

VERBAL TONE IN MPYEMO

by

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ABBREVIATIONS

1P	first person plural	HTR	high tone raising
1S	first person singular	HTS	high tone spreading
2P	second person plural	IMM	immediate past
2S	second person singular	IMP	imperative
3P	third person plural	INAN	inanimate
3S	third person singular	INCL	inclusive
AN	animate	INCP	inceptive
Aux	verbal auxiliary	IND	indicative
Bd1	boundary tone 1	INDF	indefinite article
Bd2	boundary tone 2	INTR	intransitive
Bd3	boundary tone 3	(L)	floating low tone
C	consonant	L↓	falling low tone
C1	(noun) class 1	N	nasal
C5	(noun) class 5	∅	toneless
C6	(noun) class 6	OBJ	object
C7	(noun) class 7	PL	plural
C8	(noun) class 8	POSS	possessive
CAR	Central African Republic	PRF	perfect
CONJ	conjunction	PRI	prior
DEM	demonstrative	SBD	subordinator
DPST	distant past	SBSQ	subsequent
DUB	dubitative	SG	singular
EXCL	exclusive	Sh	super-high
FFC	final falling contour	sp	species
FSI	foreign service institute	SR	surface representation
FUT	future	SuAgr	subject agreement prefix
FV	final vowel	SUBV	subjunctive
G	glide	TRANS	transitive
(H)	floating high tone	UAC	universal association convention
↑H	raised high tone (super high)	UR	underlying representation
HAB	habitual	V	vowel, verb
H ^R	replacive high tone	V ₁	first root vowel
HTD	high tone docking	V ₂	second root vowel

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There are many people whom I need to thank for the successful completion of this thesis. I want to thank the Mpyemo people, and especially those of Adoumandjali, Central African Republic, for welcoming, befriending, and taking care of me and my family. In particular, this work would not have been possible without the patient cooperation of three Mpyemo men: Akiko Raphael, Loukobori Paul, and Ntago Jean-Paul. They provided the language data upon which the entire thesis rests.

Dr. Keith Snider was very helpful, even inviting me to stay in his home for a few days while we struggled with the analysis. His insights were crucial in the early stages of figuring out what was going on in Mpyemo tone. Keith Beavon and Dr. Christina Thornell have done an appreciable amount of work on the Mpyemo language. Their concern for the mpyemo people is evident. I especially want to thank my thesis committee chairperson, Dr. Steve Parker, who was willing to take on this responsibility when Dr. Snider was no longer available. I am also grateful to the other members, Dr. Ken Olson and Dr. John Clifton, for their help and encouragement. All three members of my committee have been available and welcoming, in spite of their workload or the difficulty of their own circumstances.

My wife, Maria, and my children, Christina and Kylie, have shown great patience during the long process of research and writing. Without their encouragement and understanding I would never have finished. Finally, all my thanks is due to Almighty God for allowing me to uncover a bit of the mystery of the Mpyemo language, and for giving me the strength to finish this thesis.

ABSTRACT

This thesis describes the tonal patterns and alternations present in the Mpyemo language (Bantu A.86c – ISO code mcx), with special attention to the verbal system. Rules and autosegmental representations are used to clarify and provide a formal analysis. A tone raising rule causes the underlying two-tone system to display three phonetic levels at the surface. This thesis explores nominalized verbs and verbs in the imperative. In addition, inflected verbs are described, although only a limited set of inflectional morphemes are treated. Thus, I look at verbs with inflectional prefixes for subject agreement, the perfect, and a single verbal auxiliary (a category that includes tense and aspect as well as lexical morphemes). I do not attempt a treatment of negation, questions, verbs with multiple auxiliaries, or those with causative or reflexive suffixes.

Verbal auxiliaries are subdivided into three groups according to their compatibility with the perfect. Floating tones occur at three different morpheme boundaries and distinguish between indicative mood and subjunctive mood.

Nominal tone is also briefly discussed, in order to show parallels with verbal tone and to account for the behavior of nouns as verbal objects.

CHAPTER 1

INTRODUCTION

Most of the world's minority languages receive little scholarly attention, a fact that is unfortunate both for the academic world and for the minority peoples; for the former because of the insights to be gained in studying these languages, and for the latter because of the social and educational benefits that scholarly attention can foster.

Mpyemo (ISO code mcx) is one of these little-studied minority languages. It is spoken primarily in the southwest corner of the Central African Republic. The purpose of this thesis is to describe the tone system of selected parts of the Mpyemo language. The Mpyemo tone system is interesting because two underlying tones, combined with a tone raising process, generate three discrete phonetic pitch levels. In addition, boundary tones are inserted at key places within the verb phrase to express mood distinctions. These combine with segmental tense/aspect prefixes (tone-bearing as well, in most cases) to produce a wide variety of possible meanings.

I will analyze the data to the degree required to provide economy in the description. The thesis will be limited to the verbs, verbal auxiliaries, and subject agreement morphemes. Nominal tone will also be treated, but only to the extent necessary to show parallels with verbal tone, and to account for the behavior of nouns as objects in verbal constructions. Insofar as possible, I will limit the account to generalizations that are true for a majority of the data. The existence of exceptions will be noted where appropriate, but I will not go into detail on them.

I hope this description will stimulate interest in the Mpyemo language and people, provide interesting data for other linguists, and help the Mpyemo people to use their language as a tool for written communication.

1.1 Classification, location, and dialect information

Mpyemo is a Narrow Bantu language spoken in the Central African Republic (24,000 speakers), the Republic of Cameroon (5,000 speakers), and the Republic of Congo (unknown number of speakers). Its complete classification is: Niger-Congo; Atlantic-Congo; Volta-Congo; Benue-Congo; Bantoid; Southern; Narrow Bantu; Northwest: A; Makaa-Njem A80 (Gordon 2005). Guthrie (1971:33) classifies Mpyemo as Bantu: Maka-Njem A.86c.

The Mpyemo people are divided into at least five geographical groups or districts, according to Beavon and Johnson (1989:1): Bijuki, Mpiakombo, Jasua, Kwabili, and Bikung. Duke (1996:8) lists seven groups, adding Ziendi and Bamba to the above list. At least some of these are primarily political divisions, and are recognized by the government. They are likely based on earlier social or kinship groupings. Although a detailed dialect survey of Mpyemo remains to be done, it is already clear that dialect differences exist between some of these divisions; nevertheless, they consider themselves a unified ethnic group (Duke 1996:8).

1.2 Research data and methodology

I have been doing linguistic research among the Mpyemo people in the village of Adoumandjali, Central African Republic, under the auspices of SIL (Central Africa Group), for approximately five years beginning in June 2000. The specific research relevant to this thesis was carried out from January 2006 to January 2007, as approved by the University of North Dakota's

Institutional Review Board.¹ Adoumandjali is in the Mpiakombo district of CAR; unless otherwise noted, the use of “Mpyemo” in §1.4 and thereafter will refer to this speech variety.

Three Mpyemo men provided the data for this research, and requested that their names be included in this thesis. They are: Akiko Raphael, Loukobori Paul, and Ntago Jean-Paul. Working with these language consultants, I first elicited a word list of around 1600 items, including words, phrases, and compounds. I did not elicit any texts for this research, although I have done so prior to this project. No data from these texts was used in this thesis. Although words of many grammatical categories were elicited, the focus of the data collection was on nouns and verbs. After removing words of other categories, compounds, loan words, phrasal expressions, and words whose tonal melody was in doubt, there remain 545 nouns and 312 verbs, which serve as the primary corpus for this study.

These words were studied in context using substitutionary frames, thus providing a set of constant phonological environments in which to observe the behavior of the various tone melodies. I made digital recordings of representative examples of these words in isolation and in context, about 2600 recordings in all. Details on recording procedures are given in §1.6.

Our method for distinguishing tonal melodies relied on native speaker judgments. I would write a number of words of the same type, (e.g. two-syllable prefixless nouns) on slips of paper; the language consultants would sort these into groups based on perceived similarity of pitch contour. As they did so, patterns emerged: four major groups of nouns, plus one minor group; two major groups of verbs, plus one minor group. These became the tonal melodies that I am positing in this thesis.

¹ Project title: Mpyemo Tone Analysis, IRB-200601-195.

There were, of course, some strays - words that did not seem to fit any of the main patterns. Sometimes putting a word in context would assist the language consultants in determining the group to which it belonged. As the work progressed, the language consultants became more and more adept at categorizing Mpyemo words according to phonetic pitch, and no longer needed to sort them using slips of paper.

1.3 Literature review

Little has previously been written on the Mpyemo language. Documents of interest to those desiring to learn more about the Mpyemo language appear below, with annotations. Complete bibliographic information for these is provided in the reference section, which begins on page 107.

- *Provisional description of the segmental phonemes and noun classes of the Mpyémó language (Bìjúgí dialect)*, by Keith Beavon, SIL Cameroon, 1978. This is a short unpublished manuscript that attempts to establish phonemic contrasts for Mpyemo dialects spoken in Cameroon.
- *Sociolinguistic survey among the Mpyemo* by Keith Beavon and Ann Elizabeth Johnson, both of SIL Cameroon, 1989. This unpublished paper gives the results of a sociolinguistic survey to test the Cameroonian Mpyemo people's comprehension of Mpompo and Koonzime, to study people's attitudes towards their language and neighboring languages, and to determine the viability of Mpyemo. Although the lexicostatistical analysis indicated cognate percentages of greater than 70%, comprehension of Mpompo was significantly higher. This comprehension was determined to be an acquired, rather than inherent, proficiency. The survey also determined that the Mpyemo language is not in danger of dying out or being replaced.

- *Quelques observations sur les syntagmes verbaux en mpyemo* by Keith Beavon, 2006. In this unpublished manuscript, Beavon presents a systematic analysis of verb phrases in a Cameroonian dialect of Mpyemo. Positing three underlying tones, he gives hypotheses of the tonal and segmental makeup of tense, aspect and negation markers in independent as well as dependent clauses. (See my comments at the end of this section.)
- *La classification nominale de la langue mpyemo* by Biandji Dieudonné, 1989. This unpublished work is Biandji's final undergraduate paper for the University of Bangui, Central African Republic. Mpyemo is Biandji's native language.
- *Le verbe en mpyemo, langue bantou* by Biandji Dieudonné, 1991. This is Biandji's unpublished master's thesis, University of Bangui.
- *Essai de grammaire mpyemo* by Biandji Dieudonné, 1999. This unpublished manuscript is intended to document some of the grammatical features of Mpyemo.
- *Rapport d'enquête sociolinguistique: Première évaluation parmi les mpiemo* by Daniel Duke, SIL Central African Republic, 1996. Duke presents the results of a language survey in CAR whose goals were to study the relationship of Mpyemo to neighboring languages (three dialects of Mpo, plus Nzime and Kako); to determine the Mpyemo people's level of bilingualism in Sango; and to ascertain the long-term viability of the Mpyemo language. The Mpo dialects were closest to Mpyemo, according to the interviews. Biligualism was determined to be best among those aged 26-34 (3+ on the FSI scale). The rest of the population was at or below the 2+ level. Language usage, attitudes, and demographic factors all seemed to favor the long-term viability of Mpyemo.
- *Gnoa Toma: Matthieu, Marc, Luc, ne Jean kueli go* (Good news: which Matthew, Mark, Luke and John wrote). 1978. This is a translation of the first four books of the New Testament, done by the Église Évangélique Baptiste of Berbérati, Central African Republic.

- *Data on the verb phrase in the Mpiemo language* by Christina Thornell, 2003. This is a set of verb phrase data based on a questionnaire by France Cloaric-Heiss. Unfortunately, tone is not transcribed in this data set.
- *Wild plant names in the Mpiemo language* by Christina Thornell, 2004. This is an extensive listing of plant names in Mpyemo, along with their scientific names.
- *Morphological function, syllabic and phonetic form of nasal+plosive combinations in the Bantu language Mpiemo* by Christina Thornell and Mechtilde Tronnier, 1999. The authors argue for an interpretation of nasal+plosive combinations in Mpyemo as sequences of two segments rather than as prenasalized stops. They rely on evidence from morphology, syllable structure, and acoustic phonetics.
- *On the initial aggregation of nasality and stops in the Bantu language Mpiemo* by Mechtilde Tronnier and Christina Thornell, 2000. Here the authors once again take up the study of nasal+stop combinations. This time, however, they use phonetic analysis to show the differences between nasals that precede voiced stops and those that precede voiceless stops, and conclude that the latter are in the process of losing their contrastive status.
- *Preliminaries to the phonetic structure of the Bantu language Mpiemo* by Christina Thornell and Yasuko Nagano-Madsen, 2004. The authors present the results of their acoustic phonetic study of selected sounds in the Mpyemo language.

For the purposes of this thesis, Beavon 2006 is the most relevant of the above resources. His analysis differs from the one presented here in several ways. Beavon started out by eliciting data based on a carefully thought-out paradigm of tense and aspect contrasts. He begins with the premise “Languages must be able to express meanings x,y,z. How does Mpyemo do it?” This is a useful and fruitful approach. However, I went in a different direction. I started with the verbal auxiliaries themselves and tried to infer the tense/aspect information from the glosses native

speakers gave and from what I know of how they use the auxiliaries. This difference in elicitation strategies produced different kinds of data. Beavon's data cover four verbal auxiliaries, in a variety of clauses, including affirmative and negative, dependent and independent. He also describes some tense distinctions that depend on tone alone, which I do not discuss in this thesis.

My data covers the tonal behavior of thirteen auxiliaries in affirmative independent clauses. Beavon thus did his research on a different set of data. There is little overlap in our data. I am not looking at dependent clauses or the negative. Where our data do overlap there are differences. Some are due to differences between Cameroonian Mpyemo (the Bijuki dialect) and the speech form I studied (the Mpiakombo dialect).

He posits three underlying tones: high, mid, and low. There is, however, no instance of a M-L sequence in his data, a gap which provides evidence for the analysis presented here. This point will be elaborated upon in §1.4. I believe the basic two-tone analysis presented here would work with Beavon's data, although it would require some adjustments to the rules to account for dialect variations. In spite of these differences in analysis, Beavon's paper represents an important pioneering effort in the understanding of Mpyemo tone.

Much research remains to be done on Mpyemo. This small corpus of writings on the language will, however, provide some background information for interested researchers.

1.4 Tone Overview: levels, melodies, and processes

There are three phonetic pitch levels in Mpyemo, but I will argue for only two underlying tone heights: high and low.² The noun and verb melodies that I am proposing are similar to those

² The following conventions are adopted for this thesis: Tonal melodies are written using sequences of H, L, (L), etc. Otherwise I simply refer, without abbreviation, to "high" and "low" tones. Where data are

that Greenberg (1948) proposed for Proto-Bantu: HH, LL, HL, and LH for nouns; H and L for verb roots. My analysis has an additional, marginally productive tone melody for both nouns and verbs, as explained below.

Mpyemo noun roots have the following five underlying melodies: H, L, HL, LH, and H(L). The H(L) melody ends in a low tone that is not only floating; it is a non-linking tone that is only present when the noun is utterance-final. In medial contexts it has no surface realization or effect on neighboring tones. This is an important fact for understanding the tonal behavior of these nouns. The HL melody is much less productive than the others.

In contrast to nouns, verb roots have only two underlying melodies: H and L. The Mpyemo verb root is bound to an obligatory final vowel. The verb stem is thus made up of root + final vowel, and when the tone of the final vowel is considered, there emerges a three-way distinction in verb stems. Most verb stems occur with a floating low tone following the final vowel, but a few high-toned roots take, instead, a normal low tone on the final vowel. So the three underlying melodies for verb stems are H-(L), L-(L) and H-L. Like the HL melody for nouns, the H-L verb stem melody is also rare.

This analysis also posits the existence of boundary tones at morpheme boundaries in the verb phrase. These boundary tones are grammatical morphemes, rather than intonational in nature. Snider (1999:45) considers a boundary tone to be a clitic that consists solely of a floating tone. Black (1995) posits this type of boundary tone at morpheme boundaries to account for the complex tonal behavior of Kinande verbs, as does Snider (1994) for Kako.

given using autosegmental notation, floating tone is indicated by parentheses around the H or L. Following common usage, e.g. Snider (1999:6), a floating tone is defined as one that is unattached to any segmental material. An associated tone is one that is attached to such material.

For the purposes of this thesis the tone-bearing unit is assumed to be the syllable, until this assumption can be proven or disproven. Evidence for deciding between the syllable and the mora as TBU might consist of a LH noun of the shape CVCV:. Assuming tones associate to TBUs from right to left (this assumption will be discussed later in this section), if the final long vowel (V:) were treated as a single TBU, it would result in a pitch contour like this: [---]. This would argue that the syllable is the TBU. If the V: were treated as two TBUs, the pitch contour would look like this: [---]. If this were the case, we would posit the mora as TBU. But for the present this determination must wait, because a noun of the required tone melody and syllable shape has not yet been found.

The Obligatory Contour Principle (Leben 1973, Goldsmith 1976) prohibits like tones from being adjacent to one another. However, certain combinations of morphemes produce OCP violations. These violations are assumed to be resolved by the merging of the two like tones into a single tone, but in some cases we must, exceptionally, posit unresolved OCP violations in the lexicon. These are thought to occur only across morpheme boundaries. These issues and others will be dealt with further beginning in Chapter 2.

The rules that produce the surface forms, and cause this two-tone system to surface with three phonetic levels, are shown in Table 1.

Table 1: Tone rules.

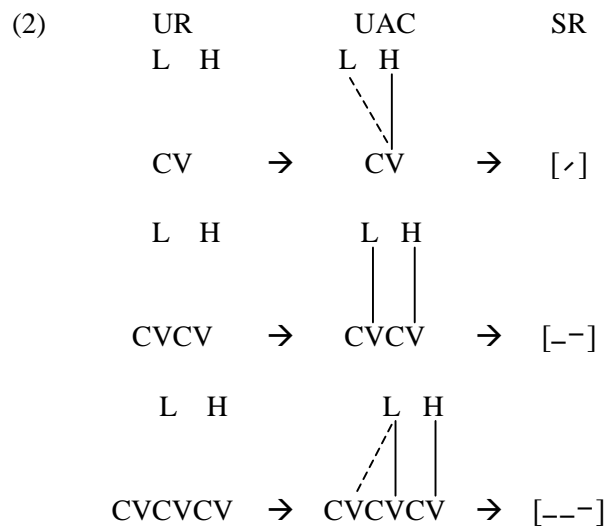
Universal Association Convention (UAC)	Associate tones with tone-bearing units in a one-to-one, right-to-left manner. Any remaining TBUs associate with the leftmost tone. Any remaining tones associate with the leftmost TBU.
High Tone Docking (HTD)	An unassociated high boundary tone docks one TBU rightwards, delinking a low tone from its TBU. If there is an intervening toneless TBU, the high boundary tone docks to it also.
High Tone Spreading (HTS)	A singly associated high tone spreads rightwards one syllable.
High Tone Raising (HTR)	A high tone that immediately precedes: 1) a phrase-medial low tone; or 2) a phrase-final associated low tone is higher in pitch than a high tone that does not precede such a low tone.
Final Falling Contour (FFC)	Utterance-final low tone (associated or floating) is realized as a falling contour.

These rules account for most of the surface forms in Mpyemo. Of the five nominal melodies mentioned above, the Universal Association Convention by itself accounts for the citation forms of the H and LH groups. Pitch contours for these are shown in (1).

(1)	<p>H</p> <p>[-]</p> <p>CV</p>	<p>LH</p> <p>[˩]</p> <p>CV</p>
	<p>[- -]</p> <p>CVCV</p>	<p>[- -]</p> <p>CVCV</p>
	<p>[- - -]</p> <p>CVCVCV</p>	<p>[- - -]</p> <p>CVCVCV</p>

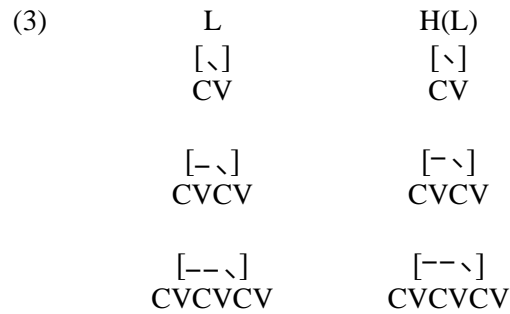
The right-to-left direction of association is made explicit in order to account for three-syllable nouns. However, it is not known whether these are morphologically complex, and if they are, what tonal effects this morphology might have. Direction of association does not play a major role in this thesis. For one- and two-syllable nouns and verbs, the direction of association does not even need to be specified since it does not appear to be crucial in these cases.

The application of the UAC is shown in (2). In the column labeled UAC, the dashed lines show how extra tones associate to the leftmost (i.e., the only) TBU (for the monosyllabic example) and how extra TBUs associate to the leftmost tone (for the trisyllabic example).



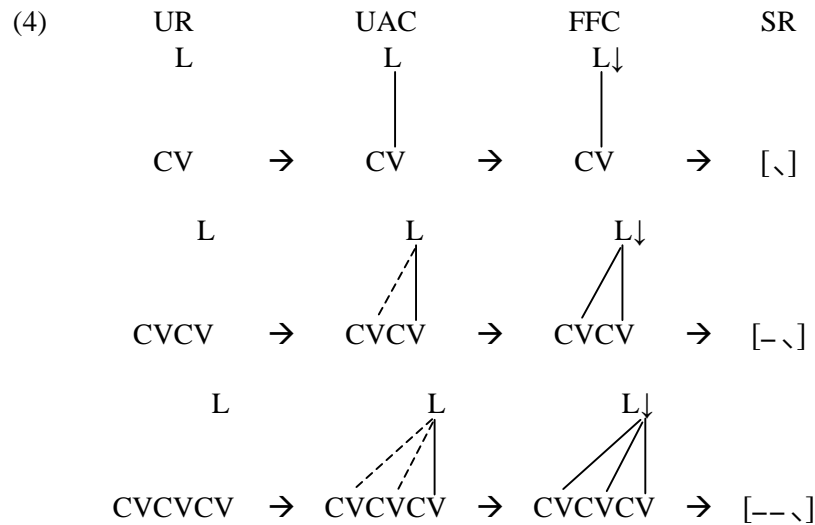
The Final Falling Contour rule and the UAC produce the citation forms for nouns of the L and H(L) melodies. Recall from the discussion above that the H(L) melody ends with a non-linking low tone. This tone is not assigned to a TBU by the UAC. Its only effect is to create the falling contour on the final syllable of the H(L) nouns. These two melodies³ are shown in (3).

³ In this thesis, falling contour lines indicate the starting point for the contour, but are not meant to imply the phonetic pitch level of the contour's endpoint. An utterance-final falling contour, regardless of its starting point, falls to below the low tone level.



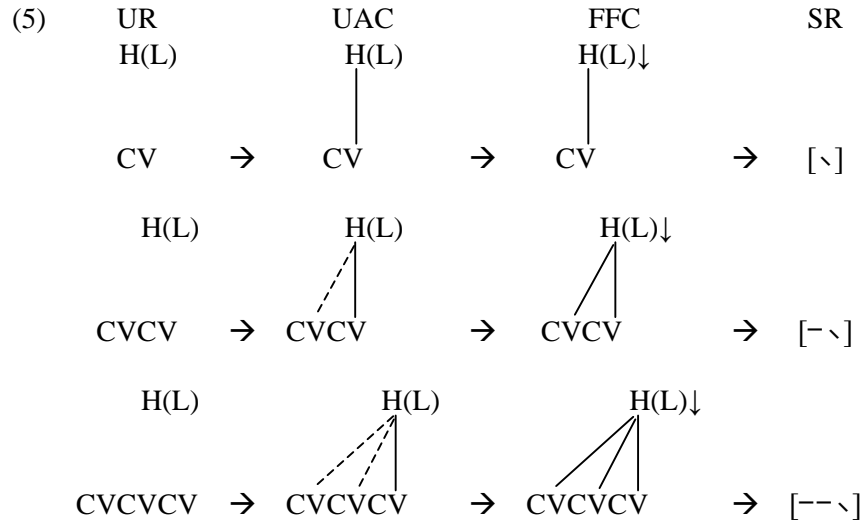
With the FFC rule there is no distinction between associated and floating low tones. Any utterance-final low causes a falling contour. This is typical behavior for utterance-final low tones in many Niger-Congo languages (Snider 1999:46).

Example (4) shows the autosegmental derivation for low-toned nouns of one, two, and three syllables. A rigorous analysis of the features of the falling low tone would require a more developed theoretical model, such as Register Tier Theory (e.g. Snider 1999). Since my aim is to remain as theory-neutral as possible, falling tone is simply represented by “L↓” on the tonal tier.

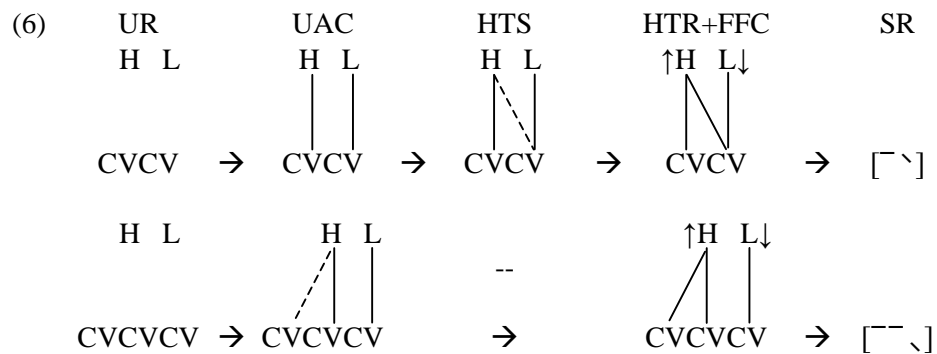


Example (5) shows the same derivation for the H(L) nouns. Recall that the low tone of this melody is a non-linking tone, and therefore unaffected by the UAC. Since it is utterance-final and

remains floating throughout the derivation, it does not cause High Tone Raising. Cases where HTR is triggered are discussed later in this section.



To account for the surface forms of the HL noun group, we need to invoke the UAC, FFC, as well as the High Tone Spreading and High Tone Raising rules. An autosegmental derivation for this is shown in (6). In order to save space, HTR and FFC are shown in a single column, but they are two distinct processes.



A raised high tone (i.e., a super-high) is symbolized here by “↑H” on the tonal tier. Since the utterance-final low tone of this group is associated, it provides the required environment for HTR.

The three-syllable HL nouns are accounted for with the UAC, HTR, and FFC, but High Tone

Spreading must be invoked to explain the two-syllable forms. The high tone, after being assigned to the first syllable by the UAC, spreads rightwards by HTS so that the final syllable is linked to a high and a low tone. HTS does not apply to three-syllable forms, since the rule only acts on singly-linked high tones. Monosyllabic HL nouns are unattested.

HTR is motivated by the following fact: Throughout the language, looking at any two adjacent phonetic tones in an utterance, we find the distribution⁴ shown in Table 2. With three phonetic levels (referred to as low, high and super-high), eight of the nine logically possible combinations are attested. The only one missing is H-L. HTR, in conjunction with a hypothesis of two underlying tones, accounts for this distribution. Any high tone followed by a low tone gets raised to the super-high level, hence the absence of H-L sequences. The sH-H sequence is generated by a floating low between two associated highs.

Table 2: Permissible phonetic tone sequences.

		Second tone		
		L	H	sH
First tone	L	✓	✓	✓
	H	∅	✓	✓
	sH	✓	✓	✓

HTR has a precedent in a closely related language: Snider (1994) reports, for Kako (Bantu A.93), high tones rising to a super-high level when followed by a low tone. The more distantly related Krachi (Niger-Congo: Kwa) also displays the raising of a high tone before a low tone (Snider 1990).

⁴ The distribution given in the table is extremely strong. However, underlyingly HL nouns that are trisyllabic can sometimes display the otherwise disallowed phonetic sequence of H-L. The HL group of nouns is rare, and trisyllabic nouns are rare as well. The set of nouns violating the distributional restriction of Table 2 is thus extremely small.

Table 1 gives two environments for High Tone Raising in Mpyemo: In order to provoke HTR, the low may either be associated or floating if it is in the middle of an utterance, but crucially, utterance-final low tones must be associated in order to cause raising. This difference will be exploited to account for the surface realizations of both nouns and verbs.

One of the most interesting and difficult aspects of this research has been to account for the difference between the HL, H(L), and H nouns. Example (7) shows the HL melody, along with the H(L) and H melodies. Since the HL nouns end with an associated low tone, the HTR rule raises the high tone to the super-high level.

(7)	HL	H(L)	H
	*CV	CV	CV
	[[~]]	[[~]]	[[~]]
	CVCV	CVCV	CVCV
	[[~]]	[[~]]	[[~]]
	CVCVCV	CVCVCV	CVCVCV

Example (8) compares autosegmental derivations for two-syllable HL, H(L) and H nouns. The two-syllable HL noun is affected by UAC, HTS, HTR and FFC. Its singly-associated high spreads rightwards, and its final associated low causes HTR as well as FFC.

is there labeled “expected output.” Instead, the “actual output” is produced, where the prefix tone rises only to the high level. I do not currently have an explanation for this.

1.5 Alternative analysis

The obvious alternative to the present analysis would be to propose a system with three underlying tones: high, mid, and low. Such an analysis is possible, but entails the following difficulties:

- 1) The phonetic sequence of mid level to low level is almost non-existent in my data. This defective distribution is accounted for with a two-tone analysis and the rules given above. It is possible to predict the occurrence of super-high based on the two other phonetic tones. If it is possible to predict some aspect of the phonology, one should do so.
- 2) Assuming two tones per melody for nouns, a three-tone analysis would generate nine different tonal groups of nouns. The four groups (plus one marginal group) that we do find are more consistent with a two-tone system.
- 3) Assuming one tone per melody for verb roots, a three-tone analysis would generate three different tonal groups for verb roots. Although we do find three tonal groups for verb stems (i.e. taking the tone of the final vowel into account), one of these groups is much less productive. Its proposed underlying form and surface melody closely parallel that of the marginal group of nouns just mentioned.
- 4) The vast majority of Bantu languages are two-toned. (Kisseberth and Odden 2003:59).

- 5) Closely related languages are analyzed as having two-tone systems. Examples: Koozime (Bantu A.84 – Beavon 1982); Makaa (Bantu A.83 – Heath and Heath 1982, Heath 2003); Kako (Bantu A.93 – Snider 1994).

In light of these facts, I maintain that the two-tone analysis is the better alternative.

1.6 Pitch measurements

In order to verify and quantify the difference between the three phonetic levels of tone, I compared them acoustically. The data for the study were 21 two- and three-syllable nouns spoken in isolation by a 40 year-old male. The first syllable of these tokens was the one under investigation. A list of the words used for this phonetic study is found in Appendix A. There were seven tokens with the first syllable at the low phonetic level, seven with the first syllable at the high level, and seven with the first syllable at the super-high level. These, like all the data in this study, were recorded directly to the hard drive of a computer using a simple headset microphone. They were digitized at 22050 Hz, 16 bit stereo.

I visually inspected a wide band spectrogram of each token to verify that there was a steady-state period of the tone. I then visually identified the midpoint of the steady state. The measurement was taken at the midpoint using Praat version 4.4.16, employing its default parameters. The mean values of F0 are shown in Table 3.

Table 3: Mean frequencies and standard deviations of F0 (in Hz).

Tone	Mean Frequency	N	Standard Deviation
L	137.0	7	8.4
H	147.6	7	3.9
sH	167.5	7	7.6

Comparisons of the means for the three phonetic levels (low, high, and super-high) using ANOVA provided evidence of a highly significant difference between the three phonetic tones [F(2,18)=35.345; p<0.001]. Interestingly, the difference in means between the low and high groups is approximately 10 Hz, while the difference between the means of the high and super-high groups is approximately 20 Hz. This would seem to argue against a possible reanalysis of super-high and high as, respectively, high and downstepped high, because a downstepped high would more likely be closer to high than to low.

The results of T-tests (two-sample, assuming equal variance⁵) are shown in Table 4. In concluding whether the results of these t-tests are statistically reliable, I assumed the normal α level of .05 for significance.

Table 4: T-test results.

Comparison	t	df	P
H vs. L	3.035	12	.0052
H vs. sH	-6.17	12	.0000
L vs. sH	-7.14	12	.0000

However, since I ran three related tests, I applied the Bonferroni procedure and divided .05 by three. Thus my cutoff level for significance in this context is .0167. Given this, all three contrasts in Table 4 are significant.

1.7 Segmental phonology

The remainder of this chapter gives a preliminary overview of Mpyemo segmental phonology, morphology, and phrase structure.⁶

⁵ In all three cases, the tabulated F value was greater than the variance ratio. The assumption of equal variance is therefore valid.

⁶ In many cases the example morphemes are not the main area of focus for this thesis. As a result, tonal

1.7.1 Phoneme inventory

The consonant inventory of Mpyemo, shown in Table 5, includes 20 phonemes. The principal places of articulation are labial, alveolar, and velar. Where a given phoneme has more than one allophone, the allophones are shown in square brackets underneath the phoneme.

Table 5: Mpyemo consonant phonemes.

		Labial	Alveolar	Palatal	Velar	Laryngeal
Plosive	–Voice	p	t		k [k c]	
	+Voice	b [b ɓ β]	d [d ɗ r]		g [g ɣ ʝ]	
Prenasalized Stop ⁷	–Voice	^m p	ⁿ t		^ŋ k [ŋk ɲc]	
	+Voice	^m b	ⁿ d		^ŋ g [ŋg ɲʝ]	
Nasal		m	n		ŋ	
Fricative			s [s ʃ]			h
Lateral			l			
Glide				j	w [w ɥ]	

Because the processes that govern these allophonic variations are not straightforward (they are dependent on the syllable structure of the roots), these processes are discussed in §1.7.2. The phonemes /h/ and /ŋ/ are marginal: /h/ is almost unattested except for its frequent occurrence in a subject agreement prefix (first person plural exclusive); and /ŋ/ appears only word medially, or in

information is not always available for them. Because of this, phonetic tone is not transcribed in the remainder of this chapter. Underlying tone will be indicated where it is known.

⁷ The status of nasal+stop combinations is open to debate. For the purposes of this thesis they are considered single-unit phonemes. Although this complicates the phoneme inventory, it simplifies the syllable structure. For an alternative analysis, see Tronnier and Thornell (1999) in which nasal+stop combinations are analyzed as sequences. This remains a subject for ongoing investigation.

combination with a homorganic stop. In its word-medial occurrences, /ŋ/ surfaces as nasalization of an adjacent vowel, as explained below.

Mpyemo employs a seven-vowel system as shown in Table 6.

Table 6: Mpyemo vowel phonemes.

		-Back	+Back
		-Round	
+ATR	+High	i	u
	-Low	e	o
-ATR	-High	ɛ	ɔ
	+Low		ɑ

Vowels in Mpyemo have contrastive length, as seen in (10).

- (10) /sɑ, H(L)/ → [sɑ] 'do'
 /sɑ:, L/ → [sɑ:] 'cross' (e.g. a river)
 /bogɔ, H(L)/ → [bogɔ] 'dance' (noun)
 /bɛgɔ:, L/ → [bɛgɔ:] 'shoulder'

Mpyemo also has nasalized vowels, with two different sources for the nasalization. First, all vowels are allophonically nasalized after a nasal consonant. This can be seen most clearly in examples such as (11), where Mpyemo morphology allows the alternation of oral and nasal consonant prefixes. The vowel of the demonstrative is nasalized when following the class 6 agreement /m-/, but not after the class 7 agreement /j-/. Since this nasalization is regular and predictable, it is hereafter not marked in the present work.

- (11) [ɲɔ: j- ɑ] [mẽ- diβɔ m- ɑ̃]
 house C7- DEM C6- water C6-DEM
 'that house' 'that water'

There are also cases of vowel nasalization where no nasal consonant is present in surface forms. The source of this nasalization, in the Mpiakombo dialect, is an underlying velar nasal that

follows the vowel, deleting in intervocalic and word-final position. Nasalization of the vowel is its only surface manifestation. Nasalization seems to be arising as a contrastive feature of vowels. Evidence for this comes from a comparison of dialects. These data are gleaned from occasional contact with Kwabili speakers in the Mpiakombo area. The Kwabili pronunciations are common knowledge among Mpiakombo speakers. In the Kwabili dialect, the cognates of some of these words retain the velar nasal on the surface, and may even have a following vowel. See Table 7 for examples. Where nasalization is transcribed in this thesis, it is due to this process.

Table 7: Comparison of nasals in the Mpiakombo and Kwabili dialects.

Mpiakombo dialect	Kwabili dialect	Gloss
[ɑ-cĩli]	[ɑ-cĩŋili]	meat drying rack
[cẽõ], L	[cɛŋĩ]	knife
[ntā:], H	[ntāŋā]	taro
[tā]	[tāŋ]	shelf
[pē], H	[pēŋ]	injury
[mɛ-ʝẽõ], H(L)	[mɛ-ʝɛŋĩ]	price

The seven vowels in Mpyemo display several patterns in their co-occurrences. Table 8 below shows the vowel co-occurrences on 377 two-syllable noun roots, where V_1 is separated from V_2 by one or more intervening consonants. The numbers in the cells indicate the number of tokens with the combination of vowels represented by that particular cell. Cells with unattested vowel combinations are heavily shaded, whereas cells with only one or two occurrences of the relevant vowel combination are lightly shaded. The pattern that emerges – not as a strict rule, but as a tendency – is that words with /i/, /ɔ/, and to a lesser extent /ɑ/, as the second vowel are favored, and words with the same vowel in both syllables are also somewhat preferred.

Table 8: Vowel co-occurrence combinations.

		Second Syllable						Total	
		i	e	ɛ	a	ɔ	o		u
First Syllable	i	15			3	16	2		36
	e	12	5		3	18		1	39
	ɛ	14		4	1	8			27
	a	34	1	1	20	33	2		91
	ɔ	25		1	9	27			62
	o	23			6	17	11		57
	u	29			5	27	1	3	65
Total		152	6	6	47	146	16	4	377

Table 9 repeats the information from Table 8, organizing it in a way that brings out the particular restrictions of each vowel more clearly.

Table 9: Total first- and second-syllable vowel occurrences.

	V ₁	V ₂	Comment
a	91	47	Fairly unrestricted, but preference for first syllable.
i	36	152	Fairly unrestricted, but preference for second syllable.
ɔ	62	146	
o	57	16	Prefer to be in first syllable, or to follow a vowel of the same quality.
u	65	4	
ɛ	27	6	
e	39	6	

Although the vowels of Mpyemo show co-occurrence restrictions, it is difficult to analyze this distribution as a typical vowel harmony system. Nevertheless, some generalizations can be made, which are shown in the table above. Given the preference of /i/, /ɔ/, and /a/ for the second syllable, the hypothesis that these are (or arose from) suffixes should be investigated.

1.7.2 Syllable and root structure

It has already been claimed (in §1.7.1) that the syllable structure of roots has an effect on certain allophonic processes. Syllable and root structure are therefore the subjects of this section.

Mpyemo syllable structure is dominated by the CV type syllable. The only allowable complex onset in Mpyemo is CG (where G=glide). Although C + /w/ combinations are fairly unambiguous examples of complex onsets, C + /j/ combinations are more problematic. While Thornell (personal communication) considers the palatal stops [c] and [j] to be phonemic, another possible analysis is that some or all instances of [c] and [j] are in fact underlyingly /kj/ (or /ki/) and /gj/ (or /gi/) sequences. The evidence is split, and neither analysis is without problems. However, since these types of onsets have no bearing on tonal behavior, a detailed discussion of this subject would be beyond the scope of this thesis. The sequence analysis is adopted here.

The only allowable syllable codas in Mpyemo are the three nasal consonants (/m, n, ŋ/). These codas are rare and only occur word-finally.⁸ In the speech variety under investigation here, /m, n/ in word-final position are pronounced, but /ŋ/ is realized as nasalization of the vowel that precedes it (see example (11) and the discussion of nasal vowels in §1.7.1). The genesis of word-final closed syllables is the deletion of a word-final vowel that follows a nasal. For some words the vowel is normally deleted, and is probably no longer present underlyingly; for others the deletion is a fast speech phenomenon. Example (12) shows a few instances of word-final nasals and the conditions under which they occur.⁹ Closed syllables have so far not been found to provoke any perturbations in tonal melody.

⁸ Tronnier and Thornell (1999) consider prenasalised stops as sequences of two phonemes, and claim that such nasals should be syllabified as codas in word-medial position.

⁹ Since the present research does not include possessives, I do not have tonal information for them. Yet they are the most frequent examples of word-final closed syllables. The tonal status of /morom/ is also unclear. It is a residue form, i.e. one that does not fit into one of the five main tonal groups for nouns. The paucity of good examples for word-final closed syllables shows their relative infrequency.

(12)	[m- <i>orom</i>]	C1.man	Normal speech
	[j- <i>en</i>]	C7.your_PL	Fast speech
	[j- <i>eni</i>]	C7.your_PL	Normal or careful speech
	[j- <i>am</i>]	C7.my	Normal or fast speech
	[j- <i>ami</i>]	C7.my	Careful speech
	[péŋ]	wound	Kwabili dialect
	[pé:]	wound	Mpiakombo dialect

The data indicate that, for these morphemes at least, /ŋ/ is the consonant following which a word-final vowel is most likely to be deleted. In fact, the /ŋ/ itself seems to be in the process of disappearing in the Mpiakombo dialect. On the other hand, /n/ is the consonant following which the vowel is most likely to be preserved. It appears to be preserved in all but fast speech.

Noun roots are typically composed of two syllables, although monosyllabic roots are not uncommon. Trisyllabic forms also exist, but for the purposes of this section (following Keith Snider (personal communication)), they are assumed to be polymorphemic, even though in most cases the individual morphemes and derivational history are not evident. Bisyllabic noun roots are constructed according to the following template:

(13) C(G)V(C)(G)V(N)

Glides can function as the second member of an onset, as the template indicates, or they can fill the required C position when no other consonant is present. Examples of noun roots with various CV combinations are shown in (14).¹⁰

¹⁰ All of the nouns in this example are members of noun classes 1a and 7, which have no prefix. There is also a small set of nouns that have vowel-initial roots and a consonant as noun class prefix. As the Mpyemo language evolves, Mpyemo speakers are increasingly treating nouns of this type as consonant-initial—i.e. the class prefix is being reanalyzed as a root consonant. See Thornell (1999) for a discussion of this phenomenon. The Mpyemo noun class system is briefly described in §1.8.

(14)	CV	/lo , L/	→	[lo]	‘head’
	CV:	/ba:, L/	→	[ba:]	‘fish’
	CVV	/sæ, H(L)/	→	[sæ]	‘termite’
	CVCV	/ ⁿ timi, H/	→	[ntimi]	‘blind person’
	CVCV	/bede, L/	→	[bere]	‘chest’
	CGVCV	/kwali, LH/	→	[kwali]	‘partridge’
	CGVCV	/ ⁿ gwo ^m bi, LH/	→	[ŋgwombi]	‘old person’
	CGVCV	/mjamɔ, H/	→	[mjamɔ]	‘hornbill’
	CVCV	/bo ⁿ gi, H/	→	[bɔŋji]	‘mud’

Verb roots are formed according to the template shown in (15).¹¹ To the root is added a final vowel, making the verb stem very similar in structure to the noun root.

(15) C(G)V(C)(G)

Here are some examples of different CV patterns in verbs. See the appendices for a more complete listing.

(16)	CV	/bi, L/	→	[bi]	‘hold’
	CV	/gi, L/	→	[ji]	‘cry’
	CV-V	/bo-ɔ, L/	→	[boɔ]	‘squeak’
	CV-V	/ ⁿ ka-ε, H/	→	[ŋkaε]	‘carry’
	CVC-V	/lug-ɔ, H/	→	[luɣɔ]	‘lack’
	CVC-V	/sul-i, L/	→	[ʃuli]	‘lower’
	CVC-V	/ ⁿ kim-ɔ, H/	→	[ŋcim-ɔ]	‘groan’
	CGVC-V	/ ⁿ kwa ⁿ g-a, L/	→	[ŋkwangga]	‘shiver’
	CVCG-V	/pe ⁿ gja, L/	→	[peŋja]	‘change’

The remainder of this section will describe phonological processes and distributional restrictions active in roots. Although nouns are used as examples, these processes and restrictions apply equally to verb stems.

¹¹ In addition to the template shown, there are also verbs with the structure CV. These should probably be analyzed as a CV root with no final vowel, rather than a C root plus a final vowel. Final vowels can sometimes carry valence information. Pairs like /bja/ ‘give birth’ - /bjali/ ‘be born’ show that valence is not changed by substituting a different vowel for the /-a/ of /bja/; rather, it is changed by the addition of (probably epenthetic) /-l/ and the final vowel /-i/. The final vowel and its effect on valence are discussed again in §1.8, example (24).

In the Mpyemo language, the distribution of consonants varies according to position in the root. The full range of phonemic contrasts is found in the root-initial consonant (C_1) position, but only voiced consonants may occur in the second root consonant (C_2) position. The lone exception to this generalization is /s/, and its voiced counterpart /z/ does not occur in Mpyemo. So the voicing contrast is effectively absent in the C_2 position. For the sake of simplicity, voiced allophones of voiceless phonemes are not listed in the phoneme chart (Table 5), but due to this lack of voicing contrast there is in fact no simple way to know if a given C_2 , with a voiced surface form, is underlyingly voiced or voiceless.

In addition to limiting the allowable consonants, root position also determines the allophonic processes to which consonants are subject. A spirantization process applies to non-prenasalized stops in the C_2 root position. Such stops are realized as continuants. Thus /b, d, g/ become, respectively, [β, ɾ, ɣ].

While the intervocalic environment triggers this change, the root-initial consonant is in a protected position (cf. Beckman 1998: 52ff) and is thus immune to spirantization. This is demonstrated most clearly when a noun has a noun class prefix. Example (17) shows a noun with and without a class prefix. When the prefix is present the first root consonant /b/ is not spirantized, in spite of its intervocalic position. In contrast, when this consonant is in the C_2 position, spirantization takes place.

(17)	/bunɔ, L/	→	[bunɔ]	‘machete’
	/bi-bunɔ, L/	→	[bi-bunɔ]	‘machetes’
	/ŋkubu, LH/	→	[ŋkuβu]	‘hippopotamus’

Certain consonants in the C_1 root position undergo changes triggered by the vowel that follows. Thus /b, d/ are realized as the implosives [ɓ, ɗ] when followed by a [–high] vowel.

Mutaka (2000:47) reports the same process for Duala and other “Sawabantu” languages on the coast of Cameroon.

- | | | | | |
|------|--------------|---|---------|----------------|
| (18) | /dɔmbɔ, HL/ | → | [dɔmbɔ] | ‘toad’ |
| | /bogɔ, H(L)/ | → | [bɔɣɔ] | ‘dance’ (noun) |
| | /digi, LH/ | → | [diɣi] | ‘forest’ |
| | /bunɔ, L/ | → | [bunɔ] | ‘machete’ |

Similarly, /w/ is realized as [ɥ] when followed by a [–back] vowel.

- | | | | | |
|------|------------|---|--------|------------|
| (19) | /wiɔ, H/ | → | [ɥiɔ] | ‘sunshine’ |
| | /wε, H(L)/ | → | [ɥε] | ‘gecko’ |
| | /wani, L/ | → | [wani] | ‘chief’ |

The final allophonic process to be presented concerns /s/, which is realized as [ʃ] when followed by a [+ round] vowel. This process only occurs in the C₁ position.

- | | | | | |
|------|---------------|---|---------|----------|
| (20) | /sumbi, H(L)/ | → | [ʃumbi] | ‘cane’ |
| | /sɔ, H/ | → | [ʃɔ] | ‘friend’ |
| | /sisɔ, LH/ | → | [sisɔ] | ‘vein’ |
| | /seβε, L/ | → | [seβε] | ‘bait’ |

The Mpyemo language thus has several different allophonic processes that are dependent on the segmental environment, as well as on the position within the root.

1.8 Morphology

This section briefly presents a few key elements of Mpyemo morphology. Mpyemo is an agglutinative language; in many cases its morphemes are readily separable and identifiable. Word formation in Mpyemo involves both prefixes and suffixes. For example, as is typical of Bantu languages, Mpyemo employs a system of nominal classification. Mpyemo nouns take the noun class prefixes shown in Table 10. This assignment of numbers to the classes¹² follows closely that

¹² For the purposes of this thesis, the description of the noun class system has been somewhat simplified. Several of the classes should be split into animate/inanimate divisions in order to accommodate

of Thornell (1999). The classes whose numbers are enclosed in parentheses are marginal, i.e. they contain few members. The most productive noun classes in Mpyemo correspond to the proto-Bantu classes 1a, 2a, 5, 6, 6a, 7, and 8.

Table 10: Noun class prefixes.

Class	Number	Prefix
(1)	singular	m-
1a	singular	Ø
(2)	plural	b-
2a	plural	be-
5	singular	a-,d-
6	plural	mε-, m-
6a	mass	
7	singular	Ø
8	plural	bi-
(9)	singular	N-
(10)	plural	N-

Classes 5, 6 and 6a use the CV- or V- prefix for consonant-initial roots, and the C- prefix for vowel-initial roots. Example (21) shows a singular noun with the class five prefix.

- (21) /a- lula, HL/
 C5- needle
 'needle'

Possessive and demonstrative pronouns have prefixes that agree with the noun class of the nouns they modify. Thus the first person singular possessive pronoun /-am/ in (22) must bear the prefix that corresponds to a class eight noun. In this example the prefix on the possessive pronoun happens to be the same as the nominal prefix, but this is not always the case.

differences in their concordial morphemes.

(22) bi- kuli bi- am
 C8- cable C8- 1S.POSS
 ‘my cables’

As the Mpyemo language changes, the noun class agreement system is becoming progressively simpler and is increasingly dependent on the semantic criteria of animacy and number. This phenomenon is documented by Thornell (1999).

Verbs can take prefixes¹³ for subject agreement, negation, tense, mood and aspect. The final three of these are grouped in this thesis under the cover term “verbal auxiliaries,” which also includes morphemes that are highly adverbial in meaning. Example (23) shows a verb with a subject agreement prefix and two verbal auxiliaries.

(23) me- mi- ba- ke pembro
 SuAgr Aux Aux V N
 1S INCP DUB go field
 ‘I’m going to the field.’ (nuance: doubt, indifference)

Verbs also take causative and reflexive suffixes (often referred to in Bantu literature as “verbal extensions”), as well as suffixal final vowels. Verbal suffixes often have an effect on valence, though not in predictable ways. The pairs of verbs in (24) show that a given final vowel can in one case form a transitive verb, and in another an intransitive verb.

¹³ The question of whether these preverbal elements are best analyzed as prefixes, separate words, or clitics is not yet resolved. My research so far into this question has yielded mixed results. For the purposes of the present work they will be considered prefixes.

- (24) [wɑl -ɔ] [wɑl -i]
wake -INTR wake -TR
‘wake’ ‘wake’ (someone)
- [liɣ -ɔ] [liɣ -i]
leave -TR wake -INTR
‘leave’ ‘be left’

The verbal prefixes and suffixes in Mpyemo are assigned according to template (25). The minimal utterance for verbs is the imperative, where root and final vowel are the only required constituents.

(25)

Inflection				Stem				
Subject agreement	Negation Perfect	Bd1	Auxiliary (up to three attested)	Bd2	Root	Extension	Final Vowel	Bd3

Subject agreement prefixes agree in number and animacy with the subject of the clause. They are the focus of Chapter 5, where a discussion of the perfect is also included. Bd1, Bd2 and Bd3 are slots for boundary tones. These are tones (both high and low) that occur at morpheme boundaries in the inflected verb and form a part of the language’s means of expressing tense, aspect, and mood. Throughout this work, especially from Chapter 3 onwards, they are invoked to account for the tonal variations that occur in the Mpyemo language.

The term “auxiliary” is used to designate the class of morphemes that immediately precede the verb root and that modify the verb in various ways. In some cases they are easily glossed using tense/aspect terminology, while in other cases they are more adverbial in meaning. Chapter 4 includes an analysis and discussion of thirteen different verbal auxiliaries. Causative or reflexive suffixes occur in the slot labeled “extension.”

This thesis deals with only a subset of the possibilities that template (25) affords. Example (26) shows the reduced verbal template covered by the present work.

(26)

Inflection				Stem			
Subject agreement	Perfect	Bd1	Auxiliary	Bd2	Root	Final Vowel	Bd3

This template forms an important part of this thesis and will, for convenience, be repeated at appropriate points in the discussion.

1.9 Phrase structure

Basic word order of a language, especially with respect to verb and object, correlates with the order of its other constituents (cf. Comrie 1989:86ff). The normal clause constituent order for Mpyemo is subject-verb-object, as in (27).

- (27) 6ε- jε 6εmbi koŋgo
 3P give Bembi room
 ‘They gave Bembi a room.’

The more a language is typologically consistent, the more the orders of its various constituents will correlate with its basic word order. So languages that are head-initial in the verb phrase (i.e. VO languages) tend to be head-initial in other constituents as well. In this respect, Mpyemo is almost fully consistent. The constituents in Mpyemo that are consistent with a VO word order are listed in (28).

(28)

Head	Modifier
Verb	Object
Noun	Numeral
Noun	Possessive
Noun	Demonstrative Determiner
Adposition ¹⁴	Noun Phrase
Comparative	Standard Marker
Noun	Genitive
Noun	Relative Clause
Verb	Adpositional Phrase
Verb	Manner Adverb

¹⁴ I am following Comrie (1989:98) in considering the adposition to be the head of its phrase.

Exceptions to the head-initial constituent order, shown in (29), are the Mpyemo language's preference for articles, quantifiers, and adjectives preceding the noun, and negative particles preceding the verb. According to Dryer (1992), however, the latter two of these are "noncorrelation pairs," which are not predicted to correlate with verb-object order.

(29)

Modifier	Head
Article	Noun
Quantifier	Noun
Adjective	Noun
Negative	Verb

Following are selected examples demonstrating the Mpyemo language's preference for head-initial constructions, as well as some of the exceptions to that preference. Example (30) shows a noun with a preceding adjective and a following possessive pronoun.

(30) mε- nε wola: bunɔ j- am
 1S CONJ sharp machete C7- 1S.POSS
 'I have my sharp machete.'

In (31) the noun has a preceding article and a following possessive and numeral.

(31) βε- nε nu le j- ā wɔɔ
 3P CONJ INDF tree C7- 3P.POSS one
 'They have their one certain tree...'

The Mpyemo relative clause has normal (i.e. SVO) constituent order. The following example shows the relative clause (in square brackets) following the noun.

(32) mε- liɔ [βεmbi jε- sa γɔ]
 C6- clear Bembi 3S- do SBD
 '...the (action of) clearing that Bembi did ...'

Mpyemo adpositions precede the noun phrase, as seen in (33).

- (33) ɔ- kɛ to diyi
 2s- go in forest
 ‘You go into the forest.’

The order for comparatives is comparative adjective-standard marker.

- (34) ɔ- taβɔ mpyɛmɔ kwā mɛ
 2s- speak Mpyemo pass 1s
 ‘You speak Mpyemo more than I do.’

Following are some examples of how subordinate clauses relate to the matrix clause.

Conditional clauses usually precede their accompanying result clause.

- (35) [ti ʙɛ nɛ a- jaɛ ɣɔ] mɛ- na- ʙa ɲɛ
 if be CONJ 3s- answer SBD 1s- FUT- marry 3s.OBJ
 ‘If (it be that) she answers, I will marry her.’

Purpose clauses usually follow the main clause.

- (36) ʙena- kɛlɔ kambɔ [tɛla nɛ hɛ- ɲkwa- kumɔ]
 1P.INCL- run speed for CONJ 1P.EXCL- quickly- arrive
 ‘Let’s run, so that we’ll arrive quickly.’

Polar interrogative questions end with the particle /e/. This particle may be absent. When absent, the utterance ends with rising intonation.

- (37) ʙɔ- bi para e
 3P- grab money Inter
 ‘Did they get money?’

Information questions have an interrogative word in the normal syntactic place of the questioned constituent. They may, in addition, end with /e/.

- (38) ɔ- ji jɛ
 2s- cry what
 ‘What are you crying about?’

Oblique phrases (in square brackets) precede the subject, as shown in (39), or follow the predicate, as in (40).

- (39) [ji a- lũ γɔ] i- jɔ ndɔ jɛimɔ ʃwɛ
 INDF C5-day SBD 1S.INAN- arrive then time planting
 ‘[A certain day], the time for planting arrived.’
- (40) hɛ- kwã [kolɔ kɛ bɛɛ bi- lambɔ]
 1P.EXCL- pass on go see C8-trap
 ‘We left [to go see the traps].’

This brief introduction to Mpyemo phonology, morphology, and phrase structure will provide some background to aid the reader in understanding the remainder of the thesis.

CHAPTER 2

NOMINAL TONE

Before looking at verbal tone, which is the main subject of interest in this thesis, it will be necessary to briefly describe nominal tone. The tone of Mpyemo nouns is in some respects similar to that of verbs, so showing this similarity strengthens the overall analysis. And since nouns are also of interest in Chapter 3 (they appear in verbal constructions as objects), a basic knowledge of their tonal behavior is needed in order to understand verbal tone.

2.1 Underlying forms

It was stated in §1.4 that noun roots in Mpyemo carry melodies that consist of one or two tones, regardless of the number of syllables. This naturally leads to four logically possible tone melodies: L, H, LH and HL. Mpyemo also has a fifth melody: H(L). Four of these melodies, L, H, LH and H(L), are quite productive, while HL is only marginally so. This is the group that always surfaces phonetically with a super-high tone.

Mpyemo's inventory of allowable syllable types was described in §1.7.2. It was further stated in §1.8 that Mpyemo employs a system of nominal classification. The examples in Appendix A show that neither syllable types nor noun classes have any effect on the distribution of tonal melodies or on their surface realizations. A given melody can appear on any type of syllable, and on a noun of any noun class, the lone exception to this generalization being that no HL nouns are attested in class 5.

Table 11 shows how the five underlying tone melodies are realized phonetically on nouns with varying numbers of syllables, as well as with and without noun class prefixes, as these nouns are pronounced in isolation.

Table 11: Surface melodies of nouns in isolation.

		Surface Melody					
		Without prefix			With (toneless ¹⁵) prefix		
	Underlying tone	1 Syllable	2 Syllable	3 Syllable	P+1 Syllable	P+2 Syllable	P+3 Syllable
a.	L	[˩] ʃɔ 'soul'	[˩˩] pɔndɔ 'trap'	[˩˩˩] bomara 'fire'	[˩˩] a-bja 'hernia'	[˩˩˩] a-peβɔ 'dove'	[˩˩˩˩] mɛ-ɲɔɛɛ 'cat'
b.	H	[˨] le 'tree'	[˨˨] kandɔ 'cloth'	[˨˨˨] waβala 'spoon'	[˨˨] bi-ka 'leaves'	[˨˨˨] a-kɔyi 'stone'	[˨˨˨˨] bi-βoyiri 'ditches'
c.	H(L)	[˩˨] lo 'head'	[˩˩˨] lemɔ 'heart'	[˩˩˩˨] mijjali 'urine'	[˩˩˨] βɛ-po 'rats'	[˩˩˩˨] a-kali 'word'	[˩˩˩˩˨] bi-mijjali 'urines'
d.	LH	[˨˨] ko 'leg'	[˨˨˨] ɲkando 'crocodile'	unattested	[˨˨˨] bi-pa 'hooves'	[˨˨˨˨] a-ɲɛmɔ 'antelope'	[˨˨˨˨˨] a-βɔŋɔɔ 'cocoon'
e.	HL	unattested	[˩˨˩] lima 'dream'	[˩˩˩˩] ɟiyuru 'smoke'	unattested	[˩˩˩˩˨] βɛ-kemɔ 'monkeys'	[˩˩˩˩˩˨] a-kayɔɔ 'headpad'

For the sake of completeness, three-syllable forms are included, although it has already been stated in § 1.4 and §1.7.2 that these may be morphologically complex. The present work will not include a detailed analysis of three-syllable nouns. The key for reading the pitch contour lines is

¹⁵ High tone docking provides evidence that noun class prefixes are toneless. This is explained in §2.2. If no other tone is available, toneless morphemes receive a default low tone.

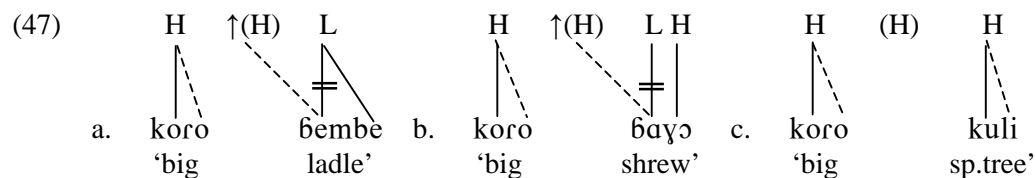
shown in Table 12. The falling tones do not seem, impressionistically, to fall far, but in fact on the pitch traces it can be seen that all three fall to the low level or below. Rising tone is so far only known to occur from low to high. A rise from low or high to super-high is so far unattested.

Table 12: Key to pitch contour lines.

[–] low	[ˉ] high	[ˆ] super-high
[ˋ] low falling	[ˊ] high falling	[ˎ] super-high falling
	[ˌ] low rising	

For the high tone raising rule in Table 1, §1.4, a distinction was made between floating and associated low tones in utterance-final position. There it was stated that utterance-final low tones must be associated in order to cause HTR. The difference between the H(L) and the HL group turns on this distinction. A derivation for the H(L) nouns is given in (41).

The data from (44) are presented again in (47), this time using autosegmental notation. Examples (47a, b) show how high tone docks onto the first syllable of the noun root, displacing the low tone that is there underlyingly. In (47a) the low tone remains associated to the final syllable. In (47b), however, the low has no syllable available to it and therefore remains floating. In both cases this low tone causes the preceding high tone to rise to the super-high level. In contrast, (47c) shows that no raising happens when a high-toned noun follows a high-toned adjective.



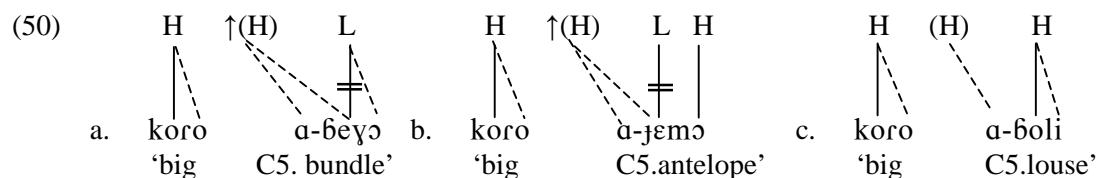
When a noun has a noun class prefix, the high tone following the adjective docks on both the prefix and the first root syllable of the noun. Thus we see underlying forms such as those in (48) surfacing with the pitch contours shown in (49).

- (48) /a-begɔ, L/ 'C5-bundle'
 /a-gyɛmɔ, LH/ 'C5-antelope'
 /a-boli, H/ 'C5-louse'

- (49) [-- - ˉ \] [-- - ˉ -] [-- ---]
- a. koro a-ɓeyɔ 'big C5-bundle' b. koro a-ɟɛmɔ 'big C5-antelope' c. koro a-boli 'big C5-louse'

Again, a high-toned noun, (49c), is shown for comparison. One might conclude from the pitch contours of citation forms given in Table 11, that noun class prefixes are underlyingly low-toned. However, high tone docking provides evidence that they are in fact toneless. The autosegmental representation of these data in example (50) shows this. Notice that the surface pitch of the prefix rises to high, not to super-high. This is a fact not easily accounted for under the present analysis.

When a doubly-associated high tone is raised to super-high, the effect should take place on all the syllables to which it is associated, such as we see in the HL nouns. This is the way the autosegmental representations are configured. But it only rises to super-high on the first syllable of the root. This problem was noted in the discussion of high tone docking in §1.4, example (9).



In (50c), there is no evidence of a low tone on the prefix, because there is no super-high tone like we find in (50a,b), where a low tone is present in the isolation forms. If the class prefix were low-toned, we should see a super-high in (50c) as well. The high tone might be expected to dock onto the prefix, delinking its hypothetical low tone and providing an environment for triggering the high tone raising rule, resulting in a super-high tone on the prefix. Instead, the prefix only surfaces with a high tone, not a super-high. This provides evidence that noun class prefixes are toneless.¹⁶

High tone docking in nouns is presented in order to lay the groundwork for an understanding of verbal tone. Its significance with respect to verbs is shown in §3.4, where HTD is invoked to explain the tonal alternations of nouns as the objects of verbs.

¹⁶ Although true as a generalization, there may be one very marginal noun class whose prefixes bear tone. In the interest of simplicity, and in order to maintain the focus on verbal tone, no nouns from this class appear in the present work.

CHAPTER 3

VERB STEM TONE

Having discussed various preliminary aspects of the Mpyemo language, I now turn to the main subject of interest in this thesis. The aim of the next three chapters is to describe the tonal phenomena in Mpyemo verbs.

In order to limit the scope of this thesis, only verbal forms that employ a single auxiliary will be considered, nor will negation, the causative, or the reflexive be treated. This thesis will thus consider only the possibilities reflected in the reduced template shown in (51), repeated from §1.8, example (26). The full template is given in example (25) of the same section.

(51)

Inflection					Stem		
Subject agreement	Perfect	Bd1	Auxiliary	Bd2	Root	Final Vowel	Bd3

This chapter begins with the verb stem (root + final vowel), describing its citation forms and its interaction with various nouns as direct object. Chapter 4 will move leftward in the verbal template, describing the tone on verbal auxiliaries and the perfect, as well as the boundary tones which play a role in tense/aspect/mood distinctions. Chapter 5 will describe tone on subject agreement markers.

3.1 Underlying tone of verb roots and stems

It has already been stated in §1.4 that Mpyemo verb roots have two underlying melodies, H and L. It was further explained that verb stems consist of a root plus a final vowel, and when the tone of the final vowel is taken into account, verb stems have three underlying melodies: H-(L), L-(L), and H-L. Examples of these are shown in (52):

(52)	/bɔm-ɔ, H-(L)/	/kaŋgj-i, L-(L)/	/len-a, H-L/
	‘buy’	‘sell’	‘pass’

The H-L verbs are rare compared to the H-(L) or L-(L) verbs. Given the rules set forth in Table 1, these underlying forms account for the surface forms of verbs in isolation and in context.

The crucial difference between the H-(L) verbs and the H-L verbs is the fact that the latter have an associated low tone on their final vowel, whereas the former have only a floating low, which cannot provoke raising of the preceding high tone in utterance-final position. In contrast, the associated low of the H-L verbs does cause raising of the verb’s high tone. This point will become clearer when the surface forms of the verbs are discussed in §§3.2 and 3.3.

The underlying verb stem melody L-(L) is tolerated, even though it constitutes a violation of the OCP. This may be because of the morpheme break between the verb root and the final vowel. This floating low is necessary to account for the verbs’ tonal behavior in the imperative form. Refer to §3.2 for an account of imperative verbs.

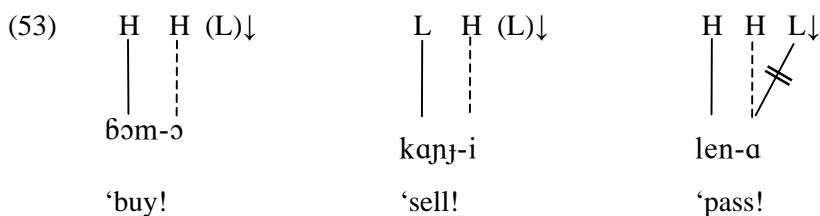
The underlying melodies of verb stems partially parallel those of nouns. As is the case for HL nouns, the H-L group of verbs is only marginally productive, and the crucial distinction between the H-L and H-(L) verbs again lies in whether the final low tone is associated or floating. In contrast to the five melodies for noun roots, however, verb stems only have three underlying tone

melodies. This is because the CVC verb root favors melodies shorter than those of the CVCV noun root.

3.2 Imperative verbs

There are two isolation forms for Mpyemo verbs: they are either in an imperative or nominalized form. Imperatives are discussed in this section, and nominalized verbs follow in §3.3.

The mark of the imperative is a high tone that follows the root and docks on the final vowel. See example (53). This may seem an unusual place for the insertion of a tonal morpheme, but verbal extensions (causative and reflexive suffixes) also occur between the root and final vowel, as the full verbal template in (25) shows. Recall that the verb stem is made up of a bound root with its tonal melody (H or L) and a final vowel with its tonal melody (L or (L)). In the imperative, the tone of the final vowel is still there. For the H-L verbs, the high tone of the imperative delinks the low tone on the final vowel. Thus, in the imperative, H-(L) and H-L verbs end up with the same structural representation, and therefore, the same surface tone. The H-L verb's associated low, which normally provokes raising, becomes a floating low, which only causes a falling contour, symbolized by “↓”, at the end of the utterance.



The examples in (54) show how the phonetic pitch is realized for the three different tonal melodies of verbs. HL and H(L) verbs are pronounced at the same pitch level.

(54)	UR:	/bɔm-ɔ, H-(L)/	/kəŋj-i, L-(L)/	/len-a, H-L/
		[⁻ ˨]	[⁻ ˨]	[⁻ ˨]
	SR:	bɔmɔ 'buy!'	kəŋji 'sell!'	lena 'pass!'

3.3 Nominalized verbs

Verbs are nominalized in the Mpyemo language simply by adding a noun class prefix (usually *a*- class 5) to the verb stem. When nominalized, a verb receives the nominal melody that most closely matches its verbal melody. Thus, nominalized verbs have three melodies, corresponding to the noun melodies H(L), L and HL. This latter melody is restricted in productivity, just as it is for nouns. Nominalization is one of only two known contexts where the underlying difference between H-(L) and H-L verbs becomes apparent in surface forms. (The other context, clauses in which the verb is the final element, is treated in §3.4.) Example (55) shows how the three different melodies are realized phonetically.

(55)	UR:	/a-bɔm-ɔ, H(L)/	/a-kəŋj-i, L(L)/	/a-len-a, HL/
		[⁻ ˨]	[⁻ ˨]	[⁻ ˨]
	SR:	aɔmɔ 'a purchase'	akəŋji 'a sale'	alena 'a passing'

Nominalized verbs behave identically to nouns with the H(L), L, and HL melodies. The HL verbs are pronounced at the super-high pitch level, while the H(L) verbs are pronounced at the high pitch level. All three types of nominalized verbs end with a falling contour when in utterance-final position.

3.4 Verb-object interaction

The tonal behavior of the Mpyemo verb is sensitive to the presence or absence of any phonological material that follows it. In the previous section it was noted that there are so far only two known contexts where H-(L) and H-L verbs differ in their surface realizations. The first context is the nominalized form. Clauses in which the verb is the final element are the second.

When no object or other segmental material¹⁷ is present, the verb is utterance-final. Therefore, in the case of a H(L) verb, the environment required for high tone raising is not present. This is shown in (56a).¹⁸ The floating low tone cannot cause HTR when in utterance-final position. Its only effect is to cause a falling contour. When an object is present, however, the verb is no longer at the end of the utterance, so it does get raised to super-high. Example (56b) shows the H-(L) verb followed by a H object.

- | | | | | |
|------|----|---|----|---|
| (56) | a. | [^ˉ ^ˉ ^ˉ ˨] | b. | [^ˉ ^ˉ ^{ˉˉ} ^{ˉˉ}] |
| | | mɔ- ɔ- ɓɔmɔ | | mɔ- ɔ- ɓɔmɔ mpaŋɔ |
| | | 1S- PRF- buy | | 1S- PRF- buy shelter |
| | | ‘I have bought.’ | | ‘I have bought a shelter.’ |

Though (56b) has a high-toned object, this is not the cause of the super-high tone; the H-(L) verb behaves identically regardless of the tone of the object. Examples (57a, b, c, d) show, respectively, a L object, a LH object, a HL object and a H(L) object. High tone docking and

¹⁷ Because I use transitive vs. intransitive clauses to show this distinction, it could be claimed that transitivity of the clause is the relevant parameter. This is, indeed, a possibility that needs to be explored in the future. But the tonal rules are formulated in a way that crucially distinguishes utterance-finality and nonfinality, thus predicting that any phonological material that follows the verb will have the same tonal effect that an object does. This will therefore be assumed to be the case until further data are available.

¹⁸ The verb /ɓɔmɔ, H/ ‘buy’ can take an object, but does not require one to make a well-formed utterance. The super-high tones on the subject agreement and perfect morphemes are explained in Chapters 4 and 5.

raising are also evident on the objects in (57a, b). HTD and HTR will be discussed at the end of this section.

- | | | | | |
|------|----|---|----|---|
| (57) | a. | [[̄] [̄] [̄] [̄] [̄] \] | b. | [[̄] [̄] [̄] [̄] [̄] [̄]] |
| | | mɔ- ɔ- ɓɔmɔ kuli | | mɔ- ɔ- ɓɔmɔ bumɔ |
| | | 1S- PRF- buy cable | | 1S- PRF- buy fruit |
| | | 'I have bought a cable.' | | 'I have bought a fruit.' |
| | c. | [[̄] [̄] [̄] [̄] [̄] \] | d. | [[̄] [̄] [̄] [̄] [̄] \] |
| | | mɔ- ɔ- ɓɔmɔ gwɔra | | mɔ- ɔ- ɓɔmɔ nkali |
| | | 1S- PRF- buy firewood | | 1S- PRF- buy gun |
| | | 'I have bought firewood.' | | 'I have bought a gun.' |

Examples (56) and (57) show that the H-(L) verb is pronounced at the super-high level when followed by an object, but only at the high level when the verb is utterance-final. On the other hand, since the H-L verb has an associated low tone, it meets the requirements for HTR regardless of whether or not it is utterance-final. So H-L verbs are pronounced at the super-high level in both final and non-final position, as (58) shows. The presence or absence of a falling contour is the only difference between the final vs. non-final pronunciations of H-L verbs.

- | | | |
|------|---|---|
| (58) | [[̄] [̄] [̄] \] | [[̄] [̄] [̄] [̄] [̄] [̄]] |
| | mɔ- ɔ- lena | mɔ ɔ lena mpaŋɔ |
| | 1S- PRF- pass | 1S- PRF- pass shelter |
| | 'I have passed.' | 'I have passed a shelter.' |

Like the H-L verbs, the behavior of L verbs is not affected by what follows, aside from, again, the falling contour caused by a final low tone. This is shown in (59).

- | | | |
|------|---|---|
| (59) | [[̄] [̄] [̄] \] | [[̄] [̄] [̄] [̄] [̄] [̄]] |
| | mɔ- ɔ- kaŋɔ | mɔ ɔ kaŋɔ mpaŋɔ |
| | 1S- PRF- sell | 1S- PRF- sell shelter |
| | 'I have sold.' | 'I have sold a shelter.' |

Verbs with an object have a following high boundary tone in the boundary 3 slot of template (51). A high tone in this position is also attested in future forms for Babole (Bantu C101) (Leitch

CHAPTER 4

VERBAL AUXILIARIES AND THE PERFECT

Mpyemo has a wide variety of verbal auxiliaries, which precede the verb and carry lexical and/or grammatical meaning. Some of these can co-occur with the perfect. Verbal auxiliaries and the perfect, in combination with various boundary tone configurations, express a variety of tense, aspect, and mood distinctions. This chapter describes the tonal behavior of selected verbal auxiliaries, the perfect, and boundary tones, and how these interact. In most cases, the boundary tones and the underlying tones of the verbal auxiliaries are regular. A few auxiliaries require a hypothesis of irregular boundary tone combinations (see §4.3.2), and two are handled under the present analysis only with great difficulty (see §4.3.3).

The Mpyemo verbal template in its reduced form, first given in example (51) at the beginning of Chapter 3, is repeated here for convenience. The positions that are of interest in this chapter are: perfect, boundary tone 1, auxiliary, and boundary tone 2.

(61)

Inflection					Stem		
Subject agreement	Perfect	Bd1	Auxiliary	Bd2	Root	Final Vowel	Bd3

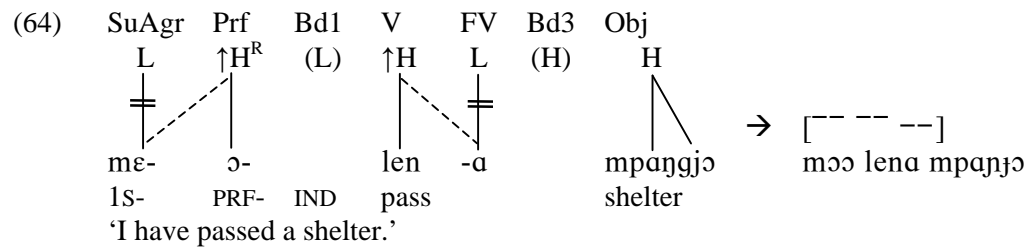
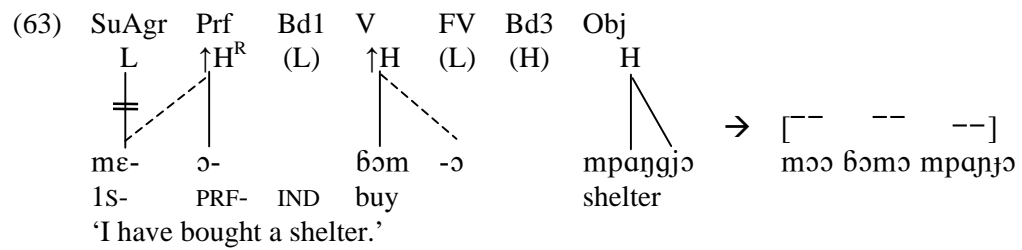
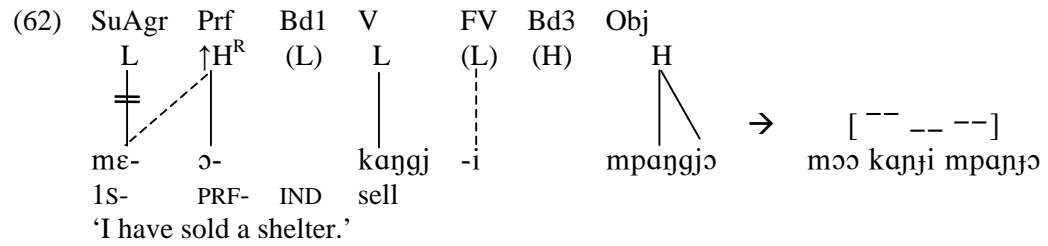
In order to limit complexity, all examples in this section will employ the first person singular subject agreement /mɛ-, L/. Subject agreements are more fully explored in the next chapter.

4.1 The perfect

As a modifier that occurs between the subject agreement and the verb, the perfect might be analyzed as simply another verbal auxiliary. It is nevertheless accorded a separate slot in the verbal template for two reasons. First, it is phonologically more closely linked to the subject agreement prefix. Segmentally, the perfect is expressed by /ɔ-/ immediately following the subject agreement prefix, and this vowel quality replaces the vowel of the subject agreement prefix, while leaving its mora intact (i.e. compensatory lengthening). For example, /mɛ + ɔ/ → [mɔɔ]. It does this for several of the subject agreement markers, and there is a functional reason for its failure to do so in the others. See §5.2 for further discussion of the interaction between the subject agreement prefix and the perfect morpheme.

The second reason the perfect is assumed to warrant its own slot in the verbal template, separate from verbal auxiliaries, has to do with its tonal behavior. Its tone is a “replacive” high (symbolized by “H^R” in this thesis). Rather than simply adding itself to the melody, it completely replaces the underlying tone of the subject agreement prefix. When no verbal auxiliary is present, the perfect is accompanied by a low tone in the boundary 1 slot. This triggers HTR, causing the replacive high tone on the subject agreement to rise to super-high. If the perfect morpheme were a verbal auxiliary, we would expect it to behave like the other auxiliaries. Indicative clauses have a high tone in the boundary 2 slot (cf. §4.3.1). Since there is no evidence of this with the perfect (unless an auxiliary is present), the boundary 2 slot is assumed not to exist in the absence of a verbal auxiliary. In such a case, the boundary 1 slot is immediately adjacent to the verb root.

The following examples show the perfect with the three different tonal classes of verbs and a high-toned object. Replacive high tone is symbolized autosegmentally as a leftward spreading of the high tone.



With this background information on the perfect, we now turn to verbal auxiliaries and how they interact, or fail to interact, with the perfect.

4.2 Verbal auxiliaries

A basic three-way distinction in verbal auxiliaries is defined by their compatibility with the perfect. The first set, which I call the “lexical” auxiliaries, consists of those auxiliaries that require the perfect if they are to appear in an indicative clause. They are listed in Table 13.

Auxiliaries of this set can also occur without the perfect, but only in a subjunctive clause. They are highly lexical in meaning; they carry little or no tense/aspect information. The tense/aspect information needed to form an indicative clause is supplied by the perfect. This explains their need to occur with the perfect to form an indicative clause.

Table 13: Lexical auxiliaries.

Auxiliary	Gloss	Comment
/ba-, L/	dubitative	Weakens the certainty of the clause. Increases respect when used with the imperative.
/kwa-, L/	contrary	The clause is contrary to what is expected or implied.
/le-, L/	already	
/ŋkwa-, H/	quickly	
/sugi-, H/	simply, only	

The second set is composed of those auxiliaries that can freely occur in indicative clauses, with or without the perfect. See Table 14. These carry their own tense/aspect information and thus do not need to be with the perfect. They all have some sort of past meaning, which makes them well-suited to occur with the perfect. Past meaning seems to be a necessary condition for membership in this group, but it is not sufficient in itself, as the next section will show.

Table 14: Tense/aspect group 1.

Auxiliary	Gloss	Comment
/ε-, Ø/	perfective past	Past action viewed as a whole, without regard to internal temporal structure.
/nja-, L/	prior	Relative tense marker denoting an action that occurs prior to some other action.
/bo-, L/	distant past	Uses subjunctive boundary tones.

The distant past auxiliary /bo-, L/ is included in this group for semantic reasons, but because of the boundary tones with which it occurs, its status is uncertain. This is explained further in the discussion on Table 19, in §4.3.2.

The third set of verbal auxiliaries consists of those that cannot co-occur with the perfect to form a grammatical utterance. They carry tense or aspect information but are presumably incompatible with the perfect for semantic reasons.

Table 15: Tense/aspect group 2.

Auxiliary	Gloss	Comment
/luga-, H/	subsequent	Relative tense marker denoting an action that is subsequent to or logically dependent on some other action.
/ti:-, H/	immediate past	
/di-, Ø/	imperfective	Replacive tone on the subject agreement further subdivides this into a progressive/habitual distinction.
/na-, H(L)/	future	Sometimes includes high replacive subject agreement tone.
/mi-, H/	inceptive	Denotes the beginning of a state or action.

The presence of /ti:/ in this group is somewhat perplexing, since other auxiliaries with past meaning are found in the previous group. It may be that /ti:/ has a meaning similar to the perfect, so their co-occurrence would be redundant.

Another way to present this three-way division is shown in Table 16.

Table 16: Three-way division of verbal auxiliaries.

Compatible with the perfect		Incompatible with the perfect	
Perfect required for indicative clause	Perfect not required for indicative clause		
Lexical auxiliaries	Tense/Aspect group 1		Tense/Aspect group 2
/ba-, L/ dubitative	/ε-, Ø/ perfective past	/luga-, H/ subsequent	
/kwa-, L/ contrary	/nja-, L/ prior	/ti:-, H/ immediate past	
/le-, L/ already	/bo-, L/ distant past	/di-, Ø/ imperfective	
/ɲkwa-, H/ quickly		/na-, H(L)/ future	
/sugi-, H/ simply, only		/mi-, H/ inceptive	

The first and second columns show the auxiliaries that are compatible with the perfect, while the second and third columns contain the auxiliaries that need not occur with the perfect in an indicative clause. Auxiliaries in the second column satisfy both of these restrictions. These divisions are important for understanding the boundary tone combinations that occur with the various auxiliaries.

4.3 Boundary tone combinations and replacive subject agreement tones

4.3.1 Regular boundary tone combinations

Boundary tones 1 and 2 carry mood information and interact with tone on verbal auxiliaries. My working assumption is that Bd1 and Bd2 work as a unit, a discontinuous morpheme that surrounds the auxiliary. I therefore refer, not to individual tones occurring in the Bd1 and Bd2 slots, but to boundary tone combinations. For example, the H-L combination means a high tone in the Bd1 slot and a low tone in the Bd2 slot.

Table 17 shows the three main boundary tone combinations and their meanings (i.e. which mood they signify). These three combinations account for the majority of the data. The third, (row c), is a variant of the indicative that lacks the boundary 2 slot. As stated in §4.1, the boundary 2 slot does not exist when no auxiliary is present.

Table 17: Regular boundary tone combinations

	Boundary 1	Boundary 2	Mood
a.	L	H	Indicative (with or without the perfect)
b.	H	L	Subjunctive
c.	L	--	Indicative (with perfect, no auxiliary)

Of the thirteen verbal auxiliaries studied in this thesis, ten of them are attested with the boundary tone combinations shown in rows a and b of Table 17.

The distribution of auxiliaries with respect to the different boundary tone combinations is shown in Table 18. Empty cells indicate unattested boundary tone-auxiliary combinations. The indicative combination (L-H – row a of Table 17) is split into two columns in Table 18 to show the auxiliaries' occurrences with or without the perfect. The H-L combination (subjunctive) is indicated in the third column of Table 18. Row c of Table 17 concerns forms without an auxiliary and is thus not shown in Table 18.

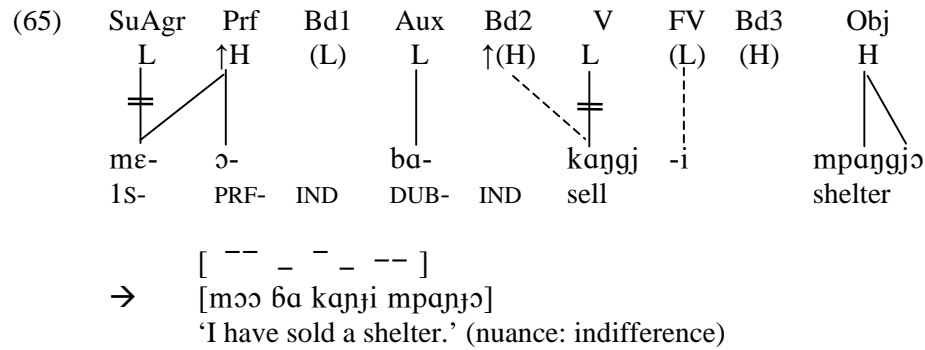
Table 18: Distribution of verbal auxiliaries and boundary tones.

		Indicative with perfect L-H	Indicative without perfect L-H	Subjunctive H-L
/ba-, L/	dubitative	✓		✓
/kwa-, L/	contrary	✓		✓
/le-, L/	already	✓		
/ŋkwa-, H/	quickly	✓		✓
/sugi-, H/	simply, only	✓		✓
/ε-, Ø/	perfective past	✓	✓	
/nja-, L/	prior	✓	✓	✓
/bo, L/	distant past	✓		
/ti:-, H/	immediate past		✓	
/di-, Ø/	imperfective		✓	

All clauses with the perfect employ the L-H boundary tone combination. No exceptions have been found. This means that the replacive high tone of the perfect is always followed by a low tone in the boundary 1 slot, creating an environment for the high tone raising rule to operate. This replacive high on the subject agreement prefix is therefore always realized at the super-high pitch level. When a verbal auxiliary is present, the high tone in the boundary 2 slot spreads to the first syllable of the low-toned verb, so it, too, is raised by HTR.

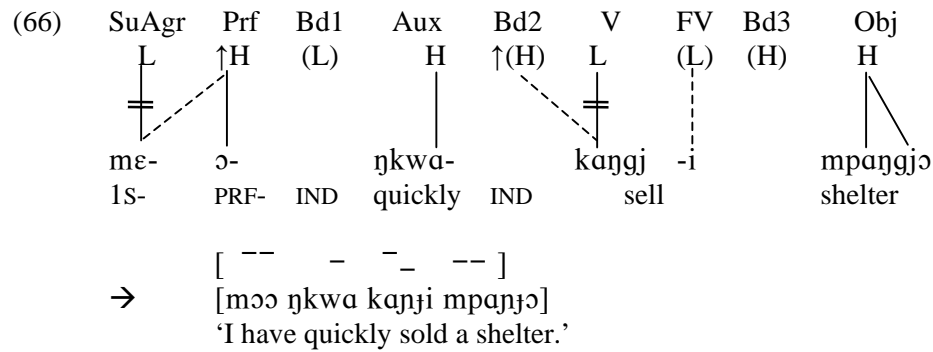
The following examples show the interaction of boundary tones with low- and high-toned verbal auxiliaries, in the presence and the absence of the perfect. The special case of the toneless auxiliaries /ε-/ and /di-/ is covered in §4.3.3. When a high-toned verb is present, tonal contrast in the boundary 2 slot is neutralized, but this contrast is apparent with a low-toned verb. For this reason, all of these examples employ a low-toned verb. For the verbal object, a high noun is used. Its stable melody gives a good benchmark for comparison with the other tones. The tonal aspects of verb-object interaction are covered in §3.4.

Example (65) shows an indicative clause with the perfect and a low auxiliary:

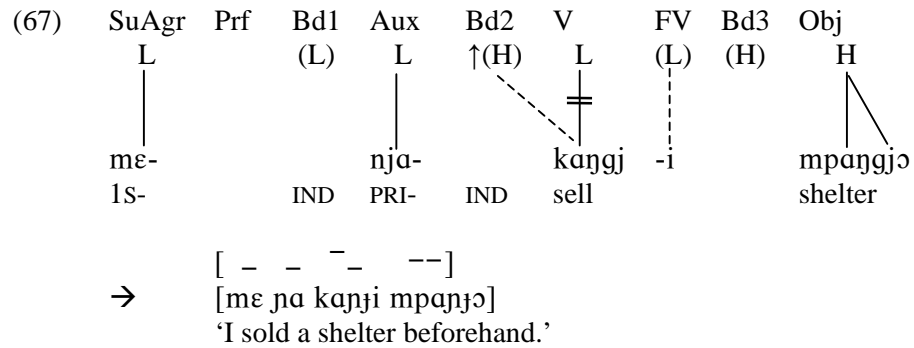


Since the boundary 1 tone is low, it has no effect on the surface pitch of the auxiliary, whether low-toned as above, or high-toned as in the following, example (66). The presence of the low boundary tone in Bd1 is shown in the fact that the subject agreement prefix is pronounced at the super-high level.

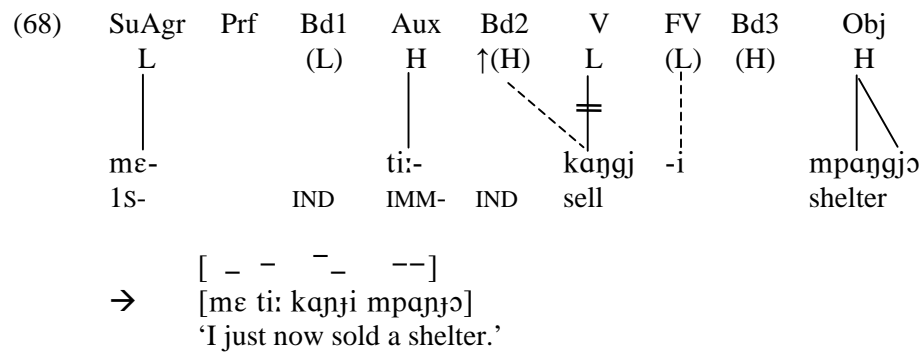
In (66) we see an indicative clause with the perfect and a high auxiliary. The auxiliary surfaces at the high phonetic level, since the following tone, also high, does not provoke HTR.



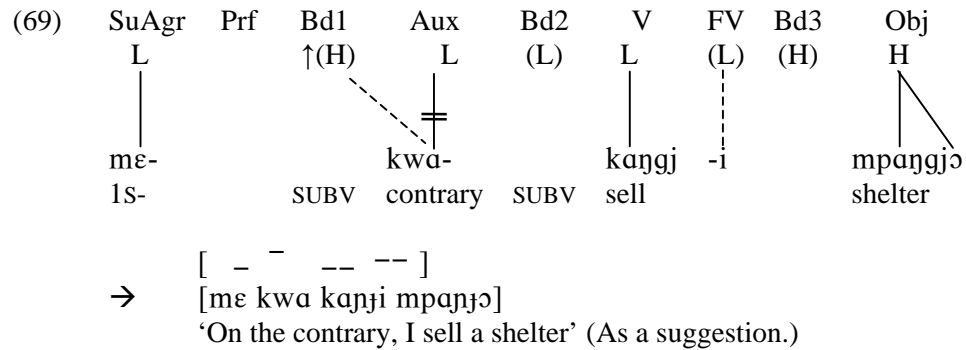
In (67) we see an indicative clause without the perfect, and with a low auxiliary. Here there is no replacive high tone on the subject prefix. The subject prefix and the verbal auxiliary both remain at the low phonetic pitch level.



Next is an indicative clause without the perfect, and with a high auxiliary. As in (66), we see the auxiliary at the high phonetic level rather than at the super-high level, because there is no low following it to trigger HTR.

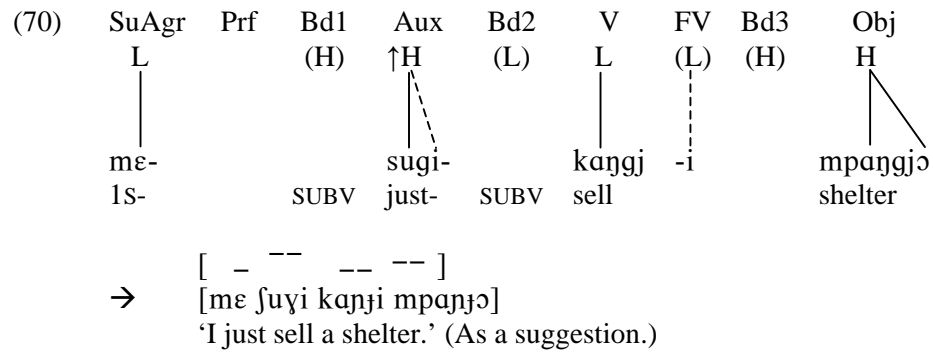


We now turn to the subjunctive mood. The boundary tones are reversed from those employed for the indicative. First to be presented is a subjunctive clause with a low auxiliary. The high boundary tone docks on the auxiliary and rises to super-high by HTR.



When a high auxiliary is employed in a subjunctive clause, as in (70), the low in the boundary

2 slot triggers HTR on the auxiliary:



To summarize, the surface tones of verbal auxiliaries alternate as follows: Both low- and high-toned auxiliaries surface with the same phonetic tone as their underlying tone in an indicative clause; and both are realized at the super-high level in a subjunctive clause.

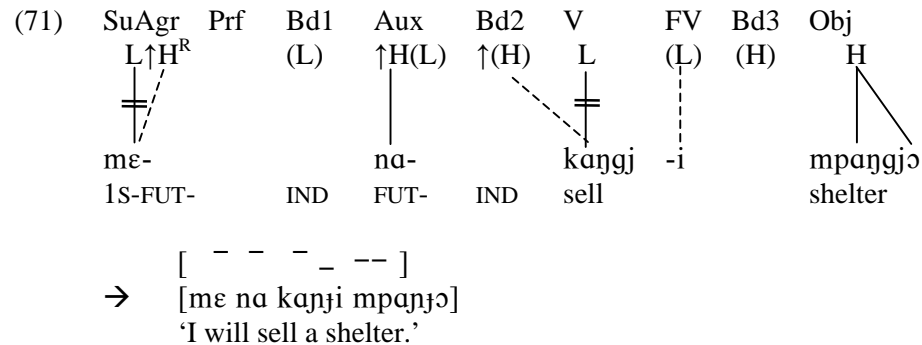
4.3.2 Irregular boundary tones and replacive subject agreement tones

While the boundary tone configurations outlined in §4.3.1 cover most of the data, certain auxiliaries occur with atypical boundary tone configurations. Some grammatical constructions also specify a replacive high tone (shown as “H^R”) on the subject agreement marker, one that is distinct from the replacive high of the perfect (as described in §4.1). These atypical configurations are shown in Table 19.

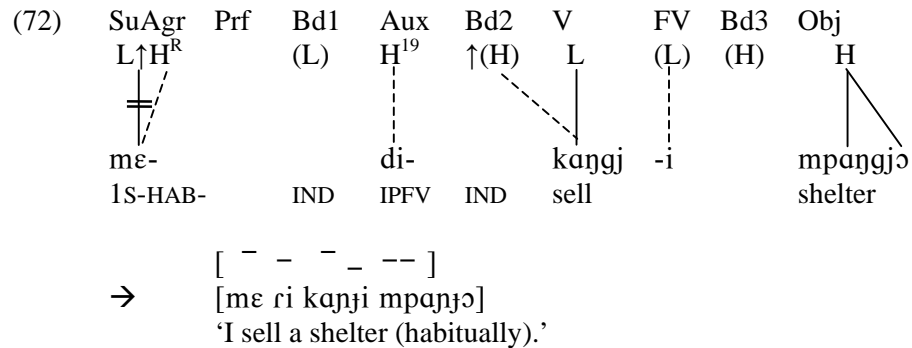
Table 19: Atypical boundary tone configurations.

	Comment	Subject agreement	Boundary 1	Boundary 2
/na-, H(L)/	future	H ^R	L	H
/di-, Ø/	imperfective			
/luga-, H/	subsequent	H ^R	H	H
/sugi-, H/	simply, only			
/mi-, L/	inceptive		H	L
/bo-, L/	distant past			

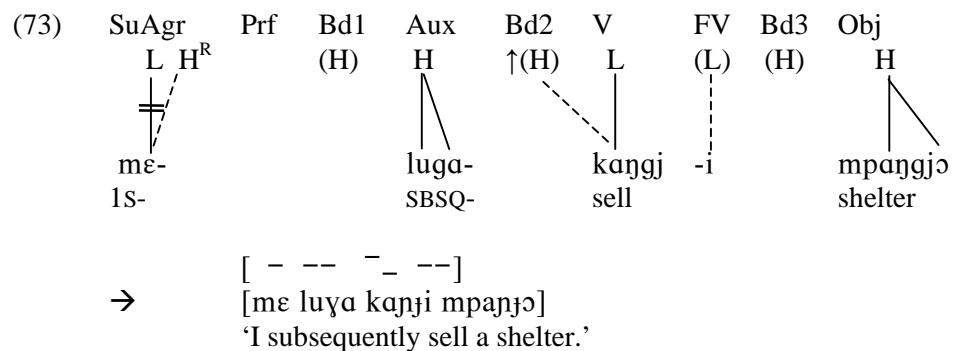
The verbal auxiliary /na-, H(L)/, shown in (71), uses the normal boundary tones for an indicative clause. It is irregular, however, in two respects. First, it specifies a replacive high tone on the subject agreement; and second, its tonal melody is H(L), which means that, due to HTR, it is always realized at the super-high pitch level.



The imperfective /di-, Ø/ likewise uses normal boundary tones for an indicative clause. The imperfective meaning is subdivided into ‘progressive’ and ‘habitual.’ When it is used in the progressive meaning it behaves normally, but the habitual meaning carries with it a replacive high tone on the subject agreement prefix, as shown in (72). The tonal behavior of the auxiliary itself is dealt with in §4.3.3.



The next two examples have a replacive high subject agreement tone as well as a unique boundary tone combination. The combination is unique because, although these are indicative clauses, their boundary tones are both high.²⁰ This is the only context attested so far for /luga-, H/ shown in (73). Since the replacive high subject agreement tone is followed by a high boundary tone, the conditions are not met for the high tone raising rule.

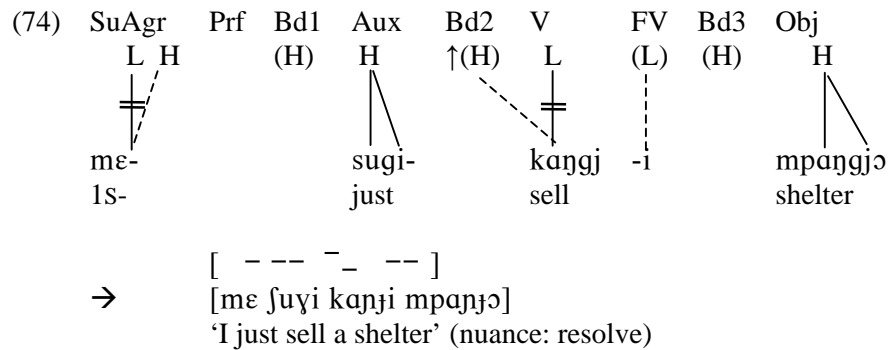


In Table 18, /sugi-, H/ is listed as appearing in normal indicative and subjunctive clauses. The difference in meaning between a normal indicative clause and one with the tonal configuration shown in (74) is difficult to explain using the usual linguistic categories. My language consultants tell me that in example (74), the speaker has firmly resolved to take the

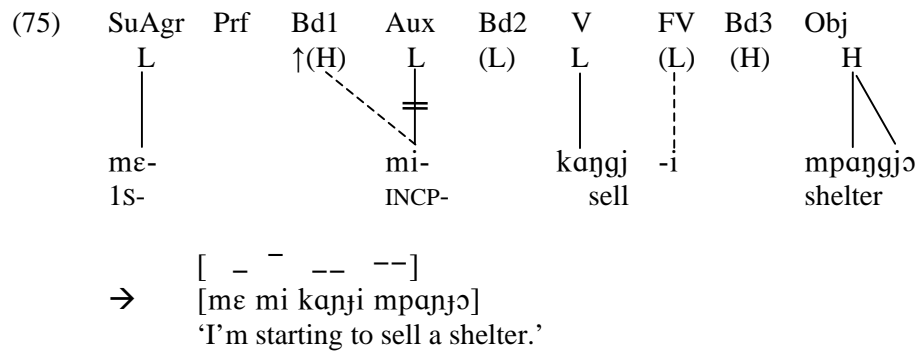
¹⁹ The origin of this high tone is unknown. See §4.3.3.

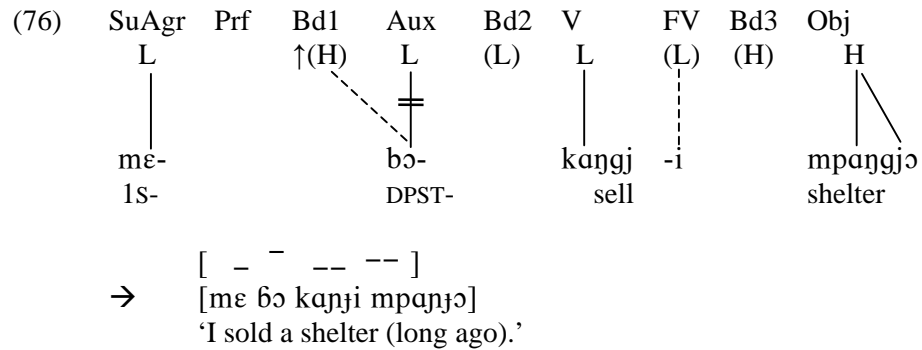
²⁰ Since the analysis requires boundary tones in other places, I posit them here as well. However, an analysis without boundary 1 & 2 tones would also produce the correct surface forms. Such an analysis would also require the high tone from the auxiliary to spread across to the first syllable of the verb.

action. The analysis of more data may at some point allow a more technical description that unifies the boundary tone combination used in (73) and (74).



The final two examples do not seem unusual, but they are irregular in one respect: They use, for indicative clauses, a boundary tone combination that is normally employed with subjunctives.



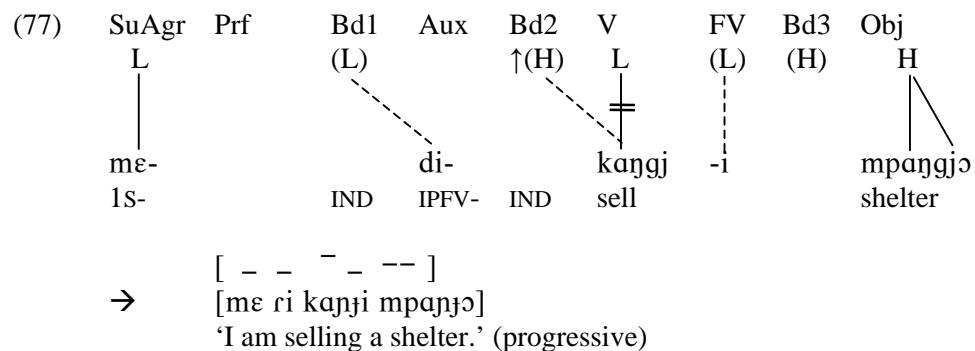


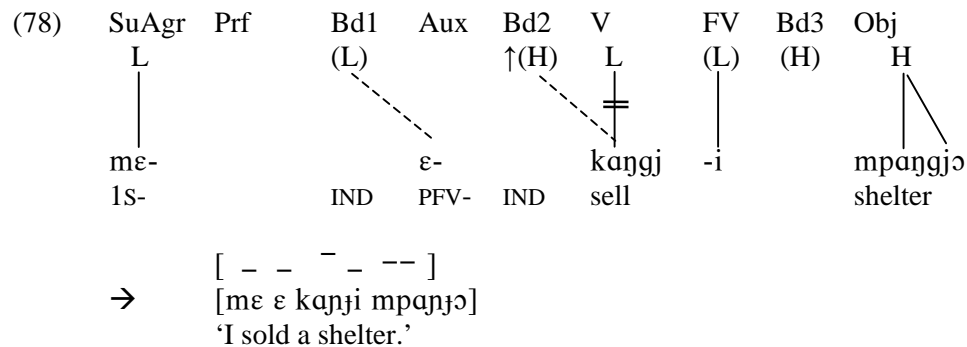
It may be that these are in some sense subjunctive clauses or, more likely, that this boundary tone combination is in fact associated with some meaning broader than 'subjunctive.' For now, these examples are set apart as exceptions to what is known about normal boundary tone usage.

4.3.3 Toneless verbal auxiliaries

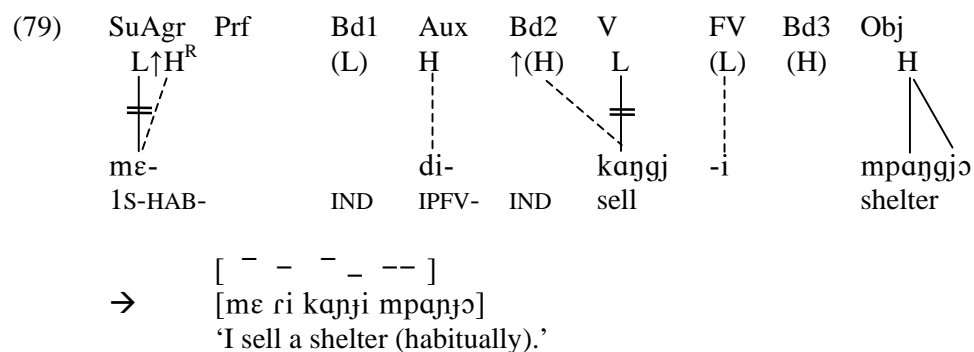
In §4.2 there are two verbal auxiliaries analyzed as toneless, namely /ε-, Ø/ 'perfective past' and /di-, Ø/ 'imperfective.' This analysis is due to their perplexing tonal behavior and is actually little more than an admission that their status is unclear.

When preceded by a low-toned subject agreement prefix, these two auxiliaries behave as if they were low-toned. In examples (77) and (78), one can assume that the normal boundary low for the indicative mood associates to the toneless verbal auxiliary to its right.

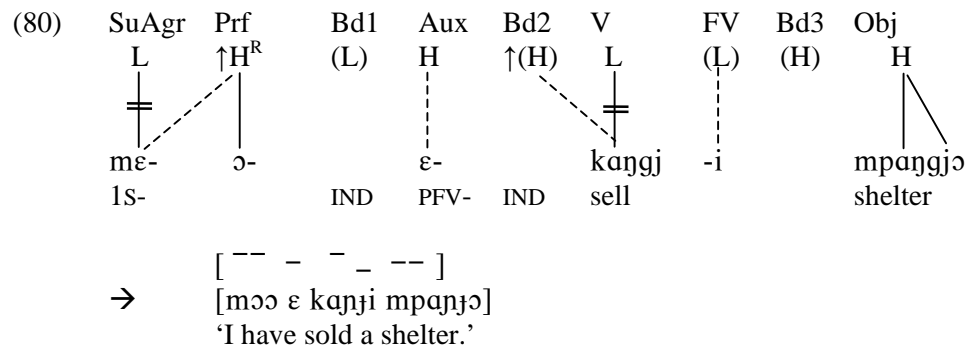




There is nothing in (77) and (78) that is incompatible with analyzing these auxiliaries as low-toned. But their behavior differs from that of low-toned auxiliaries when preceded by subject agreement prefixes that surface at the super-high level. The low-toned auxiliaries remain at the low level in the indicative mood, even in the presence of the super-high subject agreement caused by the high replacive tone of the perfect (cf. example (65), §4.3.1). But when /ε-/ and /di-/ are in a similar tonal environment, they are pronounced at the high, rather than the super-high, phonetic level. Example (79) shows the habitual usage of /di-/, with its high replacive tone on the subject agreement prefix. (This is example (72) repeated from §4.3.2.)



The high tone on the auxiliary could be considered another replacive high tone that comes with the habitual meaning, except for the fact that the auxiliary /ε-/ (example (80)) behaves similarly in a clause with the perfect, and no sort of habitual meaning.



The difficulty lies in determining the source of the high tone on the auxiliary. One way to analyze this would be to say that these particular morphemes are copying their tone from the tone of the subject agreement. However, such a tone copying process is otherwise unattested in Mpyemo.

CHAPTER 5

SUBJECT AGREEMENT MORPHEMES

5.1 Underlying tone

Mpyemo has both low-toned and high-toned subject agreement prefixes. In addition, there are two forms that are not easily handled under the present analysis, namely, first person plural inclusive and third person plural animate. The Mpyemo subject agreement morphemes are listed in (81).

The three singular forms are all low-toned. On the plural side, the situation is more complex. First person plural exclusive and second person plural are high-toned. The animate form for third person is toneless. Unfortunately, tonal data are not available for the third person inanimate form.

(81)	/mɛ-, L/	‘First person singular’
	/ɔ-, L/	‘Second person singular’
	/ɑ-, L/	‘Third person singular (animate)’
	/hɛ-, H/	‘First person plural exclusive’
	/bena-, L(H)/	‘First person plural inclusive’
	/bi-, H/	‘Second person plural’
	/bɛ-, Ø/	‘Third person plural (animate)’
	/i-/	‘Third person inanimate (singular and plural)’

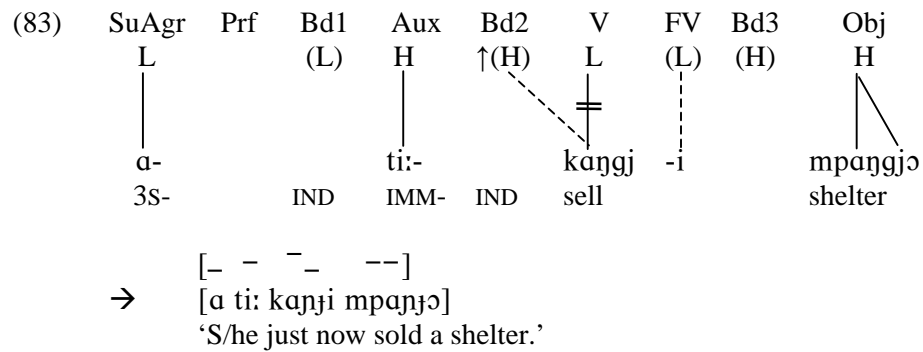
When I collected this data, my understanding of Mpyemo tone was extremely limited. I did not yet have a hypothesis of underlying forms for verbal auxiliaries, the perfect, or even verbs, much less a notion of boundary tones. I recorded the subject agreement prefixes with a selected set of

verbal auxiliaries, chosen because of their varied tonal behaviors. The auxiliaries I chose are shown in (82).

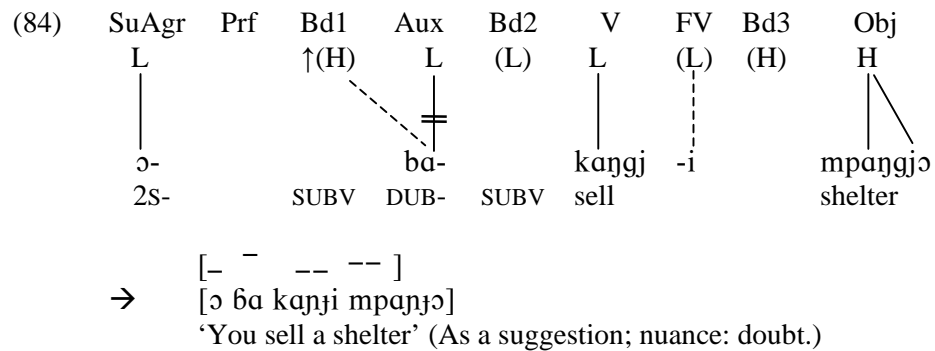
(82)	/ba-, L/	‘dubitative’
	/ε-, Ø/	‘perfective past’
	/ti:-, H/	‘immediate past’
	/na-, H(L)/	‘future’

Unfortunately, two of the auxiliaries chosen turned out to be unusual in some way. As was explained in §§4.3.2 and 4.3.3, /ε-/ is probably toneless, but behaves in a way not easy to account for under the current analysis. Likewise, /na-/ carries an unusual H(L) melody and a replacive high tone on the subject agreement prefix. The remaining two auxiliaries belong to different groups in terms of their compatibility with the perfect: /ba-/ requires the perfect in order to appear in an indicative clause, but /ti:-/ is incompatible with the perfect. Because of the limited and somewhat anomalous nature of the data, the conclusions drawn here will necessarily be preliminary ones.

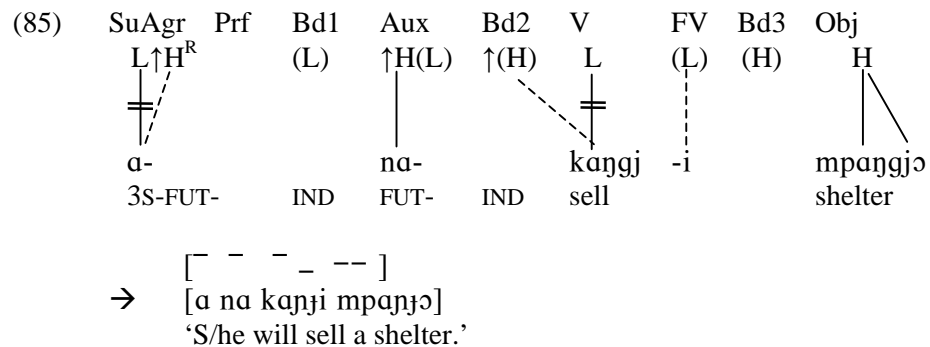
All of the examples in the previous chapter used the low-toned subject agreement prefix /mε-/ ‘first person singular,’ so an extensive discussion of the other low-toned subject agreement prefixes would be redundant. All of the singular subject agreements are low-toned and behave identically in all the contexts that I am aware of. A few examples will therefore suffice to show their behavior. We start with (83), an indicative clause with a high-toned verbal auxiliary.



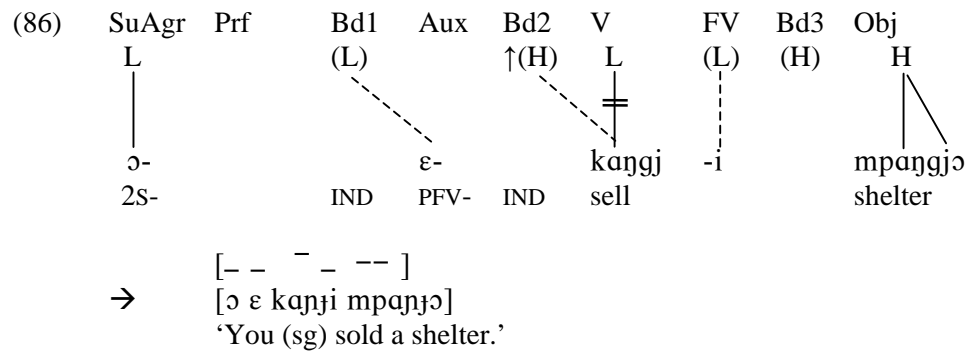
Next, (84) shows a subjunctive clause with a low auxiliary.



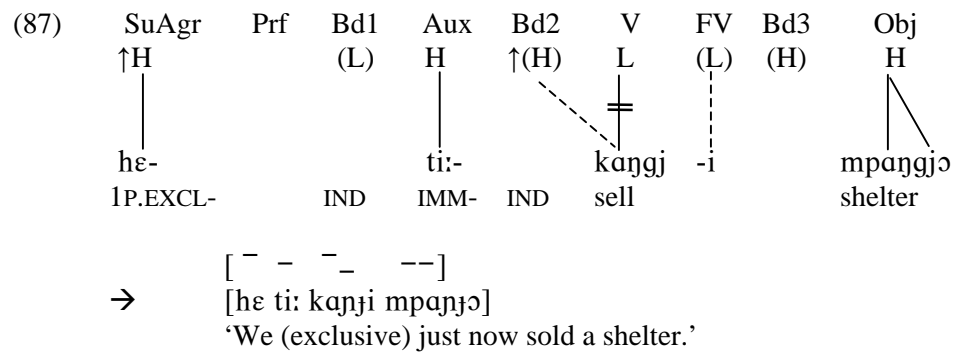
With (85) we see the special replacive high tone that cooccurs with /na-/ ‘future.’



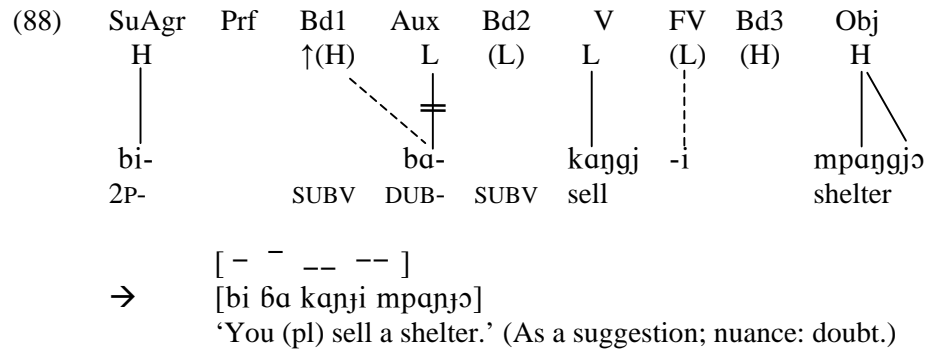
The “toneless” auxiliary /ε-/, still mysterious in its behavior, is shown in (86) behaving like a low-toned auxiliary with the second person singular subject agreement.



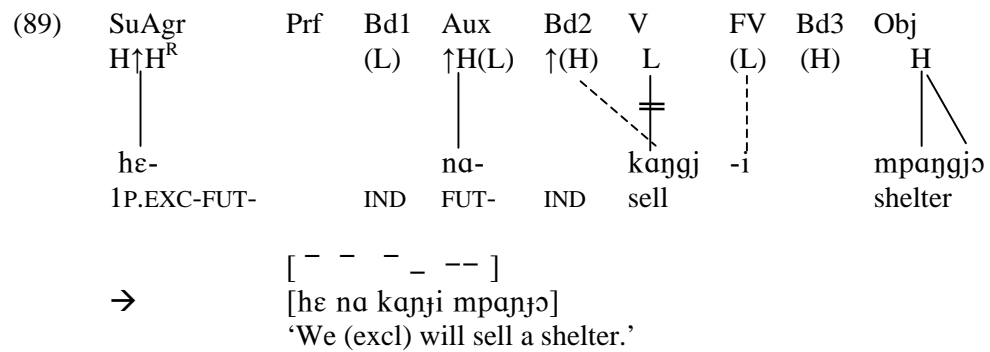
Like the low-toned subject agreement prefixes, the high ones are fairly straightforward. Example (87) shows a high subject agreement prefix with a high auxiliary in the indicative mood. The boundary 1 low tone for the indicative causes the subject agreement prefix's high tone to rise to super-high.



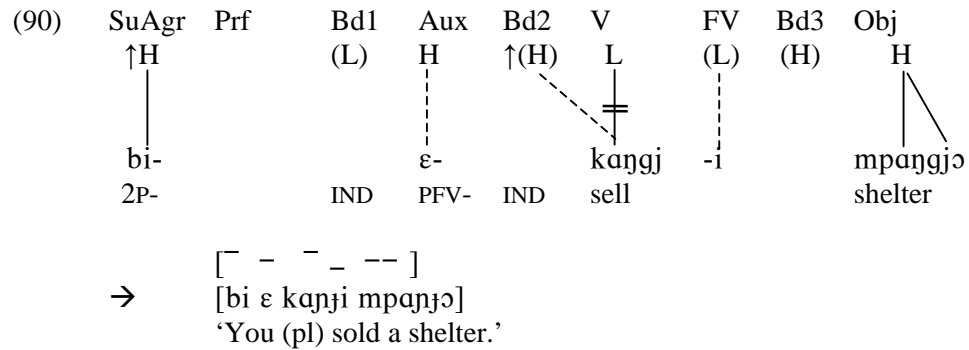
Example (88) shows a high subject agreement prefix, followed by a low auxiliary, in the subjunctive mood. This time the subject remains at the high level, instead of rising to super-high, because the tone following it is the high tone for the subjunctive in the boundary 1 slot.



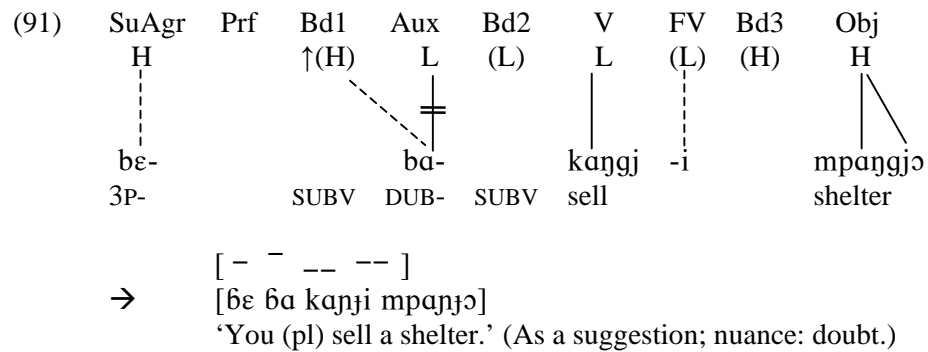
The high replacive tone that accompanies /na-/ is, on a high-toned subject agreement prefix, indistinguishable from the tone of the prefix. In (89) the prefix tone goes to super-high, as it does for all subject agreements, regardless of their underlying tone.



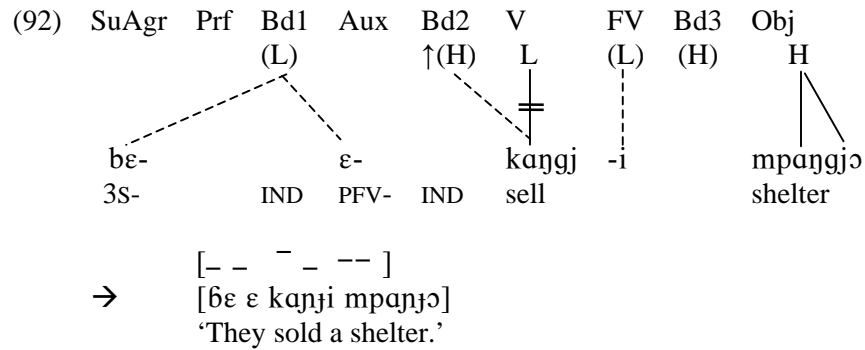
Once again we come to the toneless perfective marker /ε-/. When followed by a high-toned subject agreement prefix, it has high tone as well. The source of this high tone is unknown. The subject agreement prefix tone, however, is raised to super-high because of the low boundary 1 tone that follows it in indicative clauses.



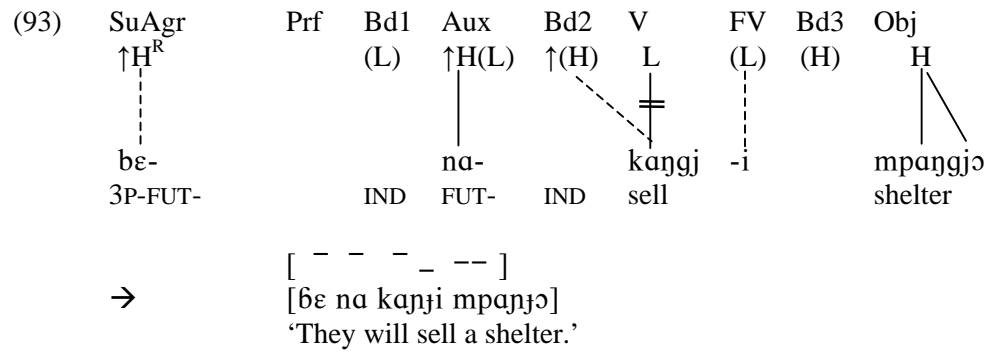
To close this chapter, we now turn to the two remaining subject agreement prefixes. They are, as stated previously, difficult to handle under the present analysis. Beginning with the third person plural form /bε-/ , we see in example (91) that it behaves like the high-toned subject agreements (cf. example (88)). The source of the high tone on the subject agreement prefix is unknown. It could be spreading from the boundary 1 tone, but that would mean that a doubly-linked high tone is pronounced at the high level on one syllable and at the super-high level on the other.



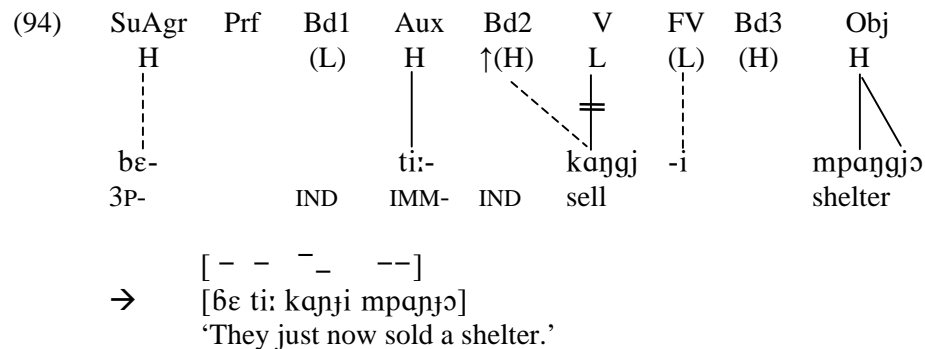
In contrast to the example above, however, when /bε-/ appears with /ε-/ it behaves like the low-toned subject agreements. This is shown below in (92). Once again, it could be getting its tone from the floating low tone in the boundary 1 slot.



With the future morpheme /na-/, the behavior of /bε-/ is not surprising. Recall that /na-/ specifies a replacive high tone on the subject.



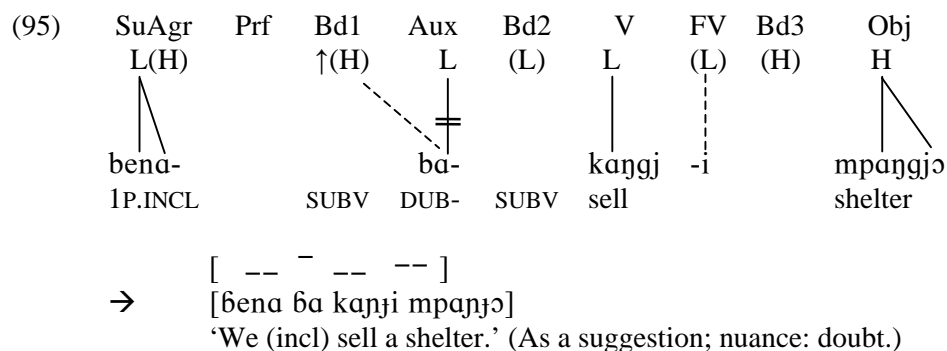
In the final example involving /bε-/, we see that it behaves like neither a low- nor a high-toned subject agreement prefix, but instead behaves in a unique way.



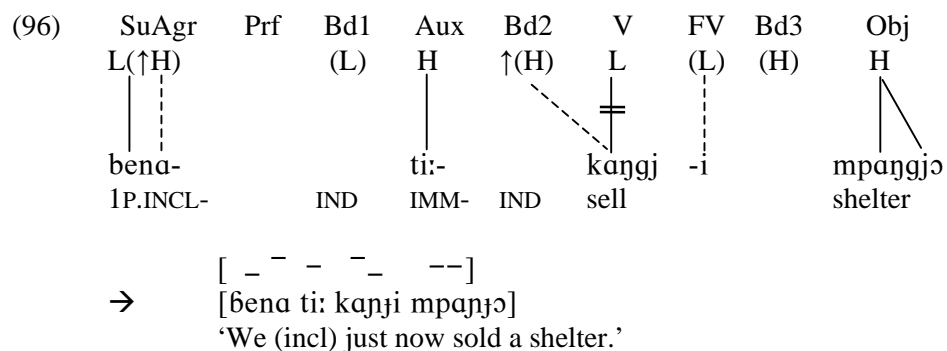
Where the low-toned subjects are low in this frame (see (83)) and the high ones are super-high (see (87)), here we see that /bε-/ is high. We cannot say that it is getting its tone from the

boundary 1 tone, since that tone is low in this case. This is a mystery that cannot be resolved at this time.

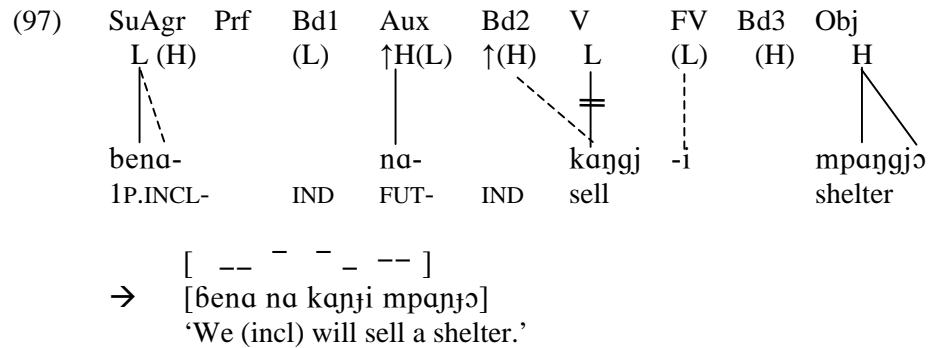
Finally, I will present the first person plural inclusive subject agreement /bena-/. I have posited its tonal melody as L(H), and in certain frames its behavior seems fairly normal. In (95), the floating high merges with the boundary 1 tone, so that /bena-/ seems like simply a low-toned subject agreement.



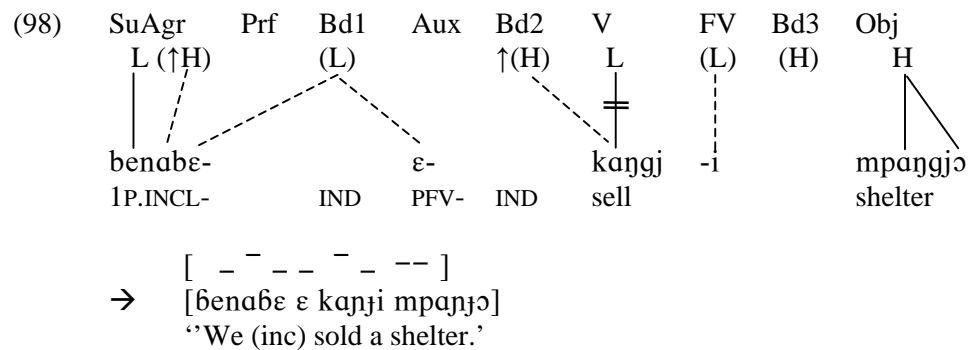
The need for the floating high in the melody becomes apparent in (96), where this floating high docks on the second syllable of the subject agreement prefix and surfaces as super-high.



In (97), the difficulty is in determining why the replacive high tone on the subject agreement that usually accompanies /na-/ is apparently not there. Also unusual is the fact that the high tone of /bena-/ remains floating.



The behavior of /bena-/ is strange, not only tonally, but also segmentally. In the following example it adds another syllable, which either bears low tone underlyingly or gets its tone from the boundary 1 tone. It behaves similarly in the presence of the perfect, as shown in Table 20, §5.2. I have no explanation for this.



So, with the subject agreement prefixes, as with the verbal auxiliaries, we find that there are a majority that are explainable under the present analysis, and a few that stretch the analysis and point to perhaps more going on.

5.2 Interaction with the perfect

In §4.1, one of the reasons given for considering the perfect to be distinct from verbal auxiliaries was the closeness with which it is phonologically bound to the subject agreement.

Having introduced the full range of subject agreement morphemes, we return to examine this claim further.

Table 20 shows the changes that take place in subject agreement prefixes when the perfect morpheme is present. A high tone replaces the original tone on the subject agreement prefix. In addition, in several cases the vowel quality of the perfect overrides that of the subject agreement prefix, while leaving the original vowel's mora intact, resulting in compensatory lengthening.

Table 20: Phonological effects of the perfect on subject agreement prefixes.

	Subject Agreement	SuAgr + Perfect	Gloss	Phonological Effect of the Perfect
a.	/mɛ-/	/mɔɔ-/	1S	Overrides vowel quality
b.	/ɔ-/	/ɔɔ-/	2S	N/A: Vowel quality is already the same
c.	/ɑ-/	/ɑɑ-/	3S.AN	Original vowel quality remains
d.	/hɛ-/	/hɔɔ-/	1P.EXCL	Overrides vowel quality
e.	/bena-/	/benabɔɔ-/	1P.INCL	Extra syllable onset added to accommodate the perfect
f.	/bi-/	/bjɔɔ-/	2P	Residual vowel quality remains in the form of a glide
g.	/bɛ-/	/bɔɔ-/	3P.AN	Overrides vowel quality
h.	/i-/	/jɔɔ-/	3.INAN	Residual vowel quality remains in the form of a glide

Where the vowel quality does not override the vowel of the subject agreement prefix, (i.e. Table 20, rows c, e, f, h), there is a functional reason for its failure to do so. Since the perfect bears a replacive tone, the tonal contrast is lost between the different persons/numbers. Keeping the original vowel quality is therefore necessary to avoid confusion between certain subject agreements. So if the third person singular animate subject agreement /ɑ-/ (row c) were to have its vowel quality overridden by the perfect morpheme, it would be tonally and segmentally identical to the second person singular (row b) with the perfect morpheme: both would become /ɔɔ-/. The same holds for the third person inanimate subject agreement (row h).

Similarly, if the second person plural /bi-/ (row f) were to have its vowel totally replaced by that of the perfect morpheme, it would become /bɔɔ-/, identical to the third person plural animate subject agreement (row g). These facts show that, phonologically, the perfect is bound more closely to the subject agreement than the verbal auxiliaries are.

The case of row (e) is unique. When the perfect morpheme combines with the first person plural inclusive subject agreement, an extra consonant is inserted between them. This provides a syllable onset, but it is not clear why this is necessary.

CHAPTER 6

CONCLUSION

6.1 Findings

The tonal system of Mpyemo has several interesting features. The first of these is a tone raising process that elevates high tone to the super-high level whenever it is followed by a low tone. The effect of this process is to make an underlying two-tone system manifest three phonetic levels.

Most of the nouns and verbs in Mpyemo can be categorized according to tonal melody. There are four major melodies for nouns: H, L, H(L) and LH (where (L) is an inherently floating tone). There is also a fifth nominal melody, HL, that is marginal in productivity. There are two major melodies for verb roots: H and L. When the melody of the verb stem is considered, a three-way distinction emerges in the tonal melodies: H-(L), L-(L), and H-L. The H-L melody, like the HL melody for nouns, is marginal in productivity.

Mpyemo verbal auxiliaries can be subdivided into three groups based on their compatibility with the perfect morpheme. Those that require the perfect in order to appear in an indicative clause are called “lexical auxiliaries.” The ones that can freely occur in indicative clauses with or without the perfect are here labeled “Tense/aspect group 1.” Those that are incompatible with the perfect are called “Tense/aspect group 2.”

Boundary tones are posited to account for the alternations in the surface tones of verbal auxiliaries. They occur before and after the verbal auxiliary, and are used to communicate mood information. Thus a high tone before the auxiliary and a low after it indicate ‘subjunctive,’ and the opposite arrangement is used for indicative clauses.

6.2 Areas for further research

Due to time constraints, this thesis was necessarily limited in scope. I did not touch on a number of important topics. First of all, I studied verbs with only a limited number of inflectional affixes, instead of looking at all the possibilities that occur in the Mpyemo language. I did not look at negation, verbs with causative or reciprocal suffixes, or verbs with multiple auxiliaries. The whole area of nominal tone was touched on only briefly. Associative constructions, reduplication, and many other topics remain to be researched.

The phonetic component of this research was minimal. Additional phonetic research could provide further light on the phonetic differences between tones. This very brief study covers only one speaker and a few tokens; a larger sampling of tokens and a greater number of speakers would improve the likelihood that the results accurately reflect the speech community at large.

In addition to the limitations placed on the scope of this thesis, there were a number of difficulties I encountered that were not resolved. In the area of underlying melodies, the difference between H(L) and HL (for nouns) and between H-(L) and H-L (for verbs), is still somewhat unsatisfying.

The boundary tone combinations posited for indicative and subjunctive clauses account for a majority of the data, but not all of it. In several cases I have had to posit boundary tones specific to a given verbal auxiliary. Furthermore, two of the verbal auxiliaries are presumed to be toneless,

but such an analysis remains problematic. A real possibility exists that some of the morphemes called “verbal auxiliaries” are some other category of word. Beavon’s (2006) research strongly suggests the existence of tense/aspect distinctions that are purely tonal, with no contrastive segmental material.

Future research will require a more well-developed tonal theory, such as Register Tier theory (Snider 1990, 1999), to adequately account for the varied tonal phenomena present in the Mpyemo language. However, I do believe this thesis will be useful in the ongoing research of the Mpyemo language.

6.3 Orthographic considerations

As stated in Chapter 1, one of the main practical purposes of this study is to help the Mpyemo people use their language as a means of written communication. There have been a few different orthographies for Mpyemo, and as far as I am aware, none of them has attempted to mark tone. The orthography we currently use is considered experimental and does not indicate tone. So far, the results of this approach have been positive. People already literate in French say the orthography is easy to read. This must not be taken to mean that tone does not need to be marked, however, because a person can read and understand *a meaning* but not necessarily *the meaning* – the one intended by the author.

Even though this thesis covers tone in only a small part of the Mpyemo language, the insights gained in writing it will be valuable in determining how to mark tone, and how much tone needs to be marked. This will be done with the help of linguistic and orthography consultants, and with the input of many native speakers in the Mpyemo community.

APPENDICES

Appendix A

Word lists

Nouns are sorted by tonal group, noun class, and root CV pattern.

Tonal Group: L					
Root CV Pattern ²¹	Noun Classes		Singular	Plural	Gloss
CV	1a, 2a	/ ⁿ ta/	[nta]	[bɛnta]	descendant
CVN	1a, 8	/kuŋ/	[kū]	[bikū]	owl
CV:	1a, 8	/ta:/	[ta:]	[bita:]	goat
CGV	1a, 8	/ ⁿ kjɔ/	[ɲɔ]	[bijɲɔ]	civet
CVV	1a, 8	/koe/	[koe]	[bikoe]	parrot
CVV	1a, 8	/ ⁿ taɛ/	[ntaɛ]	[bintaɛ]	cow
CVV	1a, 2a	/ ⁿ kɔɛ/	[ɲkɔɛ]	[bɛɲkɔɛ]	leopard
CVCV	1a, 8	/wani/	[wani]	[biwani]	chief
CGVCV	1a, 2a	/ ⁿ gjali/	[ɲjali]	[bɛɲjali]	daughter-in-law
CGVCV	1a, 2a	/ ⁿ kjɔgi/	[ɲɔɣi]	[bɛɲɔɣi]	elephant
CGV	5, 6	/a-bja/	[abja]	[mɛbja]	hernia
CGV:	5, 6	/a-kwa:/	[akwa:]	[mɛkwa:]	illness
CVCV	5, 6	/a-pebɔ/	[apɛβɔ]	[mɛpɛβɔ]	dove
CVCV	5, 6	/a-sugi/	[afuyi]	[mɛfuyi]	tree trunk
CVCGV	5, 6	/a-ka ⁿ gji/	[akɑɲji]	[mɛkɑɲji]	fin
CVCV	5, 6	/a- ⁿ ta ^m bi/	[antambi]	[mentambi]	phlegm
CVCV	5, 6	/a-ku ⁿ di/	[akundi]	[mɛkundi]	garbage dump
CVCV	5, 6	/a- ⁿ tumɔ/	[antumɔ]	[mentumɔ]	heel
VCV	5, 6	/d-ɑɣɔ/	[dɑɣɔ]	[mɑɣɔ]	nest
VCV	5, 6	/d-a ^m bi/	[dambɪ]	[mambɪ]	war
CV	7, 8	/so/	[ʃo]	[biʃo]	womb
CVN	7, 8	/kɔŋ/	[kɔ̃]	[bikɔ̃]	back
CGV	7, 8	/sjo/	[sjo]	[bisjo]	year
CGV	7, 8	/ ⁿ gja/	[ɲja]	[bijɲja]	intestine
CVN	7, 6	/ ^m puŋ/	[mpū]	[mɛmpū]	fur
CVCV	7, 8	/bede/	[bɛrɛ]	[bibɛrɛ]	chest
CVCV	7, 8	/bamɔ/	[ɓamɔ]	[bibamɔ]	scar
CVCV	7, 8	/ ^m bɔ ^m bi/	[mbɔmbɪ]	[bimbɔmbɪ]	abcess
CGVCV	7, 6	/ ⁿ kjɛli/	[ɲɛli]	[mɛɲɛli]	beard
CGVCV	7, 8	/kjɛgi/	[ɛɣi]	[bicɛɣi]	molar

²¹ Although it was stated in § 1.7.2 and in footnote 7 that the status of certain phonetic sequences is still open to debate, the conventions used here are: 1) Prenasalized stops are designated C rather than as N+C sequences. 2) The phones [c], [j] and [ɲ] are assumed to be /kj/, /gj/ and /nj/ respectively, and are thus designated CG. 3) Nasalized vowels are interpreted as underlyingly VN. Nevertheless, because these issues are still controversial, I have made an effort to include a variety of consonants.

Tonal Group: LH					
Root CV Pattern	Noun Classes		Singular	Plural	Gloss
CV	1a, 2a	/ki/	[ci]	[βeci]	father-in-law
CV:N	1a, 8	/le:ŋ/	[lē:]	[bilē:]	leech
CGVV	1a, 2a	/njæ/	[ɲæ]	[βɛɲæ]	sister-in-law
CVV	1a, 2a	/ ^h kœ/	[ɲkœ]	[βɛɲkœ]	millipede
CVCV	1a, 8	/kɔɔ/	[kɔɔ]	[bikɔɔ]	namesake
CVCV	1a, 8	/bagɔ/	[βagɔ]	[bibagɔ]	shrew
CVCV	1a, 8	/nɔni/	[nɔni]	[binɔni]	bird
CGVCV	1a, 8	/kwali/	[kwali]	[bikwali]	partridge
CVCV	1a, 2a	/ ^h ko ^m bɔ/	[ɲkombɔ]	[βɛɲkombɔ]	porcupine
CVCV	1a, 8	/ ^m pogi/	[mpoyi]	[bimpyi]	squirrel
CVCV	5, 6	/a-bagi/	[abayi]	[mɛbayi]	obstacle
CVCV	5, 6	/a-konɔ/	[akonɔ]	[mekonɔ]	clay
CVCV	5, 6	/a- ^m palɔ/	[ampalɔ]	[mɛmpalɔ]	penis
CVCV	5, 6	/a- ^m pabɔ/	[ampaβɔ]	[mɛmpaβɔ]	wing
CGVCV	5, 6	/a-gjɛmɔ/	[ajɛmɔ]	[mɛjɛmɔ]	antelope
CGVCV	5, 6	/a-njagi/	[ɲɲayi]	[mɛɲayi]	anus
CV	7, 6	/ko/	[ko]	[meko]	leg
CV	7, 6	/ ^m pe/	[mpe]	[mɛmpe]	pot
CVN	7, 8	/lɔŋ/	[lɔ]	[bilɔ]	grassland
CV:N	7, 8	/tɔ:ŋ/	[tɔ:]	[bitɔ:]	pipe
CV:N	7, 6	/ ^h kɔ:ŋ/	[ɲkɔ:]	[mɛɲkɔ:]	sorrow
CVV	7, 8	/suɔ/	[ʃuɔ]	[biʃuɔ]	roof
CVCV	7, 8	/bulɔ/	[bulɔ]	[bibulɔ]	night
CVCV	7, 8	/bondi/	[bondi]	[bibondi]	corn cob
CVCV	7, 6	/ ^h kogɔ/	[ɲkoyɔ]	[mɛɲkoyɔ]	sugar cane
CGVCV	7, 8	/gjandɔ/	[jandɔ]	[bijandɔ]	latrine

Tonal Group: H(L)					
Root CV Pattern	Noun Classes		Singular	Plural	Gloss
CV	1a, 2a	/po/	[po]	[βepo]	rat
CV	1a, 2a	^m pi/	[mpi]	[βempi]	dog
CGV	1a, 2a	/njɔ/	[njɔ]	[βɛnjɔ]	snake
CVN	1a, 8	/kaŋ/	[kã]	[bikã]	guinea fowl
CGVVN	1a, 2a	ⁿ gjeŋ/	[ŋjẽɔ̃]	[βɛŋjẽɔ̃]	guest
CVCV	1a, 2a	/luli/	[luli]	[βɛluli]	blacksmith
CVCV	1a, 2a	ⁿ tomi/	[ntomi]	[βɛntomi]	brother
CVCV	1a, 2a	/sa ⁿ gɔ/	[saŋgɔ]	[βɛsaŋgɔ]	father
CGVCV	1a, 8	ⁿ gjemɔ/	[ŋjemɔ]	[bijnjemɔ]	fruit bat
CGVCV	1a, 2a	ⁿ gwomi/	[ŋgwomi]	[βɛŋgwomi]	husband
V	5, 8+5	/d-o/	[dɔ]	[bidɔ]	nose
V:	5, 6	/d-i:/	[di:]	[mi:]	eye
CGV	5, 6	/a-bjɛ/	[abjɛ]	[mɛbjɛ]	jackal
VCV	5, 6	/d-ɛgi/	[dɛgi]	[mɛgi]	chair
VCV	5, 6	/d-inɔ/	[dinɔ]	[minɔ]	name
CVCV	5, 6	/a-leni/	[aleni]	[mɛleni]	buttock
CVCV	5, 6	/a-kali/	[akali]	[mɛkali]	word
CVCV	5, 6	/a-bɛli/	[abɛli]	[mɛbɛli]	breast
CGVCV	5, 6	/a-kjɛgi/	[akɛgi]	[mɛkɛgi]	mountain
CGVCGV	5, 6	/a-kwa ⁿ gji/	[akwanɟi]	[mɛkwanɟi]	broom
CV	7, 8	/lo/	[lo]	[bilo]	head
CV	7, 8	^m bɛ/	[mbɛ]	[bimbɛ]	door
CGV	7	/gwɔ/	[gwɔ]		sleep
CVN	7, 8	/dɔŋ/	[dɔ̃]	[bidɔ̃]	navel
CVV	7, 8	/dɛɛ/	[dɛɛ]	[bidɛɛ]	chin
CVV	7, 8	/soe/	[soe]	[bi]soe]	breath
CGVVN	7, 8	ⁿ kjeŋ/	[ŋkẽɔ̃]	[bijnkẽɔ̃]	axe
CVCV	7, 8	/lemɔ/	[lemɔ]	[bilemɔ]	heart
CGVCV	7, 8	/mjɛgɔ/	[mjɛgɔ]	[bimjɛgɔ]	fish dam
CGVCV	7, 6	ⁿ kja ^m bɔ/	[ŋkambɔ]	[mɛŋkambɔ]	biceps

Tonal Group: H					
Root CV Pattern	Noun Classes		Singular	Plural	Gloss
CV	1a, 2a	/sɔ/	[sɔ]	[ʒɛsɔ]	friend
CV	1a, 8	/pa/	[pa]	[bipa]	flea
CVV	1a, 8	/muɔ/	[muɔ]	[bimuɔ]	hornbill sp.
CVV	1a, 2a	/ ^m poe/	[mpoe]	[ʒempoe]	brother-in-law
CVCV	1a, 8	/bibi/	[bibi]	[bibibi]	mumbler
CVCV	1a, 8	/lumɔ/	[lumɔ]	[bilumɔ]	maggot
CVCV	1a, 8	/si ⁿ go/	[siŋgo]	[bisŋgo]	ant
CVCV	1a, 8	/ ^m pe ^m be/	[mpembe]	[bimpembe]	puff adder
CVCV	1a, 2a	/ ^m pa ^m bɔ/	[mpambɔ]	[ʒempambɔ]	father-in-law
CGVCV	1a, 8	/mjamɔ/	[mjamɔ]	[bimjamɔ]	hornbill sp.
CVV	5, 6	/a-wuɔ/	[awuɔ]	[mewuɔ]	co-wife
CVCV	5, 6	/a-togi/	[atɔyi]	[metɔyi]	kidney
CVCV	5, 6	/a-boli/	[aboli]	[mɛbɔli]	louse
CVCV	5, 6	/a-kɔgi/	[akɔyi]	[mekɔyi]	stone
CVCV	5, 6	/a- ⁿ tolɔ/	[antɔlɔ]	[mentɔlɔ]	bruise
CVCV	5, 6	/a-ti ⁿ di/	[atindi]	[metindi]	elephantiasis
CVCV	5, 6	/a- ⁿ kɔ ⁿ dɔ/	[aŋkɔndɔ]	[mɛŋkɔndɔ]	loincloth
CVVN	5, 6	/a- ⁿ tuɔŋ/	[antuɔ̃]	[mentuɔ̃]	knot (wood)
CGVCV	5, 6	/a- ⁿ kjɔlɔ/	[aŋcɔlɔ]	[mɛŋcɔlɔ]	brideprice
CGVCGV	5, 6	/a- ⁿ kja ⁿ gɔ/	[aŋcaŋɔ]	[mɛŋcaŋɔ]	clearing
CV	7, 8	/le/	[le]	[bile]	tree
CGVN	7, 6	/kjiŋ/	[cɪ]	[mɛcɪ]	neck
CVN	7, 8	/ ⁿ tɔŋ/	[ntɔ̃]	[bintɔ̃]	point
CGVN	7, 8	/ ⁿ kjɔŋ/	[ncɔ̃]	[bincɔ̃]	eggplant
CVCV	7, 8	/winɔ/	[ɥinɔ]	[biɥinɔ]	pus
CVCV	7, 6	/ ^m pala/	[mpala]	[mempala]	camp
CVCV	7, 8	/ka ⁿ dɔ/	[kandɔ]	[bikandɔ]	cloth
CVCV	7, 8	/ ⁿ kɔ ⁿ da/	[ŋkɔnda]	[biŋkɔnda]	elbow
CVCV	7	/bɔ ⁿ gɔ/	[bɔŋgi]		mud
CGVCV	7, 8	/ ⁿ kwali/	[ŋkwali]	[biŋkwali]	sesame seed

Tonal Group: HL					
Root CV Pattern	Noun Classes		Singular	Plural	Gloss
CVV	1a, 8	/sæ/	[sæ]	[bisæ]	termite
CVCV	1a, 8	/ləda/	[ləra]	[bilera]	ghost
CVCV	1a, 2a	/kemo/	[kemo]	[bɛkemo]	monkey
CVCV	1a, 8	/soɔ/	[soɔ]	[biɔɔ]	lizard
CVCV	1a, 8	/dɔ ^m bɔ/	[dɔmbɔ]	[bidɔmbɔ]	toad
CVCGV	1a, 8	/sɔ ⁿ gja/	[sɔŋja]	[bisɔŋja]	soldier
CGVV	7, 6	/ ⁿ kja/	[ŋcia]	[mɛŋcia]	blood
CVCV	7, 8	/lima/	[lima]	[bilima]	dream
CVCV	7, 8	/kuda/	[kura]	[bikura]	fist
CVCV	7, 8	/sugu/	[suyu]	[bisuyu]	soup
CVCV	7, 8	/bege/	[beye]	[bibeye]	pot
CVCV	7, 8	/kugu/	[kuyu]	[bikuyu]	kitchen
CVCV	7, 8	/bija/	[bija]	[bibija]	cudgel
CVCV	7, 8	/sani/	[sani]	[bisani]	thing
CGVCV	7, 8	/gwoda/	[gwora]	[bigwora]	firewood
CVCV	7, 8	/ ^m peda/	[mpera]	[bimper]	grinding stone
CVCV	7, 8	/ko ⁿ go/	[kongo]	[bikongo]	hoe
CGVCV	7, 8	/qja ⁿ do/	[jando]	[bijando]	market
CGVCV	7, 8	/ ⁿ kja ⁿ gɔ/	[ŋcaŋgɔ]	[biŋcaŋgɔ]	nail

No class 5 nouns are attested for the HL tone group. The list of HL nouns is nearly exhaustive for my data.

Nouns used in the phonetic pitch study in §1.6.

Tonal Group H	Pitch on first syllable, Hz	Gloss
[bi̋]	147.3	fear
[b̋ɔndɔ]	147.9	paint
[b̋ɔŋji]	147.2	mud
[kőyi]	149.0	uncle
[kuli]	152.4	sp. tree
[mpambɔ]	149.3	in-law
[mpaŋɔ]	139.7	shelter
Tonal Group L		
[mpaɔ]	144.4	crossbow
[ɔamɔ]	135.7	scar
[bere]	137.1	chest
[kuli]	147.2	cable
[mpambɔ]	121.2	cobra
[ɔembe]	139.0	ladle
[ŋali]	134.1	sister-in-law
Tonal Group HL		
[ɔeye]	173.8	pot
[bija]	159.9	club
[kemɔ]	164.3	monkey
[keŋa]	165.3	backpack
[ɔŋa]	158.1	soldier
[ɔiyuru]	172.9	smoke
[je̋yele]	178.4	teacher

Verbs are sorted by tonal group and root CV pattern.

Tonal Group: L-(L)			
Root+FV CV Pattern			Gloss
CV	/bi/	[bi]	touch
CV	/nɔ/	[nɔ]	take
CVN	/daŋ/	[dã]	draw water
CVV	/sæ/	[sæ]	spit
CGV	/njɔ/	[nɔ]	be good
CGV:	/kwa:/	[kwa:]	hurt
CVC-V	/min-ɔ/	[minɔ]	drink
CVC-V	/saŋ-i/	[saŋi]	frighten
CVC-V	/wal-ɔ/	[walɔ]	awaken
CVC-V	/dɛd-ɔ/	[dɛrɔ]	weaken
CVC-V	/ ^m bu ^m b-ɔ/	[mbumbɔ]	roast
CGV-V	/gja-ɛ/	[jaɛ]	reply
CVC-V	/ti ⁿ d-i/	[tindi]	polish
CVCG-V	/ka ⁿ g-j-i/	[kaŋji]	sell
CGVC-V	/kwal-i/	[kwali]	love
CGVC-V	/bjel-a/	[bjela]	find
CGVC-V	/ ⁿ kwa ⁿ g-a/	[ŋkwaŋga]	tremble
CGVC-V	/mjag-i/	[mjayi]	sprinkle
CGVC-V	/kjɔl-ɔ/	[cɔlɔ]	cut down

Tonal Group: H-(L)			
Root+FV CV Pattern			Gloss
CV	/sa/	[sa]	do
CV	/sɔ/	[ʃɔ]	undress
CV	/ba/	[ba]	marry
CV	/wa/	[wa]	put
CGV	/bja/	[bja]	give birth
CVN	/baŋ/	[bã]	hurt oneself
CVN	/kɔŋ/	[kõ]	deceive
CVN	/wiŋ/	[qĩ]	lend
CGVN	/kwaŋ/	[kwã]	depart
CVC-V	/dad-ɔ/	[daraɔ]	lick
CVC-V	/kɛb-ɔ/	[kɛβɔ]	jump
CVC-V	/pam-ɔ/	[pamɔ]	greet
CVC-V	/ba ⁿ d-ɔ/	[bandɔ]	tighten
CVC-V	/bɔm-ɔ/	[bɔmɔ]	buy
CVC-V	/kal-i/	[kali]	curse
CGVC-V	/gwog-ɔ/	[gwoɣɔ]	hear
CGVC-V	/gjib-ɔ/	[jiβɔ]	steal
CGVC-V	/gja ^m b-ɔ/	[jambɔ]	cook
CGVC-V	/kjɛg-ɔ/	[cɛɣɔ]	cut
CGVC-V	/gje ^m b-ɔ/	[jemɔ]	sing
CGVC-V	/bjal-i/	[bjali]	be born

Tonal Group: H-L			
Root+FV CV Pattern			Gloss
CGV	/ ^h kje/	[<u>nce</u>]	come
CV	/de/	[<u>de</u>]	eat
CV	/wi/	[<u>ɥi</u>]	die
CV	/kɛ/	[<u>kɛ</u>]	go
CV-V	/wɛa/	[<u>wɛa</u>]	argue
CVC-V	/baq-a/	[<u>baɣa</u>]	say goodbye
CVC-V	/ti ⁿ d-a/	[<u>tinda</u>]	approach
CVC-V	/bul-a/	[<u>bula</u>]	return
CVC-V	/len-a/	[<u>lena</u>]	pass
CVC-V	/tɔl-a/	[<u>tɔla</u>]	drip
CVC-V	/nam-ɔ/	[<u>namɔ</u>]	be beautiful
CVC-V	/kun-ɔ/	[<u>kunɔ</u>]	approach
CVC-V	/pud-a/	[<u>pura</u>]	pay
CVC-V:	/kud-ɔ:/	[<u>kurɔ:</u>]	squat
CVC-V:	/wɛg-a:/	[<u>ɥɛɣa:</u>]	look for
CVC-V:	/pul-a:/	[<u>pula:</u>]	mix
CVC-V:	/ko ^h g-ɔ:/	[<u>koŋgɔ:</u>]	soar
CVC-V:	/bud-ɔ:/	[<u>burɔ:</u>]	stoop
CVC-V:	/lɛb-ɔ:/	[<u>lɛβɔ:</u>]	be thin
CVC-V:	/kɔd-ɔ:/	[<u>kɔrɔ:</u>]	be crooked
CVCG-V	/ ^h kɛ ^h gɣ-ɔ/	[<u>ŋkɛŋɣɔ</u>]	clean
CGVC-V:	/gɣɛg-ɔ:/	[<u>ɣɛɣɔ:</u>]	lean

This list of H-L verbs is exhaustive for my data.

Appendix B
Noun phrase paradigms

Tone Group: L	Noun in Isolation	kodo ____ 'big ____'
1 syllable	[\]	[-- \]
2 syllable	[- \]	[-- - \]
3 syllable	[-- \]	[-- - - \]
Prefix+1 syllable	[- \]	[-- - \]
Prefix+2 syllable	[-- \]	[-- - - \]
Prefix+3 syllable	[--- \]	[-- - - - \]

Tone Group: H	Noun in Isolation	kodo ____ 'big ____'
1 syllable	[-]	[-- -]
2 syllable	[--]	[-- --]
3 syllable	[---]	[-- ---]
Prefix+1 syllable	[- -]	[-- - -]
Prefix+2 syllable	[- --]	[-- - --]
Prefix+3 syllable	[- ---]	[-- - ---]

Tone Group: H(L)	Noun in Isolation	kodo ____ 'big ____'
1 syllable	[\]	[-- \]
2 syllable	[- \]	[-- - \]
3 syllable	[-- \]	[-- - - \]
Prefix+1 syllable	[- \]	[-- - \]
Prefix+2 syllable	[- - \]	[-- - - \]
Prefix+3 syllable	[- - - \]	[-- - - - \]

Tone Group: LH	Noun in Isolation	kodo ____ 'big ____'
1 syllable	[/]	[- - -]
2 syllable	[- -]	[-- - -]
3 syllable	*	
Prefix+1 syllable	[- /]	[-- - -]
Prefix+2 syllable	[-- -]	[-- - - -]
Prefix+3 syllable	[--- -]	[-- - - - -]

Tone Group: HL	Noun in Isolation	kodo ____ 'big ____'
1 syllable	*	
2 syllable	[- \]	[-- - \]
3 syllable	[- - \]	[-- - - \]
Prefix+1 syllable	*	
Prefix+2 syllable	[- - \]	[-- - - \]
Prefix+3 syllable	[- - - \]	[-- - - - \]

Tone Group: L	Noun in Isolation	___ aa be '___ isn't there'
1 syllable	[\]	[- - -]
2 syllable	[- \]	[- - -]
3 syllable	[- - \]	[- - - -]
Prefix+1 syllable	[- \]	[- - - -]
Prefix+2 syllable	[- - \]	[- - - - -]
Prefix+3 syllable	[- - - \]	[- - - - -]

H	Noun in Isolation	___ aa be '___ isn't there'
1 syllable	[-]	[/ - -] or [- - -]
2 syllable	[- -]	[- - - -]
3 syllable	[- - -]	[- - - - -]
Prefix+1 syllable	[- -]	[- - - -]
Prefix+2 syllable	[- - -]	[- - - - -]
Prefix+3 syllable	[- - - -]	[- - - - -]

H(L)	Noun in Isolation	___ aa be '___ isn't there'
1 syllable	[\]	[/ - -] or [- - -]
2 syllable	[- \]	[- - - -]
3 syllable	[- - \]	[- - - - -]
Prefix+1 syllable	[- \]	[- - - -]
Prefix+2 syllable	[- - \]	[- - - - -]
Prefix+3 syllable	Unattested	

LH	Noun in Isolation	___ aa be '___ isn't there'
1 syllable	[/]	[/ - -] or [- - -]
2 syllable	[- -]	[- - - -]
3 syllable	Unattested	
Prefix+1 syllable	[- /]	[- / - -]
Prefix+2 syllable	[- - -]	[- - - - -]
Prefix+3 syllable	[- - - -]	[- - - - -]

HL	Noun in Isolation	___ aa be '___ isn't there'
1 syllable	Unattested	
2 syllable	[- \]	[- - - -]
3 syllable	[- - \]	[- - - - -]
Prefix+1 syllable	Unattested	
Prefix+2 syllable	[- - \]	data missing
Prefix+3 syllable	[- - - \]	[- - - - -]

The three-syllable forms contain the very rare sequence of phonetic high to low tone.

This frame assumes the noun is the name of a person

L	Noun in Isolation	___ mɛ kwəŋ ‘___ has left’
1 syllable	[\]	[- \ \]
2 syllable	[- \]	[- - \ \]
3 syllable	[- - \]	[- - - \ \]
Prefix+1 syllable	[- \]	[- - \ \]
Prefix+2 syllable	[- - \]	[- - - \ \]
Prefix+3 syllable	[- - - \]	[- - - - \ \]

H	Noun in Isolation	___ mɛ kwəŋ ‘___ has left’
1 syllable	[-]	[- \ \]
2 syllable	[- -]	[- - \ \]
3 syllable	[- - -]	[- - - \ \]
Prefix+1 syllable	[- -]	[- - \ \]
Prefix+2 syllable	[- - -]	[- - - \ \]
Prefix+3 syllable	[- - - -]	[- - - - \ \]

H(L)	Noun in Isolation	___ mɛ kwəŋ ‘___ has left’
1 syllable	[\]	[- \ \]
2 syllable	[- \]	[- - \ \]
3 syllable	[- - \]	[- - - \ \]
Prefix+1 syllable	[- \]	[- - \ \]
Prefix+2 syllable	[- - \]	[- - - \ \]
Prefix+3 syllable	Unattested	

LH	Noun in Isolation	___ mɛ kwəŋ ‘___ has left’
1 syllable	[/]	[/ \ \]
2 syllable	[- -]	[- - \ \]
3 syllable	Unattested	
Prefix+1 syllable	[- /]	[- / \ \]
Prefix+2 syllable	[- - -]	[- - - \ \]
Prefix+3 syllable	[- - - -]	[- - - - \ \]

HL	Noun in Isolation	___ mɛ kwəŋ ‘___ has left’
1 syllable	Unattested	
2 syllable	[- \]	[- - \ \]
3 syllable	[- - \]	[- - - \ \]
Prefix+1 syllable	Unattested	
Prefix+2 syllable	[- - \]	no data
Prefix+3 syllable	[- - - \]	[- - - - \ \] or [- - - - \ \]

Once again, the rare phonetic high-low sequence appears in the three syllable forms.

L	Noun in Isolation	မာဝဲ ဝဲမာဝဲ ____ 'I've bought ____'
1 syllable	[\]	[____ \]
2 syllable	[- \]	[____ - \]
3 syllable	[- - \]	[____ - - \]
Prefix+1 syllable	[- \]	[____ - \]
Prefix+2 syllable	[- - \]	[____ - - \]
Prefix+3 syllable	[- - - \]	[____ - - - \]

H	Noun in Isolation	မာဝဲ ဝဲမာဝဲ ____ 'I've bought ____'
1 syllable	[-]	[____ -]
2 syllable	[- -]	[____ - -]
3 syllable	[- - -]	[____ - - -]
Prefix+1 syllable	[- -]	[____ - -]
Prefix+2 syllable	[- - -]	[____ - - -]
Prefix+3 syllable	[- - - -]	[____ - - - -]

H(L)	Noun in Isolation	မာဝဲ ဝဲမာဝဲ ____ 'I've bought ____'
1 syllable	[\]	[____ \]
2 syllable	[- \]	[____ - \]
3 syllable	[- - \]	[____ - - \]
Prefix+1 syllable	[- \]	[____ - \]
Prefix+2 syllable	[- - \]	[____ - - \]
Prefix+3 syllable	[- - - \]	[____ - - - \]

LH	Noun in Isolation	မာဝဲ ဝဲမာဝဲ ____ 'I've bought ____'
1 syllable	[/]	[____ -]
2 syllable	[- -]	[____ - -]
3 syllable	Unattested	
Prefix+1 syllable	[- /]	[____ - -]
Prefix+2 syllable	[- - -]	[____ - - -]
Prefix+3 syllable	[- - - -]	[____ - - - -]

HL	Noun in Isolation	မာဝဲ ဝဲမာဝဲ ____ 'I've bought ____'
1 syllable	Unattested	
2 syllable	[\]	[____ - \]
3 syllable	[- \]	[____ - - \]
Prefix+1 syllable	Unattested	
Prefix+2 syllable	[- - \]	[____ - - - \]
Prefix+3 syllable	[- - - \]	[____ - - - - \]

L	Noun in Isolation	မဝဲ ကျိ ___ 'I've sold ___'
1 syllable	[\]	[___ -- \]
2 syllable	[- \]	[___ -- - \]
3 syllable	[-- \]	[___ -- - - \]
Prefix+1 syllable	[- \]	[___ -- - \]
Prefix+2 syllable	[-- \]	[___ -- - - \]
Prefix+3 syllable	[--- \]	[___ -- - - - \]

H	Noun in Isolation	မဝဲ ကျိ ___ 'I've sold ___'
1 syllable	[-]	[___ -- -]
2 syllable	[--]	[___ -- --]
3 syllable	[---]	[___ -- ---]
Prefix+1 syllable	[- -]	[___ -- --]
Prefix+2 syllable	[- --]	[___ -- ---]
Prefix+3 syllable	[- ---]	[___ -- ----]

H(L)	Noun in Isolation	မဝဲ ကျိ ___ 'I've sold ___'
1 syllable	[\]	[___ -- \]
2 syllable	[- \]	[___ -- - \]
3 syllable	[-- \]	[___ -- - - \]
Prefix+1 syllable	[- \]	[___ -- - \]
Prefix+2 syllable	[- - \]	[___ -- - - \]
Prefix+3 syllable	[- - - \]	[___ -- - - - \]

LH	Noun in Isolation	မဝဲ ကျိ ___ 'I've sold ___'
1 syllable	[/]	[___ - -]
2 syllable	[- -]	[___ -- -]
3 syllable	Unattested	
Prefix+1 syllable	[- /]	[___ -- -]
Prefix+2 syllable	[- - -]	[___ -- - -]
Prefix+3 syllable	[- - - -]	[___ -- - - -]

HL	Noun in Isolation	မဝဲ ကျိ ___ 'I've sold ___'
1 syllable	Unattested	
2 syllable	[\]	[___ -- - \]
3 syllable	[- \]	[___ -- - - \]
Prefix+1 syllable	Unattested	
Prefix+2 syllable	[- - \]	[___ -- - - \]
Prefix+3 syllable	[- - - \]	[___ -- - - - \]

Appendix C
Verb phrase paradigms

	H	HL	L
Isolation (Imperative)	[- \] bɔmɔ 'buy'	[- \] lena 'pass'	[- \] kaŋgji 'sell'
Isolation (Nominal)	[- - \] abɔmɔ	[- - \] alena	[- - \] akaŋgji
'We've ____.'	[- - - \] hɔɔ bɔmɔ	[- - - \] hɔɔ lena	[- - - \] hɔɔ kaŋgji
'We've ____ a monkey'	[- - - - \] hɔɔ bɔmɔ kemo	[- - - - \] hɔɔ lena kemo	[- - - - \] hɔɔ kaŋgji kemo
'We had ____.'	[- - - - \] hɔɔ ɛ bɔmɔ	[- - - - \] hɔɔ ɛ lena	[- - - - \] hɔɔ ɛ kaŋgji
'I will ____.'	[- - - \] mɛ na bɔmɔ	[- - - \] mɛ na lena	[- - - \] mɛ na kaŋgji
'I will ____ a monkey.'	[- - - - \] mɛ na bɔmɔ kemo	[- - - - \] mɛ na lena kemo	[- - - - \] mɛ na kaŋgji kemo
'Let them not ____'	[- - -] bɛɛ bɔmɔ	no data	[- - -] bɛɛ kaŋgji
'Let them not ____ a monkey'	[- - - - \] bɛɛ bɔmɔ kemo	no data	[- - - - \] bɛɛ kaŋgji kemo

Subject agreement	_____ (maybe) buy a shelter
1 singular	[- - - -] mɛ ba bɔmɔ mpaŋgjo
2 singular	[- - - -] ɔ ba bɔmɔ mpaŋgjo
3 singular	[- - - -] a ba bɔmɔ mpaŋgjo
1 plural inclusive	[- - - -] bena ba bɔmɔ mpaŋgjo
1 plural exclusive	[- - - -] he ba bɔmɔ mpaŋgjo
2 plural	[- - - -] bi ba bɔmɔ mpaŋgjo
3 plural	[- - - -] be ba bɔmɔ mpaŋgjo

Subject agreement	_____ bought a shelter
1 singular	[- - ̄̄ - -] mε ε bɔmɔ mpaŋgjo
2 singular	[- - ̄̄ - -] ɔ ε bɔmɔ mpaŋgjo
3 singular	[- - ̄̄ - -] a ε bɔmɔ mpaŋgjo
1 plural inclusive	[-̄̄ - - ̄̄̄ - -] benabe ε bɔmɔ mpaŋgjo
1 plural exclusive	[̄̄ - ̄̄̄ - -] he ε bɔmɔ mpaŋgjo
2 plural	[̄̄ - ̄̄̄ - -] bi ε bɔmɔ mpaŋgjo
3 plural	[- - ̄̄̄ - -] be ε bɔmɔ mpaŋgjo

Subject agreement	_____ just bought a shelter
1 singular	[- - - ̄̄̄ - -] mε tii bɔmɔ mpaŋgjo
2 singular	[- - - ̄̄̄ - -] ɔ tii bɔmɔ mpaŋgjo
3 singular	[- - - ̄̄̄ - -] a tii bɔmɔ mpaŋgjo
1 plural inclusive	[-̄̄̄ - - ̄̄̄̄ - -] bena tii bɔmɔ mpaŋgjo
1 plural exclusive	[̄̄̄ - - ̄̄̄̄ - -] he tii bɔmɔ mpaŋgjo
2 plural	[̄̄̄ - - ̄̄̄̄ - -] bi tii bɔmɔ mpaŋgjo
3 plural	[- - - ̄̄̄̄ - -] be tii bɔmɔ mpaŋgjo

Subject agreement	_____ just bought a shelter
1 singular	[¹ ² ³ ⁴ ⁵ ⁶ ⁷ ⁸ ⁹ ¹⁰ ¹¹ ¹² ¹³ ¹⁴ ¹⁵ ¹⁶ ¹⁷ ¹⁸ ¹⁹ ²⁰ ²¹ ²² ²³ ²⁴ ²⁵ ²⁶ ²⁷ ²⁸ ²⁹ ³⁰ ³¹ ³² ³³ ³⁴ ³⁵ ³⁶ ³⁷ ³⁸ ³⁹ ⁴⁰ ⁴¹ ⁴² ⁴³ ⁴⁴ ⁴⁵ ⁴⁶ ⁴⁷ ⁴⁸ ⁴⁹ ⁵⁰ ⁵¹ ⁵² ⁵³ ⁵⁴ ⁵⁵ ⁵⁶ ⁵⁷ ⁵⁸ ⁵⁹ ⁶⁰ ⁶¹ ⁶² ⁶³ ⁶⁴ ⁶⁵ ⁶⁶ ⁶⁷ ⁶⁸ ⁶⁹ ⁷⁰ ⁷¹ ⁷² ⁷³ ⁷⁴ ⁷⁵ ⁷⁶ ⁷⁷ ⁷⁸ ⁷⁹ ⁸⁰ ⁸¹ ⁸² ⁸³ ⁸⁴ ⁸⁵ ⁸⁶ ⁸⁷ ⁸⁸ ⁸⁹ ⁹⁰ ⁹¹ ⁹² ⁹³ ⁹⁴ ⁹⁵ ⁹⁶ ⁹⁷ ⁹⁸ ⁹⁹ ¹⁰⁰ ¹⁰¹ ¹⁰² ¹⁰³ ¹⁰⁴ ¹⁰⁵ ¹⁰⁶ ¹⁰⁷ ¹⁰⁸ ¹⁰⁹ ¹¹⁰ ¹¹¹ ¹¹² ¹¹³ ¹¹⁴ ¹¹⁵ ¹¹⁶ ¹¹⁷ ¹¹⁸ ¹¹⁹ ¹²⁰ ¹²¹ ¹²² ¹²³ ¹²⁴ ¹²⁵ ¹²⁶ ¹²⁷ ¹²⁸ ¹²⁹ ¹³⁰ ¹³¹ ¹³² ¹³³ ¹³⁴ ¹³⁵ ¹³⁶ ¹³⁷ ¹³⁸ ¹³⁹ ¹⁴⁰ ¹⁴¹ ¹⁴² ¹⁴³ ¹⁴⁴ ¹⁴⁵ ¹⁴⁶ ¹⁴⁷ ¹⁴⁸ ¹⁴⁹ ¹⁵⁰ ¹⁵¹ ¹⁵² ¹⁵³ ¹⁵⁴ ¹⁵⁵ ¹⁵⁶ ¹⁵⁷ ¹⁵⁸ ¹⁵⁹ ¹⁶⁰ ¹⁶¹ ¹⁶² ¹⁶³ ¹⁶⁴ ¹⁶⁵ ¹⁶⁶ ¹⁶⁷ ¹⁶⁸ ¹⁶⁹ ¹⁷⁰ ¹⁷¹ ¹⁷² ¹⁷³ ¹⁷⁴ ¹⁷⁵ ¹⁷⁶ ¹⁷⁷ ¹⁷⁸ ¹⁷⁹ ¹⁸⁰ ¹⁸¹ ¹⁸² ¹⁸³ ¹⁸⁴ ¹⁸⁵ ¹⁸⁶ ¹⁸⁷ ¹⁸⁸ ¹⁸⁹ ¹⁹⁰ ¹⁹¹ ¹⁹² ¹⁹³ ¹⁹⁴ ¹⁹⁵ ¹⁹⁶ ¹⁹⁷ ¹⁹⁸ ¹⁹⁹ ²⁰⁰ ²⁰¹ ²⁰² ²⁰³ ²⁰⁴ ²⁰⁵ ²⁰⁶ ²⁰⁷ ²⁰⁸ ²⁰⁹ ²¹⁰ ²¹¹ ²¹² ²¹³ ²¹⁴ ²¹⁵ ²¹⁶ ²¹⁷ ²¹⁸ ²¹⁹ ²²⁰ ²²¹ ²²² ²²³ ²²⁴ ²²⁵ ²²⁶ ²²⁷ ²²⁸ ²²⁹ ²³⁰ ²³¹ ²³² ²³³ ²³⁴ ²³⁵ ²³⁶ ²³⁷ ²³⁸ ²³⁹ ²⁴⁰ ²⁴¹ ²⁴² ²⁴³ ²⁴⁴ ²⁴⁵ ²⁴⁶ ²⁴⁷ ²⁴⁸ ²⁴⁹ ²⁵⁰ ²⁵¹ ²⁵² ²⁵³ ²⁵⁴ ²⁵⁵ ²⁵⁶ ²⁵⁷ ²⁵⁸ ²⁵⁹ ²⁶⁰ ²⁶¹ ²⁶² ²⁶³ ²⁶⁴ ²⁶⁵ ²⁶⁶ ²⁶⁷ ²⁶⁸ ²⁶⁹ ²⁷⁰ ²⁷¹ ²⁷² ²⁷³ ²⁷⁴ 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Clauses sorted by mood, perfectivity, auxiliary tone and verbal tone.

Indicative, Perfect, No Auxiliary

L-(L) verb

[[̄] - - - -]
mɔɔ bɔmɔ mpaŋgjo
<i>I have bought a shelter.</i>

H-(L) verb

[[̄] - - - -]
mɔɔ kaŋgji mpaŋgjo
<i>I have sold a shelter.</i>

H-L verb

[[̄] - - - -]
mɔɔ lena mpaŋgjo
<i>I have passed a shelter.</i>

Indicative, Perfect, Low Auxiliary

L-(L) Verb

[[̄] - - - -]
mɔɔ ba kaŋgji mpaŋgjo
<i>I've sold a shelter (nuance: doubt)</i>
[[̄] - - - -]
mɔɔ bɔ kaŋgji mpaŋgjo
<i>I've sold a shelter (long ago).</i>
[[̄] - - - -]
mɔɔ kwa kaŋgji mpaŋgjo
<i>But I sold a shelter.</i>
[[̄] - - - -]
mɔɔ le kaŋgji mpaŋgjo
<i>I've already sold a shelter.</i>
[[̄] - - - -]
mɔɔ nja kaŋgji mpaŋgjo
<i>I've first sold a shelter.</i>

H-(L) Verb

[[̄] [̄] - - -]	მავ	ბა	ბამავ	მპაჲგჯი	<i>I've bought a shelter (nuance: doubt).</i>
[[̄] [̄] - - -]	მავ	ბავ	ბამავ	მპაჲგჯი	<i>I've bought a shelter (long ago).</i>
[[̄] [̄] - - -]	მავ	კვა	ბამავ	მპაჲგჯი	<i>But I bought a shelter.</i>
[[̄] [̄] - - -]	მავ	ლე	ბამავ	მპაჲგჯი	<i>I've already bought a shelter.</i>
[[̄] [̄] - - -]	მავ	ნჯა	ბამავ	მპაჲგჯი	<i>I've first bought a shelter.</i>

H-L Verb

[[̄] [̄] - - -]	მავ	ბა	ლენა	მპაჲგჯი	<i>I've passed a shelter (nuance: doubt)</i>
[[̄] [̄] - - -]	მავ	ბავ	ლენა	მპაჲგჯი	<i>I've passed a shelter (long ago).</i>
[[̄] [̄] - - -]	მავ	კვა	ლენა	მპაჲგჯი	<i>But I passed a shelter.</i>
[[̄] [̄] - - -]	მავ	ლე	ლენა	მპაჲგჯი	<i>I've already passed a shelter.</i>
[[̄] [̄] - - -]	მავ	ნჯა	ლენა	მპაჲგჯი	<i>I've first passed a shelter.</i>

Indicative, Perfect, High Auxiliary
L-(L) Verb

[[̄] - - - [̄] - -]
မသံ သွဂိ ကာဂ်ဂိ မာဂ်ဂိ <i>I've simply sold a shelter.</i>
[[̄] - - - [̄] - -]
မသံ နကွာ ကာဂ်ဂိ မာဂ်ဂိ <i>I've quickly sold a shelter.</i>

H-(L) Verb

[[̄] - - - [̄] - -]
မသံ သွဂိ ဝံဝံ မာဂ်ဂိ <i>I've simply bought a shelter.</i>
[[̄] - - - [̄] - -]
မသံ နကွာ ဝံဝံ မာဂ်ဂိ <i>I've quickly bought a shelter.</i>

H-L Verb

[[̄] - - - [̄] - -]
မသံ သွဂိ လော မာဂ်ဂိ <i>I've simply passed a shelter.</i>
[[̄] - - - [̄] - -]
မသံ နကွာ လော မာဂ်ဂိ <i>I've quickly passed a shelter.</i>

Indicative, Perfect, Toneless Auxiliary

L-(L) Verb

[[̄] - - - [̄] - -]
မသံ ε ကာဂ်ဂိ မာဂ်ဂိ <i>I have sold a shelter.</i>

H-(L) Verb

[[̄] - - - [̄] - -]
မသံ ε ဝံဝံ မာဂ်ဂိ <i>I have bought a shelter.</i>

H-L Verb

[[̄] - - - [̄] - -]
မသံ ε လော မာဂ်ဂိ <i>I have passed a shelter.</i>

Indicative, Low Auxiliary

L-(L) Verb

[- - - - - -]
mɛ nja kəŋɡji mpaŋɡjo
<i>I first sold a shelter.</i>

[- - - - - -]
mɛ bə kəŋɡji mpaŋɡjo
<i>I sold a shelter</i>

[- - - - - -]
mɛ mi kəŋɡji mpaŋɡjo
<i>I am starting to sell a shelter.</i>

H-(L) Verb

[- - - - - -]
mɛ nja bəmo mpaŋɡjo
<i>I first bought a shelter.</i>

[- - - - - -]
mɛ bə bəmo mpaŋɡjo
<i>I bought a shelter.</i>

[- - - - - -]
mɛ mi bəmo mpaŋɡjo
<i>I am starting to buy a shelter.</i>

H-L Verb

[- - - - - -]
mɛ nja lena mpaŋɡjo
<i>I first passed a shelter.</i>

bə
<i>Data unavailable.</i>
[- - - - - -]
mɛ mi lena mpaŋɡjo
<i>I am starting to pass a shelter.</i>

Indicative, High Auxiliary

L-(L) Verb

[- - - -]
mε tii kəŋgji mpaŋgjo
<i>I just sold a shelter.</i>

[- - - -]
mε luga kəŋgji mpaŋgjo
<i>I subsequently sell a shelter.</i>

[- - - -]
mε sugi kəŋgji mpaŋgjo
<i>I'll just sell a shelter. (nuance: resolve)</i>

H-(L) Verb

[- - - -]
mε tii bəmə mpaŋgjo
<i>I just bought a shelter.</i>

[- - - -]
mε luga bəmə mpaŋgjo
<i>I subsequently buy a shelter.</i>

[- - - -]
mε sugi bəmə mpaŋgjo
<i>I'll just buy a shelter. (nuance: resolve).</i>

H-L Verb

[- - - -]
mε tii lena mpaŋgjo
<i>I just passed a shelter.</i>

<i>Data unavailable.</i>

[- - - -]
mε sugi lena mpaŋgjo
<i>I'll just pass a shelter. (nuance: resolve)</i>

Indicative, Toneless Auxiliary
L-(L) Verb

[- - - -] mε ε kaŋgji mpaŋgjo <i>I sold a shelter</i>
[- - - -] mε di kaŋgji mpaŋgjo <i>I am selling a shelter.</i>

[- - - -] mε di kaŋgji mpaŋgjo <i>I sell a shelter (habitually).</i>
--

H-(L) Verb

[- - - -] mε ε bɔmɔ mpaŋgjo <i>I bought a shelter.</i>
[- - - -] mε di bɔmɔ mpaŋgjo <i>I am buying a shelter.</i>

[- - - -] mε di bɔmɔ mpaŋgjo <i>I buy a shelter (habitually).</i>

H-L Verb

[- - - -] mε ε lena mpaŋgjo <i>I passed a shelter</i>
[- - - -] mε di lena mpaŋgjo <i>I am passing a shelter.</i>

[- - - -] mε di lena mpaŋgjo <i>I pass a shelter (habitually).</i>
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Indicative, H(L) Auxiliary

L-(L) Verb

[⁻ ⁻ ⁻ ⁻ ⁻ ⁻]
me na kaṅgi mpaṅgjo
<i>I will sell a shelter.</i>

H-(L) Verb

[⁻ ⁻ ⁻ ⁻ ⁻ ⁻]
me na bɔmɔ mpaṅgjo
<i>I will buy a shelter.</i>

H-L Verb

[⁻ ⁻ ⁻ ⁻ ⁻ ⁻]
me na lena mpaṅgjo
<i>I will pass a shelter.</i>

Subjunctive, Low Auxiliary

L-(L) Verb

[⁻ ⁻ ⁻ ⁻ ⁻ ⁻]
me ba kaṅgi mpaṅgjo
<i>I think I'll sell a shelter.</i>

[⁻ ⁻ ⁻ ⁻ ⁻ ⁻]
me kwa kaṅgi mpaṅgjo
<i>On the contrary, let me sell a shelter.</i>

[⁻ ⁻ ⁻ ⁻ ⁻ ⁻]
me nja kaṅgi mpaṅgjo
<i>Let me first sell a shelter.</i>

H-(L) Verb

[⁻ ⁻ ⁻ ⁻ ⁻ ⁻]
me ba bɔmɔ mpaṅgjo
<i>I think I'll buy a shelter.</i>

[⁻ ⁻ ⁻ ⁻ ⁻ ⁻]
me kwa bɔmɔ mpaṅgjo
<i>On the contrary, let me buy a shelter.</i>

[⁻ ⁻ ⁻ ⁻ ⁻ ⁻]
me nja bɔmɔ mpaṅgjo
<i>Let me first buy a shelter.</i>

H-L Verb

[- - - -] me ba lena mpaŋgjo <i>I think I'll pass a shelter.</i>
kwa <i>Data unavailable</i>
[- - - -] me nja lena mpaŋgjo <i>Let me first pass a shelter.</i>

Subjunctive, High Auxiliary

L-(L) Verb

[- - - - - -] me ŋkwa kaŋgji mpaŋgjo <i>Let me quickly sell a shelter.</i>
[- - - - - -] me sugi kaŋgji mpaŋgjo <i>Let me simply sell a shelter.</i>

H-(L) Verb

[- - - - - -] me ŋkwa bɔmɔ mpaŋgjo <i>Let me quickly buy a shelter.</i>
[- - - - - -] me sugi bɔmɔ mpaŋgjo <i>Let me simply buy a shelter(subjunctive).</i>

H-L Verb

ŋkwa <i>Data unavailable.</i>
[- - - - - -] me sugi lena mpaŋgjo <i>Let me simply pass a shelter.</i>

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