) *Corrective/wh-answer focus: L*+fH* Focused constituents that serve as the answers to wh-questions[23] or as corrections to inaccurate statements bear the *focused rising pitch accent*, composed of a single pitch accent with two tonal targets: the rising pitch accent (L*+fH). Like the (non-focused) rising pitch accent (L*+H), this pitch accent is realized as an Fo valley during the stressed syllable, immediately followed by sharply rising pitch, typically reaching its peak at the right edge of the second syllable. Neither rising pitch accent (i.e. L*+H, L*+fH) surfaces in conjunction with an AP

are typically deleted, the focused high AP boundary tone (fHa) cannot be compared to other high AP boundary tones (Ha) within the same ip.

[23] Both wh-answer and corrective focused constituents bear focused rising pitch accents (L*+fH); however, in the interest of space, only the corrective focused constituent data are presented.

boundary tone (Ta). In the case of the non-focused rising pitch accent (L*+H), this is due to the fact that this pitch accent only occurs in nuclear position, so any AP boundary tone would be overridden by the ip or IP boundary tone. In the case of the focused rising pitch accent (L*+fH), this is because the pitch accent is derived by adjoining the focus high tone (fH) to the low pitch accent (L*) of an underlying rising AP (L* . . . Ha), triggering post-focal compression/deletion of the high AP boundary tone (Ha). As bitonal pitch accents are otherwise unattested in most previous models of Bengali prosody (attested only in Michaels & Nelson's 2004 study of Eastern Bengali)[24], the goal of this section is to accurately identify the features that distinguish the focused rising pitch accent (L*+fH) from the rising AP (L* . . . H), including the interruption of downtrend and the location of the pitch maximum (henceforth, Fo max).

To explore the differences between the pitch contours of non-focused and focused constituents, examples of the same word in non-focused and corrective focused environments were elicited from the same speaker in identical sentence position.[25] Like the focused rising AP (L* . . . fHa), the focused rising pitch accent (L*+fH) is distinguished from non-focused rising APs (L* . . . Ha) in its defiance of downtrend. The Fo max on a focused constituent bearing the focused rising pitch accent (L*+fH) exceeds the pitch of the preceding high AP boundary tone (Ha), thus serving to highlight the focused constituent as the most salient AP in the ip. Compare the non-focused downtrend pattern in Fig. 4.28 with the downtrend-violating focused rising pitch accent (L*+fH) of corrective focus in Fig. 4.29.

While the focused rising pitch accent (L*+fH) is distinguishable from the rising AP (L* . . . Ha) in the relative height of the H tone, this alone does not distinguish the focused rising pitch accent (L*+fH) from the focused rising AP (L* . . . fHa), which also defies downtrend. To differentiate the focused rising pitch accent (L*+fH) from the two kinds of rising APs (i.e. both default and focused), the timing of the pitch maximum must be examined. While constituents bearing a rising AP (L* . . . Ha) or focused rising AP (L* . . . fHa) project their pitch maximum on the final syllable, constituents bearing focused rising pitch accents (L*+fH) show far more variability in the location of the Fo max relative to the AP's right edge. For the purposes of this section, I collapse the rising AP (L* . . . Ha) and focused rising AP (L* . . . fHa) into one category, as the Fo max location does not vary between the two.

[24] While the downstepped high tone marking (L+H*) "finality," first introduced in Hayes & Lahiri (1991), is bitonal in terms of its formal notation, it does not represent a contour tone, distinguishing it from the rising pitch accent (L*+H) introduced in Michaels & Nelson (2004) and further described in the current study.

[25] Subjects read 14 sentences of the frame [monoa.ıa _____ nie elo] "Monoara brought _____," seven of which were controlled to elicit neutral focus, by leaving out any clitics, punctuation, or context sentences that could trigger focus realization. These seven sentences differed only in the length of the direct object. Each of the seven sentences was matched with its corrective focus variant, with the corrective focus elicited by preceding the sentence by an "incorrect" statement.

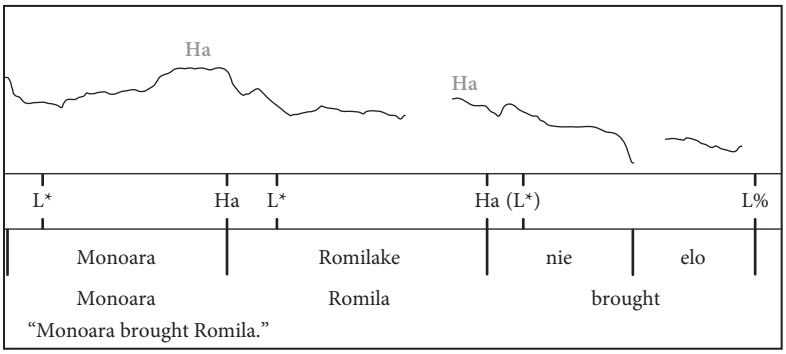


FIGURE 4.28 The pitch of the high AP boundary tone (Ha) of the second rising AP (L*...Ha) reaches a lower pitch than the first AP, following downtrend. The F0 values of the high AP boundary tones (Ha) from left to right are 245Hz and 203Hz. [Da01]

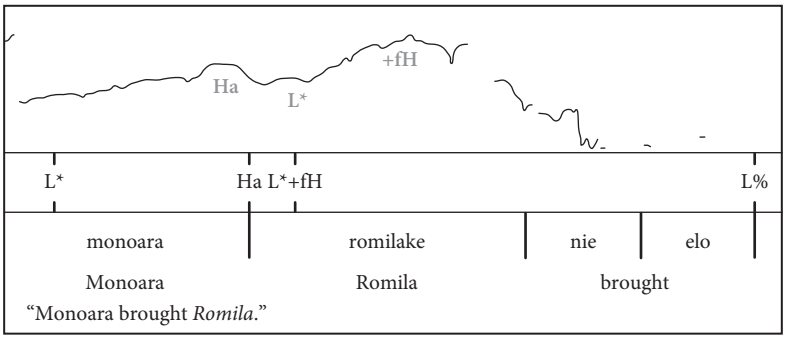


FIGURE 4.29 The focused rising pitch accent's (L*+fH) H target in the corrective focused AP [ɪomilake] "Romila-ACC" reaches a higher pitch than the previous high AP boundary tone (Ha), unlike the expected situation if the same AP were to bear a high AP boundary tone (Ha). The F0 values of the H tones from left to right are 214Hz and 250Hz.[26] [Da23]

In rising APs (L*...(f)Ha), the (focused) high AP boundary tone ((f)Ha) is simultaneously the rightmost point in the AP (or very close to it) and the highest point in terms of pitch, regardless of word length. Note in Fig. 4.30 how the disyllabic non-focused AP [make] "mother-ACC" bears its Fo max on the final syllable [ke], as does the non-focused AP [lina mamike] "Aunt Lina-ACC," with five syllables. The number of syllables does not affect the fact that the location of the Fo max.

[26] The reader may notice that the high AP boundary tone (Ha) of [monoaɪa] "Monoara" is lower in Fig. 4.29 (214Hz) than in Fig. 4.28 (245Hz). This is likely due to the overall lower pitch produced in Fig. 4.29; the low pitch accent (L*) of [monoaɪa] is also higher in Fig. 4.28 (197Hz) than in Fig. 4.29 (173Hz). It is unclear if this overall lowering of pitch on [monoaɪa] is related to its immediately pre-focal position.

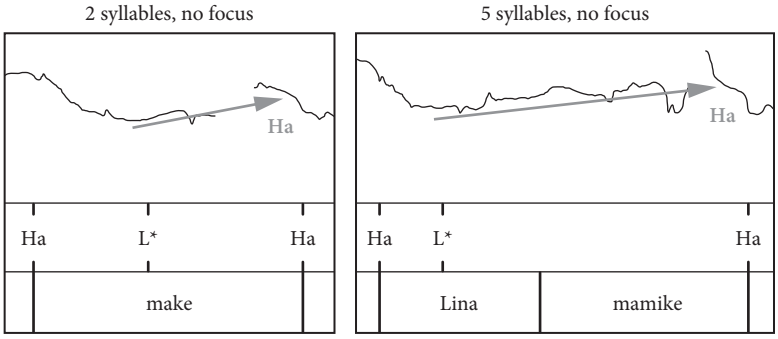


FIGURE 4.30 Non-focused [make] "mother-ACC" and [lina mamike] "Aunt Lina-ACC" illustrate how the F0 max is consistently realized at the right edge of non-focused constituents, regardless of the number of syllables. Both constituents serve as the object in the frame [monoaɹa _____ nie elo] "Monoara brought _____." [To19], [To24]

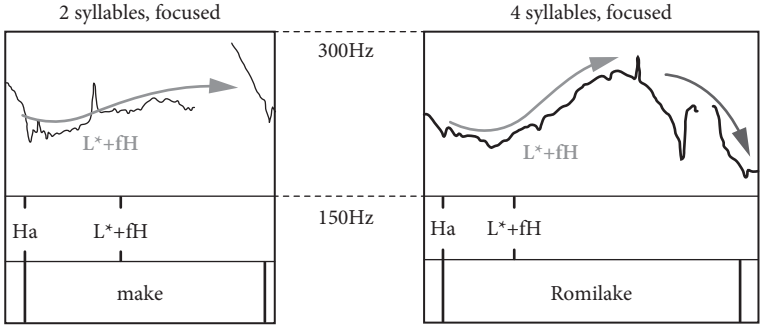


FIGURE 4.31 Focused constituents [make] "mother-ACC" and [ɹomilake] "Romila-ACC" produced by the same speaker in the carrier phrase [monoaɹa _____ nie elo] "Monoara brought _____." [BM20], [BM23]

On words bearing (focused) rising pitch accents (L*+(f)H), however, the Fo max is not anchored to the right boundary. In fact, it can be word-final, resembling a non-focused constituent (Fig. 4.31, left), or more often, word-medial (Fig. 4.31, right).

In a few cases, the Fo max of the focused rising pitch accent (L*+fH) is realized on the following word, due to the insufficient duration of the focused word itself, as in Fig. 4.32.

The Fo max of the focused rising pitch accent (L*+fH) is not anchored to the word's right edge, but to the pitch accent, and thus it occurs within a relatively fixed distance of the stressed syllable—either during the syllable immediately following the main stress (i.e. post-tonic syllable), or between the post-tonic syllable and its following syllable. By controlling the length and focus feature of a word, the differences between rising APs (L* . . . Ha) and focused rising pitch accents (L*+fH) can be revealed, as illustrated in Fig. 4.33 and Fig. 4.34.

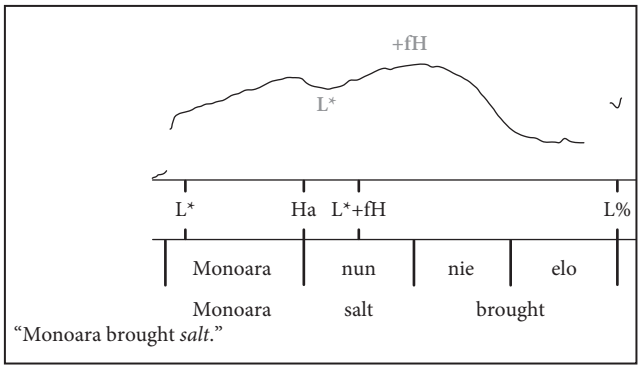


FIGURE 4.32 The F0 max for the focused rising pitch accent (L*+fH) on the corrective focused word [nun] "salt" is realized during the following word [nie] "taken" due to the short duration of the focused word. The lack of a nuclear pitch accent on the complex verb [nie elo] "brought" is due to post-focal tonal deletion. [Na18]

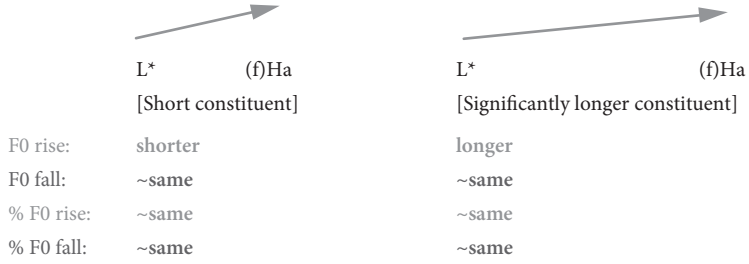


FIGURE 4.33 Properties of (focused) rising APs: L* . . . (f)Ha.

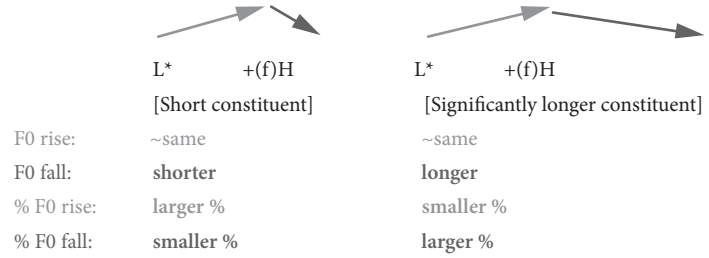


FIGURE 4.34 Properties of (focused) rising pitch accents: L*+(f)H.

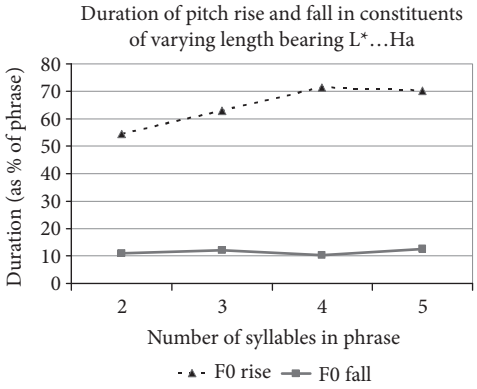


FIGURE 4.35 Durations of pitch rise (as a percentage of total phrase duration) and pitch fall (as a percentage of total phrase duration) across non-focused constituents of varying length (measured as the number of syllables).

The properties illustrated in Fig. 4.33 and Fig. 4.34 were confirmed in data including non-focused direct objects and their corresponding corrective-focused variants, ranging from two (e.g. [make] "mother-ACC") to five (e.g. [lina mamike] "Aunt Lina-ACC") syllables in length.[27] The duration of pitch rise from the Fo min to the Fo max, as a percentage of total phrase duration, was calculated as % Fo rise. This was compared to % Fo fall—the duration of pitch fall from the Fo max to the right edge of the phrase, as a percentage of total phrase duration. The data show that non-focused constituents bear their Fo max near the right edge of the phrase (i.e. the percentage of phrase duration between the Fo max and phrase edge only ranges between 10.9–12.7%), while constituents bearing a focused rising pitch accent (L*+fH) do not necessarily bear the highest pitch at its right edge (i.e. the percentage of phrase duration between the Fo max and word edge ranges widely, between 12.8–54.2%); instead, they bear their Fo max at a relatively fixed point after the Fo min of the stressed syllable (i.e. at the midpoint or right edge of the post-tonic syllable). Fig. 4.35 illustrates the effect of phrase length on the durations of % Fo rise and % Fo fall in phrases bearing rising APs (L* . . . Ha).

The same measurements (i.e. % Fo rise, % Fo fall) were made for the corrective-focused phrase corresponding to the non-focused phrase. Fig. 4.36 illustrates the effect of phrase length (measured as the number of syllables) on the durations of % Fo rise and % Fo fall in phrases bearing focused rising pitch accents (L*+fH). Note

[27] The data were selected from the eight speakers who produced all eight sentences fluently (i.e. four corrective-focused sentences and their four corresponding non-focused versions), without disfluent prosodic breaks.

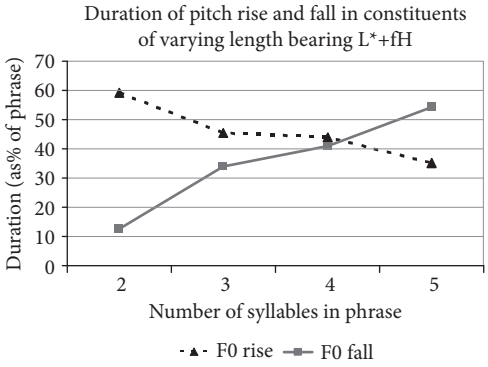


FIGURE **4.36** Durations of pitch rise (as a percentage of total phrase duration) and pitch fall (as a percentage of total phrase duration) across corrective focused constituents of varying length (measured as the number of syllables).

the very different pattern; as the length of the focused phrase increases, % Fo rise *decreases* and % Fo fall *increases*.

The data clearly show that focused rising pitch accents (L*+fH) can be distinguished from rising APs (L* . . . Ha) in the timing of the Fo max. Because the high pitch associated with the focused rising pitch accent (L*+fH) is part of the pitch accent, it occurs within a fixed distance from the stressed syllable (i.e. either within the post-tonic syllable or at that syllable's right edge), while the high pitch of the rising AP (L* . . . Ha) and focused rising AP (L* . . . fHa) are part of the AP boundary tone, and thus occurs within a fixed distance of the AP boundary.

(iii) *Surprise focus: fH** Surprising or unexpected information often triggers falling APs (H* . . . La) followed by a nuclear high pitch accent (H*), as described already. However, when under focus, surprising or unexpected information can bear what I call *surprise focus*, where the focus high tone (fH) fuses with the high pitch accent (H*) to form a focused high pitch accent (fH*), and the following AP-level tones are deleted or compressed. This focused high pitch accent (fH*) patterns with other focus tones in its defiance of downtrend, as shown in Fig. 4.37, an example of a colloquial register of Bangladeshi Standard, bearing features from a nonstandard Eastern dialect, collected in Experiment II.

Surprising or unexpected information may not seem like the most canonical focus type; it might be more accurate to label this as "new information" or "broad focus" (see Frota 2000 §1.4.1 for a review), or to relate it to the concept of contrastive focus. This pragmatic category is marked prosodically very much like the other types of focus (i.e. encliticized, wh-answer, corrective) as it involves the use of the focus high tone (fH) and post-focal AP tone compression, and thus it is grouped within the larger category of "focus" in the current study.

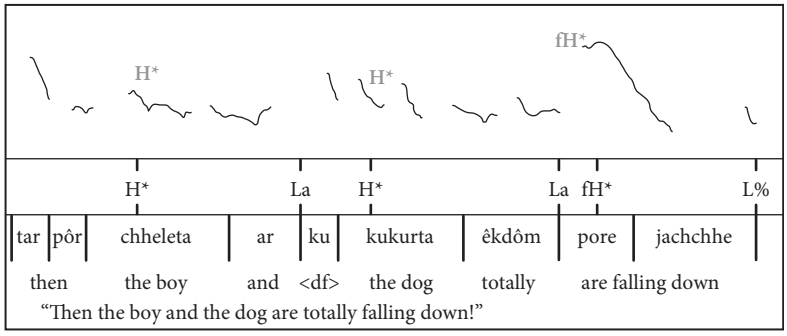


FIGURE 4.37 The nuclear AP [poɹe dʒatɕʰːe] "are falling down" bears a focused high pitch accent (fH*), signaling sudden or unexpected information. The phrase was produced by a speaker from Mymensingh District, using a hybrid of Bangladeshi Standard Bengali and Eastern Bengali in a recording session of naturalistic speech. [JhS98]

(iv) *Interaction of focus high tone (fH) with surrounding tones* When the focus high tone (fH) fuses with the high AP boundary tone (Ha) to create the focused high AP boundary tone (fHa), the main feature identifying its AP as being focused is the relative height of the boundary tone. Therefore, it is presumably of high importance to maintain this boundary tone, even when faced with the danger of concurrent boundary tone overriding. As post-focal tone compression/deletion only suppresses tones of the AP-level (i.e. pitch accents and AP boundary tones), it cannot affect the tones of higher prosodic units (i.e. ip and IP boundary tones). Thus, when the focused high AP boundary tone (fHa) appears ip-finally, it must find a way to avoid concurrent boundary tone overriding. Depending on the type of tone with which it is co-occurring, the focused high AP boundary tone (fHa) can either adjoin to the higher level boundary tone or shift away from it. I first describe the adjunction of the focused high AP boundary tone (fHa) to L boundary tones, and then move on to high tone shift.

When the boundary tone of a focus encliticized constituent (fHa) occurs before a low ip- or IP-boundary tone (L-, L%), it avoids being overridden by it, by means of simply adjoining to it, forming a *stacked tone* (i.e. fHaL-, fHaL%). This is similar to the boundary tones of American English, which combine ip and IP tones into a single contour (e.g. L-H%). Observe the pitch contour during the nuclear AP [meɹe felːoo̯] "killed-FOC" in Fig. 4.38. Note how the focused high AP boundary tone (fHa) is realized despite the concurrent low IP boundary tone (L%). The combined tone (fHaL%) is realized with a pitch maximum (for the fHa) immediately preceding the pitch minimum (for the L%), concentrated at the end of the IP-final syllable [loo̯].[28]

[28] Although the hiatus present in the string /…lo-o/ would normally be resolved to […lo], the stacking of tones presumably protects the clitic -/o/ from deletion.

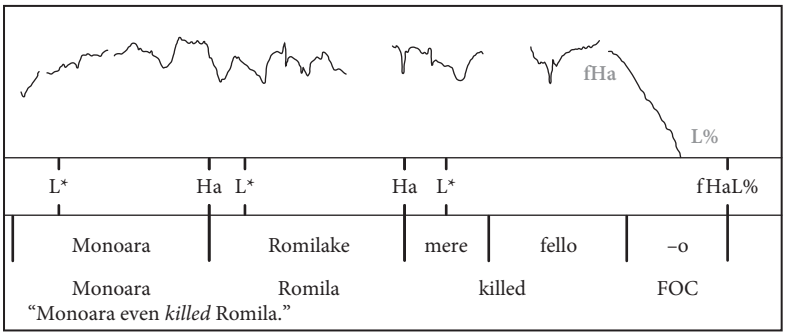


FIGURE **4.38** The focus encliticized verb [meɪe fel:oo̯] "even *killed*" bears its focused high AP boundary tone (fHa) despite the concurrent low IP boundary tone. The AP tone (fHa) is realized earlier than the IP tone (L%), although on the same syllable. [FoFSA3][29]

Just as the focused high AP boundary tone (fHa) is distinguishable from other high AP boundary tones (Ha) by its refusal to obey downtrend, it seems that this violation of concurrent boundary tone overriding helps to amplify the realization of the encliticized constituent's focused status.

Naturally, adjunction to a higher boundary tone is not appropriate when the higher boundary tone is of the H category (e.g. H-). Adjoining the focused high AP boundary tone (fHa) to the high ip boundary tone (H-)—as is done with low ip and IP boundary tones (L-, L%)—would presumably make it difficult to distinguish the pitch maxima of the two adjoined tones, thus obscuring the tonal cues of encliticized focus. To avoid this situation, the focus high tone (fH) undergoes *leftward shift*, docking not to the boundary tone but to the low pitch accent (L*), forming the focused rising pitch accent (L*+fH) normally seen on contrastive/wh-answer words. This allows separation of the two H targets, as the H target of the ip boundary tone is only realized on the final syllable (due to the locality constraint), leaving a sag in pitch between the two H targets, as shown in Fig. 4.39.

The adjunction of the focus high tone (fH) to the low pitch accent (L*) instead of to the high boundary tone is schematized in Fig. 4.40.[30]

Both tone stacking (e.g. fHaL%) and leftward shift serve as examples of the power of the focus high tone (fH) to avoid overriding. The leftward shift of the focus high tone (fH) also reveals the close relationship between the tone's three realization patterns, as it is clear from such examples that the focused rising pitch accent (L*+fH) and focused rising AP (L* . . . fHa) are in fact conditioned variants of one another.

[29] The irregular pitch track across this entire sentence is presumably due to the inability of the software to isolate the effects of the speaker's voice quality.

[30] Two other possible analyses of this leftward shift of the focus high tone (fHa) are discussed in Khan (2008) §12.3.1. These include early realization of the AP boundary tone or detachment of fH.

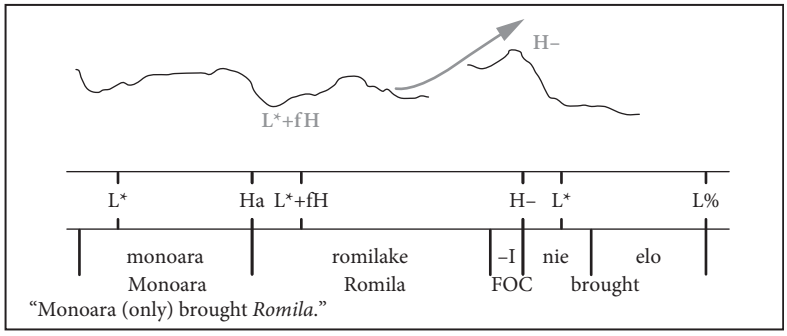
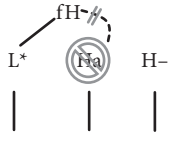


FIGURE 4.39 Although the encliticized AP [ɹomilakej] "(only) *Romila*-ACC" is expected to bear a focused high AP boundary tone (fHa), it undergoes leftward shift and thus bears a focused rising pitch accent (L*+fH), in order to avoid the overriding of the focus high tone (fH) by the high ip boundary tone (H-). [Ba12]



[[ɹómilakej]AP]FOC]ip

Romila-ACC-CL

"Monoara (only) brought *Romila*."

FIGURE 4.40 Schematic illustration of the leftward shifting of the focus high tone (fH) due to an adjacent high ip boundary tone (H-). The crossed dash line represents the otherwise expected docking of fH to Ha, which is overridden (represented by the crossed circle).

(v) *Summary* Focused constituents can bear one of three focus realization patterns, each of which incorporates a surface realization of the focus high tone (fH): focused rising AP (L* . . . fHa), focused rising pitch accent (L*+fH), and focused high pitch accent (fH*). Words attached to focus enclitics use the high AP boundary tone (Ha) as the docking point and bear the focused rising AP tonal pattern (L* . . . fHa), while corrective focus and wh-answer focus are realized through the use of the focused rising pitch accent (L*+fH), in which the low pitch accent (L*) serves as a point of adjunction with the focus high tone (fH). Words denoting particularly surprising information bear the focused high pitch accent (fH*), which is the result of fusion between the focus high tone (fH) and the high pitch accent (H*) in the falling AP (H* . . . La). All three realizations of the focus high tone (fH) can be identified in their violation of downtrend, and in the following tone deletion or compression. Furthermore, the most common tonal realization of focused constituents—the focused rising

pitch accent (L*+fH)—can be distinguished from the most common tonal realization of non-focused constituents—the rising AP (L* . . . Ha)—through observations of the differences in Fo max location. When in contact with higher level boundary tones, the docking point of the focus high tone (fH) can be modified in such a way that it avoids concurrent boundary tone overriding, either through tone stacking or leftward shift. With the violations of downtrend and of concurrent boundary tone overriding, and the compression or deletion of post-focal AP-level tones, the focus high tone (fH) accentuates focused constituents in such a way that they are easily identified by the listener as the most salient part of the sentence.

4.4 B-ToBI

Many transcription systems for prosodic models rooted in the AM theory are based on the Tones and Break Indices system, or ToBI (Silverman et al. 1992; Beckman & Hirschberg 1994; see Jun 2005c for a collection of ToBI-based transcription systems for twelve languages and the current volume for further examples). The data presented in the current study is annotated in Bengali ToBI, or B-ToBI, a transcription system introduced in Khan (2008). There are six parts to a B-ToBI transcription: an audio recording of the utterance, a record of the Fo contour, optionally superimposed on a spectrogram, and four transcription tiers (i.e. words, tones, break indices, and miscellaneous). The word tier includes the Romanized representation of the segments in the utterance. The tone tier includes the distinctive tonal events, including pitch accents and boundary tones, labeled as they are introduced in 4.3.2 (e.g. L*, HLH%). The break index tier includes integer numbers corresponding to the perceived juncture size between words, described in further detail later in this chapter. Finally, the miscellaneous tier may include any additional information about the utterance (e.g. disfluencies, stuttering, laughing), or other information such as the transcriber's notes to colleagues regarding a troublesome contour.

In addition to the labels for the phonological units introduced in 4.3.2, additional diacritics can be optionally incorporated into a more detailed prosodic annotation in B-ToBI. For example, undershot and early realizations of tones can be transcribed as such. In casual speech, interpolation between AP tones may not be direct; occasionally, speakers will reach the pitch maximum of the high AP boundary tone before the AP-final syllable. In such cases, the boundary tone can be optionally labeled eHa (for "early Ha"), and a pointer ">" can designate the point of actual phonetic realization of the Fo max. Furthermore, function words, short words, and words produced in a casual pronunciation may have one of both of their AP tones undershot, i.e. produced at a less extreme level. In these cases, the diacritic "u" can represent an undershot tone. Fig. 4.41 illustrates examples of both early and undershot high AP boundary tones (i.e. eHa and uHa, respectively).

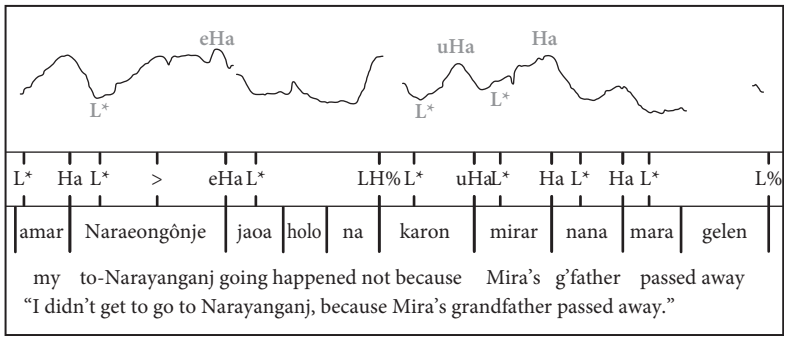


FIGURE **4.41** The AP [naɹaɐ̯ongɔndʑe] "to Narayanganj" bears a rising AP with an early realization of the high AP boundary tone, labeled eHa at the boundary and with a pointer > at the actual point of realization of the pitch maximum. Despite the fact that it is the IP-initial AP, [kaɹon] "because" bears an undershot high AP boundary tone (uHa), due to its function word status. The undershot realization of the high AP boundary tone (uHa) is obvious when comparing it to the high AP boundary tone (Ha) of the following AP [miɹaɹ] "Mira's." [Fa37]

After each word transcribed in the Word Tier of a ToBI transcription, there must be a corresponding numerical break index in the Break Index Tier. Larger numbers denote larger perceived breaks—which can be affected by final lengthening, the existence and duration of pause, changes in voice quality (e.g. final creak), segmental alternations, and other suprasegmental phenomena—and larger perceived breaks should denote the disjunctures between higher phrases in the prosodic hierarchy. B-ToBI uses break indices 1 and 2 for Word level and AP level breaks, respectively, as in other AP languages such as Japanese (J_ToBI: Pierrehumbert & Beckman 1988; Venditti 2005) and Korean (K-ToBI: Jun 2000, 2007), and break indices 3 and 4 for ip and IP level breaks, respectively, as in ip-IP languages such as American English (MAE_ToBI: Beckman & Ayers Elam 1997), German (GToBI: Grice et al. 2005), and Catalan (CatToBI: Prieto, this volume).[31] The B-ToBI system of break indices is shown in Table 4.2.

As in other ToBI-style transcription systems, the break indices of B-ToBI are transcribed on the third tier below the pitch track, as illustrated in Fig. 4.42.

In Fig. 4.42, all five possible break indices (i.e. 0, 1, 2, 3, 4) are found. Level 0, which designates a disjuncture perceived to separate a clitic from its host, is seen between [mama] "mother's brother" and the focus enclitic -[o̯] "also," "even." The breaks preceding the morphemes [dʑej] (relative clause marker) and [ni] (negation of perfect verbs) are also labeled 0. The disjuncture between [mone] "mind-LOC" and [ɹakʰt̪e] "keep-INF" and the disjuncture between [bʱule] "forget-PERF" and [gelen]

[31] See Khan (2008) §10.2 pp. 192–198 for a detailed survey of break index systems.

Table 4.2 Break indices used in the B-ToBI transcription of Bangladeshi Standard Bengali

Break index	Disjuncture represented
0	word-clitic boundary
1	word boundary
2	AP boundary
3	ip boundary
4	IP boundary

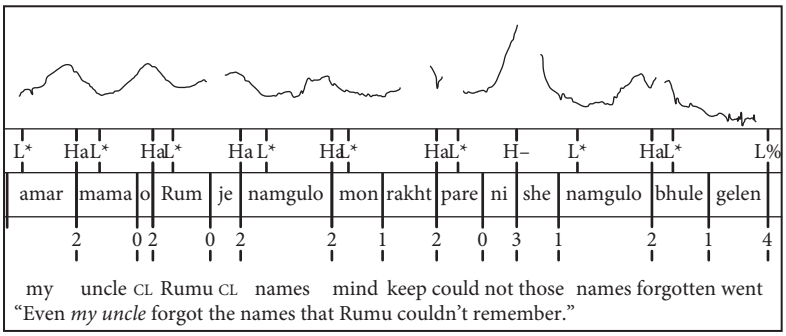


Figure 4.42 Break indices 0, 1, 2, 3, and 4 are all found in this sentence, transcribed on the break indices tier—the third tier under the pitch track. The miscellaneous tier is not included in this example, as it is empty. [Na51]

"go-PAST-HON" are labeled with break index 1, identifying the disjunctures as word boundaries within a single AP. Each of these disjunctures occurs between the two halves of complex verbs: [mone ɹakʰt̪e] "to remember," [bʱule gelen] "forgot-HON." In addition, the disjuncture between the demonstrative [ʃej] "that" and its noun [namgulo] "name-DEF.PL" is labeled with break index 1. Most of the disjunctures in the sentence are marked with break index 2, representing perceived AP boundaries. The disjuncture between the relative clause [ɹumu dʑej namgulo mone ɹakʰt̪e paɹe ni] "the names Rumu couldn't remember" and the correlative [ʃej namgulo] "those names"[32] is marked with break index 3, representing a perceived ip boundary. Finally, the break between the word [gelen] "go-PST-HON" and the end of the sentence is marked with break index 4, representing a perceived IP boundary.

[32] Bengali uses the correlative construction, and thus a noun being relativized is pronounced in both the relative clause and the correlative clause.

4.5 Conclusions

By collecting a corpus of data recorded from a large number of subjects speaking in a wide range of contexts, the current intonational phonological model of Bangladeshi Standard Bengali reveals a large tonal inventory, a prosodic structure composed of three tonally-marked phrases, various phonological interactions between tones, and exceptional attributes of the focus high tone (fH).

The current model finds two prenuclear pitch accents (i.e. L*, H*) and three nuclear pitch accents (i.e. L*, H*, L*+H), two AP boundary tones (i.e. La, Ha), four ip boundary tones (i.e. L-, H-, HL-, LH-), and five IP boundary tones (i.e. L%, H%, HL%, LH%, HLH%), which can be distinguished by their relative pitch heights, contour shapes, and domains of pitch interpolation. The current model also distinguishes the AP, ip, and IP by their distributional and durational properties. While studies of other dialects of Bengali (Hayes & Lahiri 1991, Michaels & Nelson 2004, among others) have only described two levels of tonally-marked prosodic phrasing, the current study proposes three; this AP-ip-IP structure is also seen in other languages, including Basque (Hualde 1988; Jun 2005b), Farsi (Jun 2005b; Esposito & Barjam 2007; Scarborough 2007), K'iche' (Nielsen 2005), and more recent analyses of Korean (Jun 2007).

The numerous tones in the Bangladeshi Standard Bengali inventory are under the influence of various phonological constraints. High AP-level tones (i.e. H*, Ha) are subject to downtrend, where the Fo max of each AP must not exceed that of the preceding AP. Furthermore, all AP-level tones (i.e. pitch accents and AP boundary tones) are forced by the OCP constraint to bear opposite tonal targets, while ip boundary tones are affected by a locality constraint that restricts their domain of pitch interpolation to the ip-final syllable. Lastly, both AP and ip boundary tones are susceptible to overriding by the concurrent boundary tone of a higher prosodic unit.

One particularly interesting finding of the current study is the underlying focus high tone (fH), which surfaces in three different manners depending on the type of focus applied and the existence and type of adjacent tones. The three surface reflexes of the underlying focus high tone (fH) are in complementary distribution: the focus high tone (fH) fuses with the high AP boundary tone (Ha) in encliticized focus constituents, fuses with the high pitch accent (H*) in surprise focus constituents, and adjoins with the low pitch accent (L*) in corrective and wh-answer focus constituents. The relationship between these three "allo-realizations" is clear in that they share particular phonetic properties—they all involve exceeding the pitch of the previous AP's Fo max and triggering post-focal tone compression or deletion—and in the interchangeability between two of the forms (i.e. leftward shift) in particular tonal environments.

As the literature in the intonation of South Asian languages has grown considerably in the past two decades, it would be of interest to examine data from other dialects of Bengali and from neighboring languages to see how much of the current model of Bangladeshi Standard Bengali can be applied to analyses of related prosodic systems. Testing the perceptibility of the proposed structural distinctions could shed more light on the psychological reality of the current model. The current study's findings on the various focus realizations also prompts questions of the interface between semantic/pragmatic theories of the focus feature and its phonetic/phonological realization. I hope that with the corpus of data collected for the current study and the corresponding intonational phonological model and B-ToBI transcription system as a starting point, other researchers will join me in studying the prosody of Bengali and other South Asian languages from all subfields of linguistic research.

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