LEXICAL AND POST-LEXICAL PITCH FEATURES IN IṢẸKÍRÌ OF DELTA STATE, NIGERIA

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CERTIFICATION

I certify that this research was carried out by Oludewa Roselyn OSEWA in the Department of Linguistics and African Languages, Faculty of Arts, University of Ibadan, Nigeria, under my supervision.

……………………………………………

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DEDICATION

This work is dedicated to God Almighty; to God the Father, God the Son and God the Holy Spirit.

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ABSTRACT

Pitch, a vital factor in the determination of tone, stress and intonation, which places utterances on a scale ranging from low to high, is an important feature of Iṣẹkírì, a Yoruboid language. Extant studies on Iṣẹkírì, have largely been on the syntax and segmental phonology, with little attention paid to the pitch variations of its tone and intonation. This study was, therefore, designed to examine tone and intonation in Iṣẹkírì, with a view to determining the nature of the tonal system, the mechanisms employed in the realisation of tonal contours, and the interaction of tone and intonation.

The study adopted Acoustic Phonetic Approach and Optimality Theory as the framework. The ethnographic design was employed. Data were elicited from 17 native speakers (10 males and seven females) purposively selected for their proficiency in Iṣẹkírì and duration of stay in three near homogenous communities: Abigborodo (6), Gbokoda (6) and Gbodo (5). Digital recordings of elicited and natural conversation of speech were converted to .wav format. Each measurement provided five tokens of each item of the paradigms. Data were subjected to statistical and philological analyses.

Iṣẹkírì has a three-way contrastive pitch system comprising High (H), Mid (M) and Low (L) tones. The mid tone is in asymmetry to high and low tones. Tone asymmetry is adequately accounted for by the constraint hierarchy MAX[H]>>*H↔M, *M↔H, *L↔H, *M↔L >> MAX[L] >>*MULTIPLE>> MAX[M]. Tonological operations include Leftward High Tone Spread and Rightward High Tone Spread (RHTS). The RHTS is sensitive to tone type and number of syllables with a tonal melody of LL or LLL. The F_0 mechanisms of declination, final lowering and downstep define contour formations. Declination significantly affects mid and low tones, but not the high tone, which has a better fit of regression model (R^2 =0.9) and a -0.678 regression line slope. Boundary tones used to distinguish declaratives from different question types are 0% for statement intonation and L% for question intonation. Contrary to cross-linguistic evidence, the Iṣẹkírì polar question shows a final fall in pitch, which occurs late in the utterance and a lack of suspension of downstep. There is a consistent effect of initial pitch-raising in Yes/No questions, which is accompanied by final syllable lengthening and increased acoustic intensity. Complex declaratives show a partial pitch reset at the left edge of an embedded ι-phrase. The intonational phrase, which is marked by a pause and pitch reset, is the only unit above the prosodic word. Underlying lexical tones are not affected by intonation with the exception of sentence-final tones of the question intonation. The falling intonation pattern is used across sentences. Tone-intonational strategies include partial submission and avoidance.

Falling intonation in polar questioning and zero boundary tone for statements are diagnostic patterns of Iṣẹkírì of Delta State. The language also operates downstep, bidirectional tone spreading and partial submission in its prosodic phonology.

Keywords: Iṣẹkírì prosody, Final lowering, Intonational phrase, Yoruboid language

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LIST OF ABBREVIATIONS AND SYMBOLS

ASP	-	Aspectual tense
C	-	Consonant
COMP	-	Complementizer
CON	-	Constraint Component
CONJ	-	Conjunction
Cp	-	Complementizer phrase
EVAL	-	Evaluator
F_0	-	Fundamental frequency
FOC	-	Focus
GEN	-	Generator
GR	-	Global raising
HL	-	High-Low
HM	-	High-Mid
HH	-	High-High
IP	-	Intonation phrase
LL	-	Low-Low
LM	-	Low-Mid
LH	-	Low-High
ML	-	Mid-Low
MM	-	Mid-Mid
MH	-	Mid-High
OP	-	Object pronoun
OT	-	Optimality Theory
PREP	-	Preposition
PRON	-	Pronoun
PST	-	Past tense

3SG	-	Third person singular
V	-	Vowel
#	-	Word Boundary
*	-	ungrammaticality and violations of constraints
*!	-	Fatal violation
>>	-	Dominance
☞	-	Shows the optimal candidate
σ	-	Syllable
%	-	Intonational boundary tone
[´]	-	High tone
[`]	-	Low tone
[¯]	-	Mid tone
!	-	Downstep

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Pitch, a vital factor in the determination of tone, stress and intonation, places utterances on a scale ranging from low to high. Languages make use of pitch properties to express linguistic information. What varies is how pitch is systematically used in their phonological system (Yip, 2002; Hayes, 2009). Many African languages remain fruitful areas of research with respect to the insights they offer concerning the nature of tone but the repeated concern with regard to tonal languages is whether pitch variations can be distinguished at the post-lexical level. This study is thus an empirical investigation of the tonal system, tonal behaviour and factors that govern F_0 contours in Iṣẹ̣kírì based on acoustic evidence.

Tone languages utilize pitch differences to express lexical contrasts. An understanding of the linguistic use of pitch in earlier conclusions on the tone typology of Iṣẹ̣kírì derives from impressionistic tonemic analyses (Omamor, 1979; Osewa, 2016). The present study revisits the generalisations obtained from these works by providing empirical evidence from acoustic investigations seeking to validate the prevalent assumptions for Iṣẹ̣kírì, including the tonal contrasts. It thus explores the acoustic values of the pitch properties that characterize given tone types and provides clearer descriptions to justify the tonemic characterizations and also provides empirical justification. The phonological, morphological and syntactic environments that condition the behaviour of tones and tonal processes are considered for an adequate tonal description. Thus both perceptual and instrumental analysis are considered in the description of word-level tonal phenomena in this study.

Pitch variations can be employed in the region of an utterance in which case intonation is referred to. These pitch differences harnessed within the domain of the utterance show the extent to which the selection of factors that contribute to the surface forms of tones in connected speech varies among languages. Pitch lowering phenomena play a crucial role in the realization of intonation in tone languages as intonation is used to indicate post-lexical discoursal meaning, like sentence type and information structure. Interesting issues in the study of the realization of intonation in tone languages include strategies employed by tone languages to either resolve or avoid possible conflicts in the interaction of tone and intonation since both have pitch features (Connell, 2017). This study is intended to discover the intonation patterns evident in Iṣẹkírì.

In the consideration of concerns on Iṣẹkírì phonology, we shall take opportunity of existing works in Yoruba linguistics to raise interesting points of interest significant to Iṣẹkírì. Iṣẹkírì however diverges in interesting ways from Yoruba and may contribute significant data in resolving knotty issues in Yoruba phonology. This study offers a rich potential of an understanding of issues of the study of the dual function of pitch (tone and intonation) in tonal languages.

1.1.1 The language of the study

The Iṣẹkírì language is classified as a Yoruboid language. It is a member of the Benue-Congo family within the Niger-Congo phylum (Williamson, 1988). It is spoken in areas around Warri, Sapele and the Benin River in Warri North, Warri Southwest and Warri South Local Government areas of present-day Delta State in Nigeria by a group known as the Iṣẹkírì. Its speakers inhabit an area of about 3936.8 square kilometres located in the westernmost parts of Delta State bounded approximately by latitudes 5˚20 and 6˚ North and longitudes 5˚51 and 5˚40 East (Sagay, 1981). The language shares boundaries with the Ijo in the South, the Edo in the North, the Urhobo in the East and the Yoruba (Ilaje) in the West. History suggests that the Iṣẹkírì Kingdom was founded about 1480 AD and the kingdom was based on a well-established monarchy structure before the advent of British colonial rule, and this system of administration remains to date (Eyeoyibo, 2008).

The Iṣẹ̀kírì people have been referred to as Djekiri, Jekiri, Shekiri, Ighereje and Iṣẹ̀kírì in the past (Oghaerumi, 2010). The name has been differently spelt as Itsekiri and Iṣẹ̀kírì.

This study adopts the name Iṣẹ̀kírì for a number of reasons. First, the name is synchronically pronounced as [īʃɛ̄kírì] and not [itʃɛkírì] as the voiceless alveolar stop is not present in the pronunciation. While there is the possibility of the presence of [t] historically which has been lost as a result of ease of pronunciation by the early missionaries, synchronically, [t] is absent in the pronunciation. In addition, other Yoruboid languages such as Yoruba in their orthography represent [ʃ] as ṣ, therefore, for the purpose of uniformity with these other Yoruboid languages, this study represents [ʃ] as ṣ and uses the name Iṣẹ̀kírì.

Although the location in space of Iṣẹ̀kírì speakers is not geographically contiguous with the major Yoruba speaking communities terrestrially, the language is bordered by the Ilaje from the sea and is undoubtedly closely related to Yoruba which accounts for its sometimes being classified as a dialect of Yoruba. Lexical correspondences in some verbs provide evidence of closeness in Table 1.1.

The high degree of relationship between Iṣẹ̀kírì and Yoruba notwithstanding, the language possesses unique features significant enough to establish its autonomy. Some of these features can be seen in the different lexical items for food items shown in Table 1.2.

Table 1.1. Verbs in Yoruba and Iṣẹkírì

Yoruba	**Iṣẹkírì**	**Gloss**
Kọ́ /kɔ́/	Kọ́ /kɔ́/	Build
Ṣe /ʃē/	Ṣe /ʃē/	Make
Wá /wá/	Wá /wá/	Come
Sè /sè/	Sè /sè/	Cook
Sùn /sũ̀/	Sùn /sũ̀/	Sleep
Gbálẹ̀ /g͡bálɛ̀/	Gbálẹ̀ /g͡bálɛ̀/	Sweep
Tì /tì/	Tìn/ tĩ̀/	Push
Dà /dà/	Dà /dà/	Pour
Lọ̀ /lɔ̀/	Lọ̀ /lɔ̀/	Grind
Kú /kú/	Kú /kú/	Die

Table 1.2. Food items in Yoruba and Iṣẹkírì

Yoruba	**Iṣẹkírì**	**Gloss**
Iṣu /īʃū/	orúsùn/ōrúsũ̀/	Yam
Ọ̀gẹ̀dẹ̀/ɔ̀gɛ̀dɛ̀/	Atan /ātẫ/	Plantain
Iyọ̀ /ījɔ̀/	uwanguẹ́/ūwã̄gwɛ́/	Salt
Ẹyin/ɛ̄jī̃/	Eghen /ɛ̄ɣɛ̃̄/	Egg
Ilá /īlá/	Ìkàràbọ̀/ìkàrã̀bɔ̀/	Okro
Àgbàdō /àg͡bàdō/	Imíyò /īmíjò/	Maize
Ata /ātā/	ogoló /ōgōló/	Pepper
ewúro /ēwúrō/	orúgbò /ōrúg͡bò/	Bitter leaf
Ẹ̀pà /ɛ̀k͡pà/	Isángùẹ̀/īsã́gwɛ̀/	Groundnut
egusi /ēg͡úsí/	ikpogiri /īk͡póg͡ìrì/	Melon

While some lexical differences are Edoid, the import of this is negligible. In Osewa and Ikhimwin (2017), a statistical comparison of the basic lexical items in Yoruba, Edo and Iṣẹkírì was presented. It was shown in the study that the degree of relatedness between Yoruba and Iṣẹkírì based on percentage of cognates is 46.05% and that, between Edo and Iṣẹkírì is 15.79%. This percentile value is less than the 80% benchmark proposed in Grimmes (1988) for a speech form to be regarded as a dialect of a language using the lexico- statistical technique. Lexical correspondences in some food items for Edo and Iṣẹkírì are shown in Example 1.1.

Example 1.1

Edo	**Iṣẹkírì**	**Gloss**
Ìnyá [ìɲã́]	Orúsùn/ōrúsũ̀/	Yam
Ọ̀ghẹ̀dẹ̀ [ɔ̀ɣɛ̀dɛ̀]	Atan /ātã̂/	Plantain
ùmwẹ́ [ùɱɛ̃́]	Uwanguẹ́ /ūwã̄gwɛ́/	Salt
Èkẹ́n [èkɛ̃́]	Eghen /ɛ̄ɣɛ̃̄/	Egg
Íkhiávbọ̀ [íxjáβɔ̀]	Ìkàràbọ̀/ìkàrã̀bɔ̀/	Okro
Ọ́kà [ɔ́kâ]	Imíyò /īmíjò/	Maize
Ẹ̀hiẹ́n [ɛ̀hjɛ̃́]	Ogoló /ōgōló/	Pepper
Ízẹ̀ [ízɛ̂]	Ẹroso /ɛrósò/	Rice
Ìsáẹ́wẹ̀ [ìsáɛ́wɛ̀]	Isángúẹ̀/īsã́gwê/	Groundnut
Ígárí [ígá!ɹí]	Igari /gārí/	Garri
Ùsí [ùsí]	Usín /ūsĩ́/	Starch

Some of the significant differences seen between the Iṣẹkírì language and Yoruba may be due mainly to influences from the Portuguese, the Edo and the Urhobo languages, with which Iṣẹkírì has had contact (Sagay, 1981). Although Iṣẹkírì is spoken in about 23 communities, the language does not possess identifiable varieties as only a single form is spoken by all. There are no regional varieties although the existence of sociolects is suspect. Accordingly, it could readily be described as monolithic (Omamor, 1979; Ogharaerumi,2010).

The diagrams below represent location of Iṣẹkírì in the Benue-Congo family tree (see Fig.1.1) and in the map of Nigeria's Delta State showing Iṣẹkírì land (see Fig.1.2).

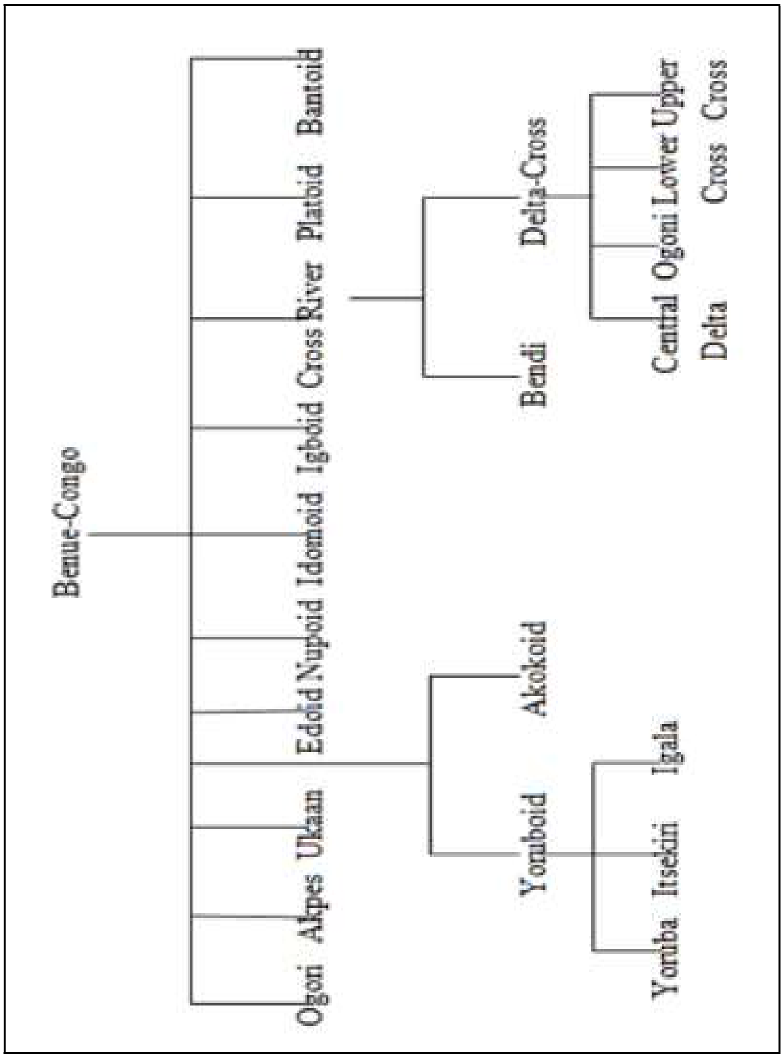


Fig. 1.1. Benue-Congo family tree (Williamson, K. 1989. The Niger-Congo overview. *The Niger-Congo Languages: A Classification and Description of Africa's Largest Language Family* J. Bendor-Samuel Ed. 3-46.)

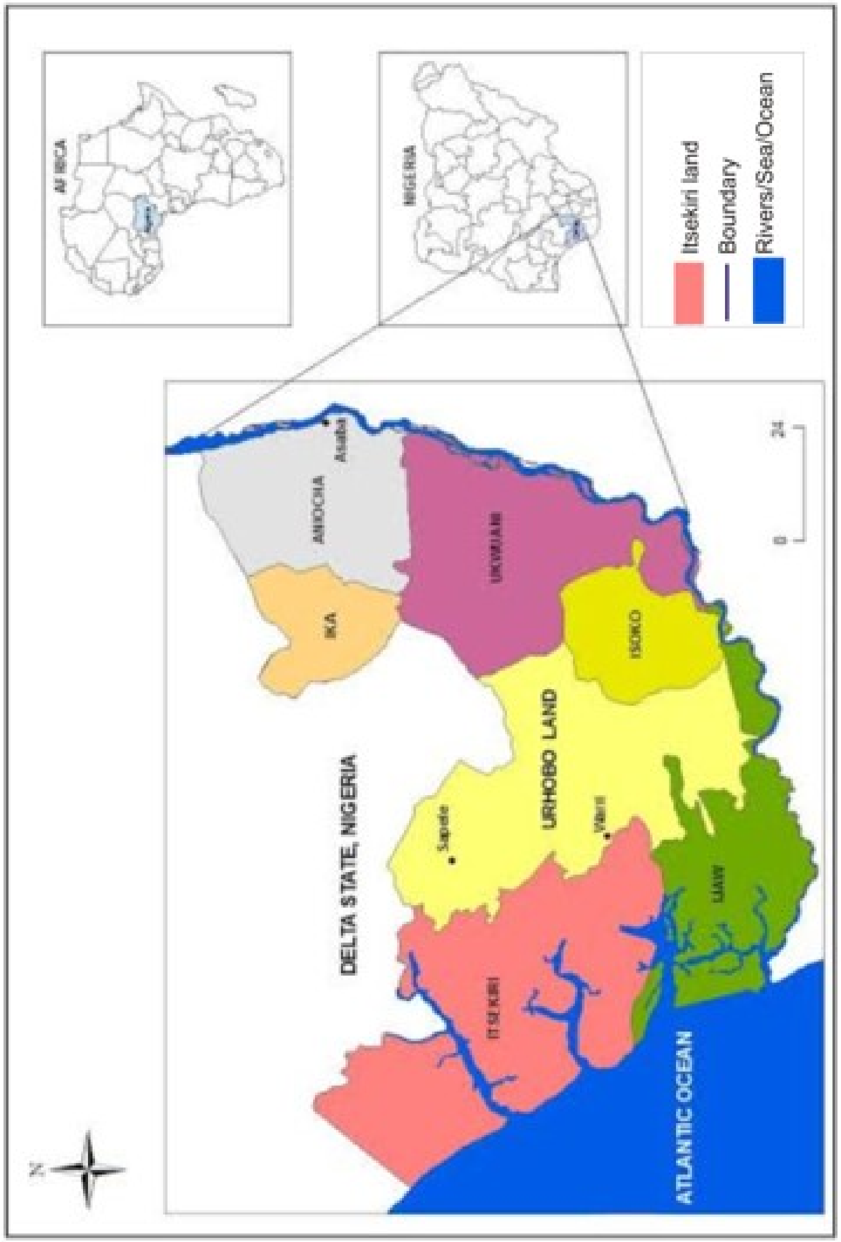


Fig. 1.2. Map of Delta State, showing Iṣẹ̀kírì land (Odemerho, F. 2007. *Delta State in maps*. Retrieved Mar.16, 2016 from https://www.siue.edu.)

1.2 Statement of the problem

A number of African languages have received a lot of research attention in the area of the prosodic feature known as tone (Hyman, 1975; Egbokhare, 1990; Laniran, 1992; Odden, 1995; Yip, 2002; Gussenhoven, 2004). While this is true for Yoruba, the same cannot be said for the Iṣẹkírì language. There is the belief that Iṣẹkírì shares and perhaps replicates the fundamental characteristics of Yoruba and that any study of Iṣẹkírì may simply be replicating existing works on Yoruba and its dialects. Even if this were true, Iṣẹkírì holds a potential for providing fresh insights into Yoruba dialectology. However, from preliminary studies in this work, there are reasons to expect interesting divergences in the prosody due to the isolation of the language in hardly accessible terrain of the creek and influence from Edo, Urhobo and Ijaw languages. Gaps in research on Iṣẹkírì include poor documentation and discussion, lack of comprehensive data and inadequate analysis for understanding the place of Iṣẹkírì. Improved tools, methodologies and theories provide greater opportunities for adding to theoretical insight and improving our typological knowledge of African languages.

A comprehensive analysis of Iṣẹkírì tonal phonology is yet to be provided. A number of undergraduate projects on the language focus on identifying the phonemes and phonological processes of the language (Otokunefor, 2002; Samuel, 2011; Ijama, 2014; Iraye, 2014) without recourse to a tonal analysis. The first significant work on Iṣẹkírì phonology (Omamor, 1979) provides a documentation and discussion of the language's tonal system. However, there are challenges in Omamor (1979:216) because she holds that "In any sequence of vowels involving two different tones, the lower tone usually gets elided… [which] means that L is always elided no matter what it combines with." A problem arises with this claim in terms of data as synchronic data from Iṣẹkírì suggests otherwise and bring to light the need for a detailed perceptual and acoustic study of tone and tonal processes in Iṣẹkírì. Therefore, an acoustic investigation to determine the tonal units, tone system and tonal behaviour in Iṣẹkírì is needed to expand the understanding of tone in the language.

A lack of consistency in theoretical explanation in the study of tone asymmetry has engendered a lot of argument on the nature of the M tone in Yoruba. Various scholars have proposed an analysis of the asymmetric behaviour of the Mid tone within different theoretical approaches namely, a Contrastive Specification theory (Steriade, 1987; Mester and Itô, 1989 in Peng, 2013), an Underspecification theory (Akinlabi, 1985; Pulleyblank, 1986), a Tone Fusion analysis (Turner, 2006), and an analysis that encodes a scale of tonal markedness into the formulation of faithfulness constraints (Pulleyblank, 2004). These approaches have been inadequate in one way or the other, thereby creating a need for a theoretical re-analysis. This study provides greater opportunities for adding to theoretical insight through an analysis of the M tone in Iṣẹkírì within an Optimality Theory (OT) account, that incorporates the grounding conditions in Heiberg (1999) to develop constraints of implicational statements. It is hoped that this will resolve the problem of competing theoretical explanations.

There is increased research interest in intonation in tone languages (Lindau, 1986; Connell and Ladd, 1990; Laniran, 1992; Fajobi, 2005; Zerbian and Barnard, 2008; Genzel, 2013; Kügler, 2017, Downing, 2017). Despite a rising scholarly interest in intonation in these languages, there is a dearth of literature in this regard in Nigerian languages. A comprehensive study of intonational phenomena in Iṣẹkírì promises to enlarge understanding and offer insights into the dynamics of relationships between tone, intonation and grammatical behaviour that can become a template for larger comparative studies in related languages. This study therefore examines and identifies possible factors that shape F_0 contour and determines if Iṣẹkírì as a tone language exhibits specific patterns of intonation through phenomena such as downdrift, downstep and declination. It investigates the degree to which the Iṣẹkírì intonation pattern corresponds to the intonation system of other tone languages thus substantiating the claim for the description of intonation systems separate from tone systems in tone languages.

1.3 Aim and objectives of the study

This work sets out to examine tone and intonation in Iṣẹkírì in order to advance analytic research in the language with the following objectives:

a) Account for the nature of the tonal system in Iṣẹkírì.

b) Examine the behaviour of the Mid tone and employ a theoretical approach that best accounts for tone asymmetry.
c) Determine the mechanisms employed for the realization of F_0 contours in Iṣẹkírì.
d) Analyze the intonation patterns evident in the language.
e) Explain the tone-intonation relationship in the language.

1.4 Research questions

Against the above objectives, this study addresses the following questions:

a) What is the nature of the Iṣẹkíri tonal system?
b) How does the M tone behave differently from the high and low tones in Iṣẹkírì and how does one best explain tone asymmetry?
c) What mechanisms does the language employ for the realization of F_0 contours?
d) How does intonation patterns in Iṣẹkírì manifest?
e) How does tone and intonation relate in the language?

1.5 Significance of the study

This study advances knowledge on Iṣẹkírì prosody. Prior works have not extensively examined tonal phenomenon in Iṣẹkírì. This study provides an acoustic description of the language's tonal grammar, which it is hoped, will present a more accurate account of its tone system. Apart from the mention of the fact that Isẹkírì contrasts three level tones and has particular tone patterns (Omamor, 1979; Osewa, 2016), tonal processes such as downdrift and downstep which this study identified and described in the language have hitherto been left unattended to.

One major importance of this study is the theoretical re-analysis of tone asymmetry. The proposal of an OT version that incorporates grounding conditions as constraints of implicational statements for an analysis of M tone asymmetry is a notable input of this study to Yorubiod studies and phonological theorizing. This is because it clears up concerns raised in previous proposals and analysis in some Yoruba data.

This study at a higher level of prosody exhibit features of intonation in Iṣẹ̀kírì that can contribute to typological classification. Rialland (2007) presented a database of 78 languages on question prosody in African languages. Interest is nevertheless on more languages in published and unpublished works including dissertstations for typological goupings. This study offers empirical evidence and data from its investigation that is appropriate for inclusion in the corpora of an African perspective on question prosody.

Also, this work will help to fill the gap of formal studies or research on the Iṣẹkírì language and will serve as a reference point to other researchers or students, most especially, post graduate students who are interested in the language and in tonal behaviour or intonation in tone languages. In addition, this work will aid teachers and language analysts interested in studying the language by providing adequate information about the tonal structure of the language.

1.6 Scope of the study

This section presents the limit within which this study was conducted. This is important because it makes clear the reason particular data were gathered and defines what can be accomplished in a reasonable amount of time. This study examines two supra-segmental features in the Iṣẹkírì phonological grammar. It concerns itself with the nature of tone and intonation in the language and therefore examines lexical tones and their interactions in lexical items and grammatical constructions. Different grammatical constructions are used to show deletion in different environments and the corresponding behaviour of the mid tone observed. The tonal distribution of lexical categories is also examined. Declarative and interrogative sentences are considered to determine the mechanisms employed in the realization of pitch contours.

1.7 An overview of Iṣẹkírì segmental phonology

An outline of the phonological structure of segments and syllables in Iṣẹkírì is presented here. This is necessary because although this study focuses on phenomena beyond the segment, the segments are the skeletal structure for the syllable and the syllable is the tone bearing unit in Iṣẹkírì as will be shown in Section 1.8.2.

1.7.1 The sound system of Iṣẹkírì

The two main classes of speech sounds are the consonants and vowels. The sound segments of Iṣẹkírì, like all languages, include consonants and vowels.

1.7.1.1 Consonants in Iṣẹkírì

The Iṣẹkírì consonant inventory consists of twenty (20) phonemic consonants produced at seven places of articulation, namely, bilabial, labio-dental, alveolar, palato-alveolar, palatal, velar and labial-velar. The manners of articulation utilized in the language are plosive, fricative, affricate, nasal, trill, lateral and approximant. Two of the twenty consonants are nasals (/m/ and /n/), while the others are oral sounds. The consonants in the language are presented in the chart in Table 1.3.

Table 1.3. An Iṣẹ̀kírì phonemic consonant chart

	Bilabial	Labiodental	Alveolar	Palato-Alveolar	Palatal	Velar	Labial-Velar
Plosive	p b		t d			k g	k͡p g͡b
Affricate				dʒ			
Nasal	m		n				
Fricative		f v	s	ʃ		ɣ	
Trill/Tap			r				
Lateral			l				
Approximant					j		w

(The reseacher, 2022)

Omamor (1979) identified eighteen phonemic consonant sounds namely /p b t d k g k͡p gb j m s ʃ f ɣ r l y w/. This phonemic consonant inventory excludes /n/ and /v/ as /n/ and /l/ are said to be in complementary distribution (Omamor, 1979: 202). The current study holds that although /n/ and /l/ alternate in certain environments in Iṣẹkírì, they are both phonemic in the language.

Evidence for the inclusion of /n/ in the phonemic inventory of the Iṣẹkírì language is evinced from the formation of deverbal nouns where nasality is shown to be stable in [n] relative to other sonorants [r] [w] and [j]. In deverbal noun formation, the consonant [n] of the verb stem is always copied even when the verb stem has a high or a non-high vowel but this is not the case with other sonorants (Akinlabi, 2000). Following a similar analysis for Yoruba in Akinlabi (2000), examples (1.2) and (1.3) show deverbal noun formation in Iṣẹkírì.

Example 1.2:

a) rín 'laugh' ― rírín [rírĩ́] 'laughing' ― *rínrín *[rĩ́rĩ́]

b) wẹ́n 'borrow' ― wíwẹ́n [wíwɛ̃́] 'borrowing' ― *wínwẹ́n *[wĩ́wɛ̃́]

c) yan 'smoke (fish)' ― yíyan [jíjã̄] 'smoking' ― *yínyan *[jĩ́jã̄]

The vowel of the prefix in Example 1.2 are oral vowels. An acoustic evidence of this for *rírín* [rírĩ́] 'laughing'is shown in Figure 1.3.

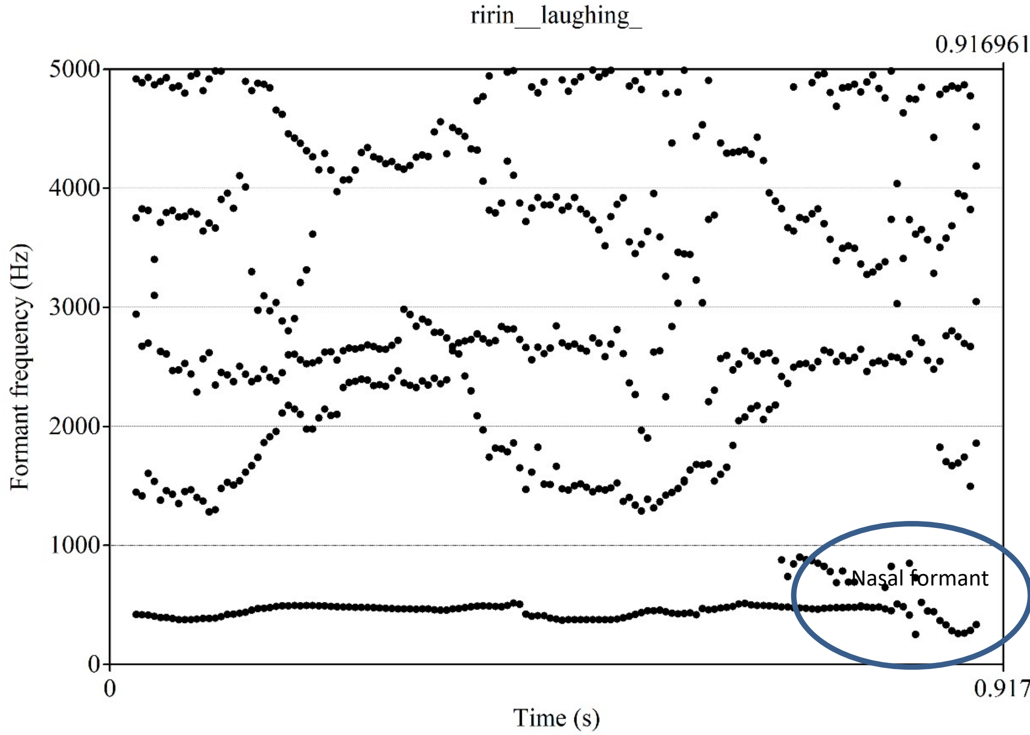


Fig.1.3. Formant graph for *rírín* [rírĩ́] ‘laughing’

When the stem consonant is [n], the nasality carries over to the prefix. This is not what is expected if the underlying form of the verb has /l/.

Example 1.3:

a) nẹ́ ‘have’ nínẹ́ ‘having’ [nĩ́nɛ̃́] * línẹ́ *[lĩ́nɛ̃́]

b) ná ‘spend’ níná ‘spending’ [nĩ́nã́] * líná *[lĩ́nã́]

c) ní ‘wear’ níní ‘wearing’ [nĩ́nĩ́] *líní *[lĩ́nĩ́]

d) nẹ̀ ‘send’ nínè ‘sending’ [nĩ́nɛ̃̀] *línẹ̀ *[lĩ́nɛ̃̀]

e) nọ̀ ‘clean’ nínọ̀ ‘cleaning’ [nĩ́nɔ̃̀] *línọ̀ *[lĩ́nɔ̃̀]

The nasality of the vowel [i] of the prefix has to be from the preceding [n] and the reason for this is that it is underlying. In the other sonorants, the prefix consonant remains oral as shown in the formant graph in Figure 1.3.

The phonemic status of /n/ is also revealed in the restricted nature of the n/l alternation (Oyelaran, 1976). Support for this position is evident in Iṣẹkírì in the morphemes *ni*, *nẹ*, *na*, where the n/l alternation is restricted. An instance of this is given in the example below.

Example 1.4:

ni ‘strong’ and *ní* ‘PREP’

a) Tójù **ni** ejú Tójù **l’**ejú ([n]alternates with /l/)

strong eye

‘Tójù is mean’

b) Tójù rí Báwò **ní** òboǹ *Tójù rí Báwò **lí** òbòn *Tójù rí Báwò **l’** óbòn (no n/l alternation)

See Prep market

‘Tójù saw Báwò in the market’.

These evidences demonstrate the claim for the recognition of /n/ as a phoneme thus proving that /l/ and /n/ are phonemes in the language and the alternation between these two segments is morphophonemic.

Also, the voiced labio-dental fricative /v/ is present in ideophonic words like *vẹ̀kẹ̀* /vɛ̀kɛ̀/ ‘wide’, *veyín* /vɛ̄jĩ́/ ‘large’, *vúvù* /vúvù/ ‘terrific speed’, etc. Thus, the voiced labio-dental fricative is attested in the language. Accordingly, the consonants in the language that are distinctive are twenty as presented in the chart in Table 1.3.

These consonants occur in the following words as shown in example (1.5) drawn from the data in appendix 1.

Example: 1.5

a. /p/	/pìpì/	‘press down`	/ɛ̄púrù/	‘yam porridge’
b. /b/	/bìní/	‘to close’	/ābɛ́tɛ̀/	‘a room’
c. /m/	/mɔ̄/	‘to drink’	/īmíjò/	‘maize’
d. /f/	/fã̄/	‘to circumcise	/īféjɛ̀/	‘tobacco’
e. /v/	/vɛ̀kɛ̀/	‘wide’	/vúvù/	‘traffic speed’
f. /t/	/tã́/	‘finish’	/ì̀tɔ̀/	‘urine’
g. /d/	/dēdē/	‘all’	/ūdé/	‘a cover’
h. /n/	/nɛ̀/	‘choose’	/nɛ̀ɣɛ̃̀/	‘sweet’
i. /l/	/lù/	‘to beat’	/ūlɔ̄/	‘grinding’
j. /r/	/rú/	‘open’	/ɛ̄rú/	‘a slave’
k. /s/	/sɛ̃̀/	‘vomit’	/ūsĩ́/	‘starch’
l. /j/	/jìrì/	‘to praise’	/ɛ̄já/	‘grandchild’
m. /ʃ/	/ʃɔ̃́/	‘look’	/ùʃà/	‘clay pot’
n. /ʤ/	/ʤí/	‘to steal’	/ɔ̀ʤɛ̀/	‘food’
o. /k/	/kú/	‘die’	/ìkũ̀/	‘dirt’
p. /g/	/gō/	‘tall’	/ēgĩ̄/	‘firewood’
q. /ɣ/	/ɣɔ̀/	‘forbid’	/ɔ̀ɣɔ̀/	‘respect’
r. /k͡p/	/k͡pè/	‘call’	/ēk͡pɔ̄/	‘oil’
s. / g͡b/	/ g͡bɛ̃̀/	‘plant’	/ūg͡bó/	‘old age’
t. /w/	/wù/	‘to like’	/ɛ̀wù/	‘a cloth’

1.7.1.2 Iṣẹ̣kírì vowels

The Iṣẹkírì vowel system comprises seven oral vowels, namely /i, e, ɛ, a, u, o, ɔ/ and five nasal vowels /ĩ, ɛ̃, ã, ũ, ɔ̃/. The formant frequency values of the oral vowels were measured and average formant values of the first two formants taken from five tokens of each vowel were obtained. The result is shown in Table 1.4. These values are plotted on an F_1-F_2 plane using MS excel as presented in Fig. 1.4.

Table 1.4. Average values of formants frequency of Iṣẹkírì oral vowels

Vowels	[i]	[e]	[ɛ]	[a]	[ɔ]	[o]	[u]
F2(Hz)	2214	2010	1752	1464	875	702	731
F1(Hz)	269	385	568	720	596	401	283

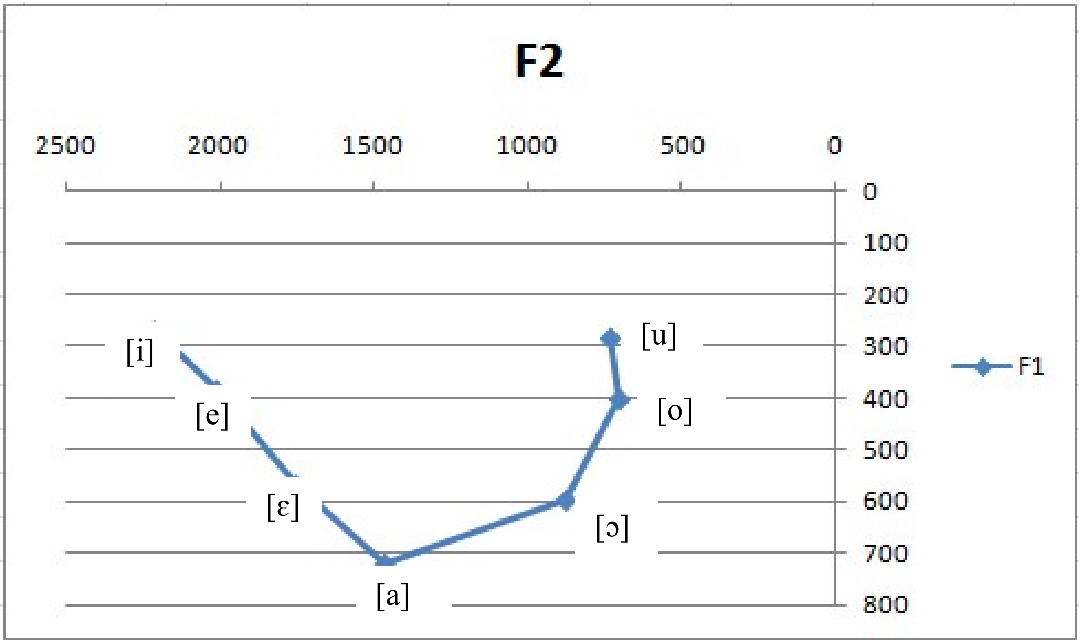


Fig. 1.4. Iṣẹ̀kírì oral vowels plotted against F1F2 plane

a) Oral vowels

The seven oral vowels can occur in any position in a word in the language. These vowels are shown in example (1.6)

1.6a) /i/

(i) iwé /īwé/ 'book'

(ii) ikún /īkṹ/ 'waist'

(iii) bí /bí/ 'to give birth'

b) /e/

(i) ejú /ēdʒú/ 'eye'

(ii) ekpo /ēk͡pō/ 'oil'

(iii) gbé / g͡bé/ 'carry'

c) /ɛ/

(i) ẹja /ɛ̄dʒā/ 'fish'

(ii) ẹsétè /ɛ̄sétè/ 'plate'

(iii) jẹ /dʒɛ̄/ 'eat'

d) /a/

(i) aga /āgā/ 'chair'

(ii) arọ́ /ārɔ́/ 'story'

(iii) lá /lá/ 'big

e) /ɔ/

(i) ọkọ /ɔ̄kɔ̄/ 'husband'

(ii) ọlá /ɔ̄lá/ 'dream'

(iii) wọ̀ /wɔ̀/ 'to enter'

(f) /o/

(i) oghó /ōɣó/ 'money'

(ii) ogún /ōgṹ/ 'twenty'

(iii) ró /ró/ 'tie'

(g) /u/

(i)ùṣà /ùʃà/ 'clay pot'

(ii) usín /ūsĩ́/ 'starch'

(iii) rú /rú/ 'open'

b) Nasal vowels

There are five contrastive nasal vowels; nevertheless, all the seven oral vowels in the language can be nasalized. A close examination of the occurrence of nasal vowels reveals that they occur at word medial and word final positions. Nasal vowels do not occur word initially in the language. Examples of nasal vowels are given in example (1.7) below:

1.7 a. /ĩ/

i) gín /gĩ́/ 'say'

ii)yin /jĩ̄/ 'uproot'

iii) etín /ētĩ́/ 'ear'

b. /ɛ̃/

i) sẹ̀n /sɛ̃̀/ 'vomit'

ii) rẹ̀n /rɛ̃̀/ 'walk'

iii) ọkẹrẹn /ɔ̄kɛ̄rɛ̃̄/ 'male'

c. /ã/

i)àràn /àrã̀/ 'worm'

ii) fàn /fã̀/ 'to circumcize'

iii) uwán /ūwã́/ 'tongue'

d. /ɔ̃/

i) kọ́n /kɔ̃́/ 'full'

ii) irọn /īrɔ̃̄/ 'hair'

iii) ukpúkpọ̀rọ̀n /ūk͡púk͡pɔ̀rɔ̃̀/ 'stone'

e. /ũ/

i) sùn /sũ̀/ 'sleep'

ii) arun /ārũ̄/ 'mouth'

iii) tun /tũ̀/ 'cold'

The phonemic status of these nasal vowels is established by contrasting them with their oral counterparts as seen in the following example:

Example 1.8

1.8a. /i/ and /ĩ/

1a) rí	/rí/	'see'
1b) rín	/rĩ́/	'laugh'
2a) ẹri	/ɛ̄rī/	'river'
2b) ẹrin	/ɛ̄rĩ̄/	'song'

b. /ɛ/ and /ɛ̃/

1a) kpẹ́	/k͡pɛ́/	'stay long'
1b) kpẹ́n	/k͡pɛ̃́/	'divide'
2a) jẹ	/ʤɛ̄/	'eat'
2b) jẹ̀n	/ʤɛ̃̀/	'deep'

c. /a/ and /ã/

1a) kpa	/k͡pā/	'kill'
1b) kpan	/k͡pã̄/	'fetch,
2a) kà	/kà/	'confess'
2b) kàn	/kã̀/	'knock'

d. /ɔ/ and /ɔ̃/

1a) fọ́	/fɔ́/	'break'
1b) fọ́n	/fɔ̃́/	'squeeze'
2a) sọ	/sɔ̄/	'throw'
2b) sọn	/sɔ̃̄/	'to cry'

e. /u/ and /ũ/

1a) okú	/ōkú/	'corpse'
1b) okun	/ōkũ̄/	'sea'
2a) ẹ̀rù	/ɛ̀rù/	'fear'
2b) ẹ̀rùn	/ɛ̀rũ̀/	'load'

1.7.2 Syllables in Iṣẹkírì

The most basic syllable type attested in all languages is the consonant and vowel sequence, CV. This syllable type is widely attested in Iṣẹkírì. The onsetless syllable type is also attested in word initial position, thus syllables may have onsets or may be onsetless in Iṣẹkírì. Examples are shown in data (1.9), (1.10) and (1.11).

1.7.2.1 The CV syllable structure

Iṣẹkírì non-nominal elements manifest a non branching onset in their root forms as shown in this example.

Example (1.9): The syllable structure of verbs: CV

a) gín	/gĩ́/	'say'
b) rè	/rè/	'go'
c)bẹ	/bɛ̄/	'peel'

(1.10) Adjectives: CV

a) kọ	/kɔ̃́/	'full'
b) wó	/wó/	'heavy'
c) gbán/	g͡bã́/	'wise'

Most Iṣẹkírì non-nominal elements in their roots are made up of the syllables with onset as shown in (1.9) and (1.10). The CV syllable is schematically represented in the following structure. This syllable type shows a non-branching onset and a non-branching rhyme and is typical in the language; hence the Iṣẹkírì syllable can be viewed as being simple.

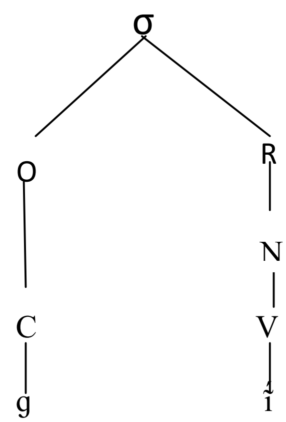


Fig. 1.5. CV syllable structure for / gĩ́/ ‘say’

1.7.2.2 The V syllable structure

The syllable structure of nouns more often than not begins with an onsetless syllable, that is, the V occurs word-initially as the only constituent of the syllable.

(1.11) Noun: V-CV

a) ẹ̀gè /ɛ̀- gè/ 'well'

b) ulọ /ū-lɔ̄/ 'grinding stone'

c) ughọ /ū-ɣɔ́/ 'navel'

The examples in (1.11) above show both the V (onsetless) and the CV syllable structures. The onsetless syllable is also evidenced as a pronoun in example (1.12):

(1.12) a) o '3SG'

b) e '3SG'

The V-type structure in the language can also be a vocalic affix as shown in example (1.13) below:

1.13a) ùsẹ̀n ù-sẹ̀n 'vomit'

b) ìtọ̀ ì-tọ̀ 'urine'

Evidence for this morphology is through prexification such that *sẹ̀n* 'to vomit' has the vocalic affix 'u' attached to it to become the noun *ùsẹ̀n* 'vomit' and *tọ̀* 'to urinate, has the vocalic affix 'i' attached to it to become *ìt*ọ̀ 'urine'. The V-type structure is seen in the V. CV syllable structure in Figure 1.6.

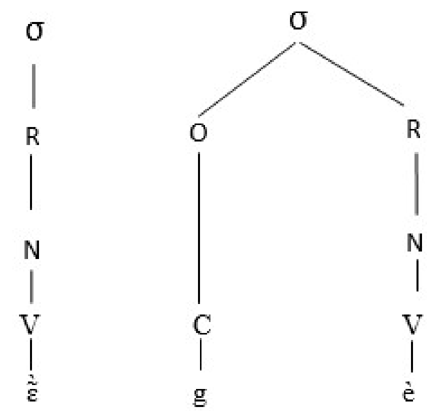


Fig. 1.6. V. CV syllable structure for /ɛ̀gè/ ‘well’

1.7.2.3 The CCV Syllable Structure

The existence of a minimally branching onset is observed at the phonetic level as a single branching onset structure. This is a phonetically attested type of syllable resulting from glide formation in Iṣẹkírì as shown below.

Example 1.14

1.14a)	gùà	/ gùà/	[gwà]	'drive
b)	uwangúẹ́	/ūwā̃gúɛ́/	[ūwā̃gwɛ́]	'salt'
c)	tié	/tíé/	[tjé]	'small'
d)	ulí ẹkọ́	/ūlí # ɛ̄kɔ́/	[ūljɛ́kɔ́]	'school'
e)	ejú ọjọ́	/ēdʒú # ɔ̄dʒɔ́/	[ēdʒwɔ́dʒɔ́]	'day'

In example (1.14), there is a readjustment of elements as a result of re-syllabification when the process of glide formation applies such that the CVV structures in /gùà/, /ūwā̃gúɛ́/ and /tíé/ yield the CCV structures in [gwà], [ūwā̃gwɛ́] and[tjé] and the V-V sequence across morpheme boundary in /ūlí # ɛ̄kɔ́/ and /ēdʒú # ɔ̄dʒɔ́/ also yield the CCV structures in V**CCV**CV [ūljɛ́kɔ́] and [ēdʒwɔ́dʒɔ́]. Glides in Iṣẹkírì are derived as full glides and not off-glides. The CCV syllable structure is a phonetically attested type in Iṣẹkírì as shown in the graphical display of spectrogram readings in Figures 1.7 and 1.8.

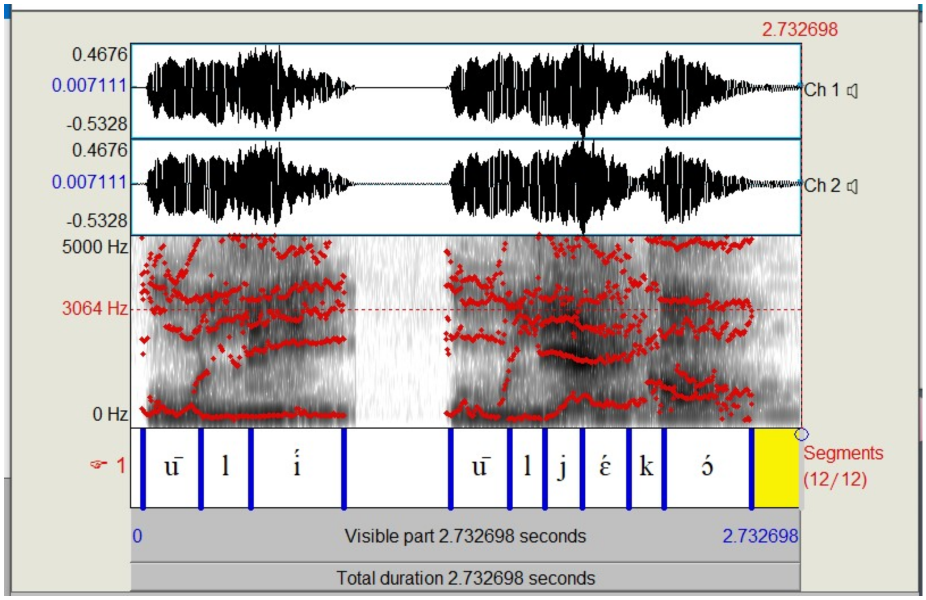


Fig. (1.7a). A graphical display of the waveform and spectrogram of [ūlí] "house" and [ūljέkʰɔ́] "school"

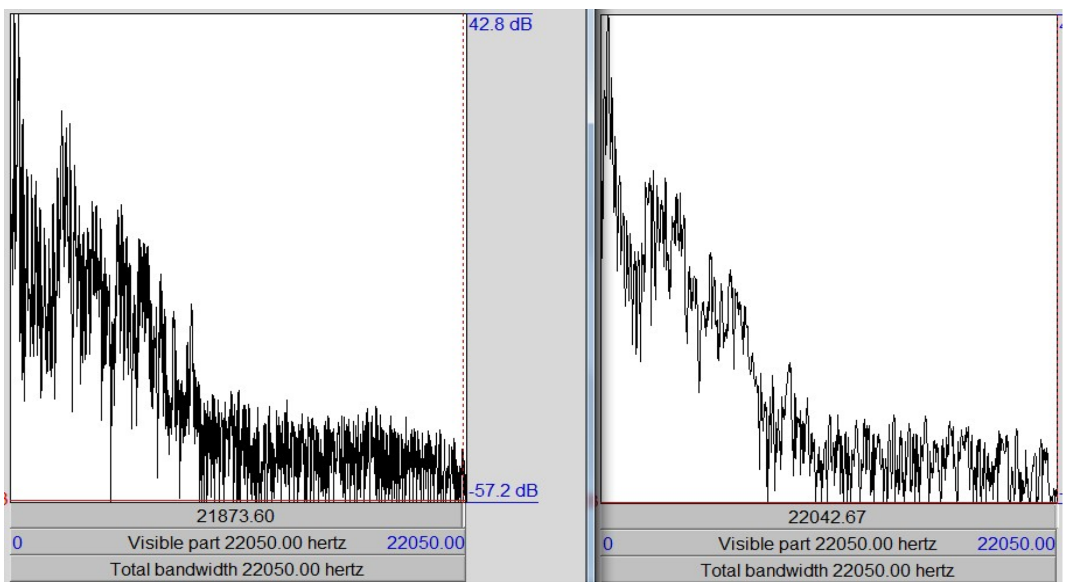


Fig. (1.7b). Spectra slide of (a) the vowel [í] and (b) the palatal approximant [j]

The spectrograms clearly show the acoustic behaviour of /j, w/, thus, suggesting the /Cj/ and /Cw/ structures are well attested in the language. The acoustic properties of glides are very akin to those of vowels, thus, the frequency spectrum of [j] in Fig. (1.7a) above resembles that of [i]. The palatal approximant is characterized by a low F_1, and high F_2 and F_3, similar to the vowel [i]. Two cues to distinguish vowels and glides are the steady state portion and acoustic energy- intensity (Reetz and Allard, 2011; Padgett, 2008). The approximant's slightly greater constriction results in a shorter steady-state portion and lower acoustic energy. The first cue is illustrated by means of the spectrogram above, which compares [í] in *ulí* to [j] in [ūljέkɔ́], [í] has more of a steady state portion than [j] which has a shorter steady-state portion. Also, the duration of [í] is 0.236 secs. while that of [j] is 0.152 secs. In addition, as illustrated in the spectra slice, [j] has a lower acoustic energy as it shows less intensity.

These spectrograms prove that complex onset occur in Iṣẹkírì thereby confirming the claim of a CCV structure as a phonetically attested syllable type in Iṣẹkírì. The implication of this is that the onsets in Iṣẹkírì are relatively simple but they may branch as a result of re-syllabification. The Cw cluster is attested in Iṣẹkírì as exemplified by the acoustic evidence in the spectrogram Figure 1.8.

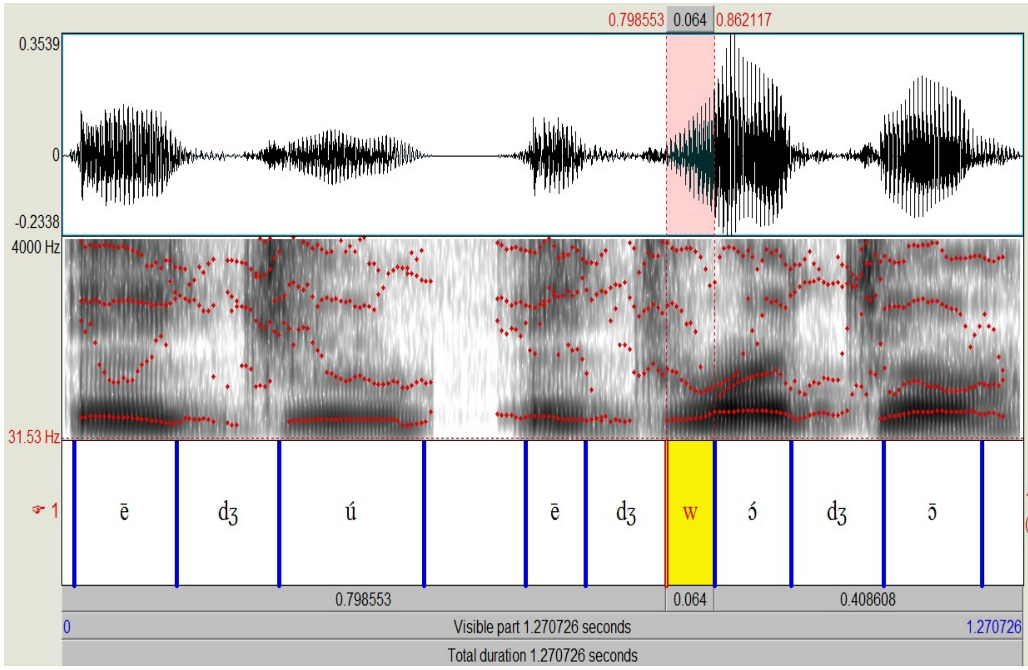


Fig. 1.8. A graphical display of the waveform and spectrogram of [ēdʒú] "eye" and [ēdʒwɔ́dʒɔ́] "day"

Figure 1.8 shows a spectrogram for [ú] in [ēdʒú] and [w] in [ēdʒwɔ́dʒɔ́], where Fl and F2 are low and close together with a high F3, this shows a similar formant structure for [u] and [w]. However, [w] has a shorter steady state portion than [u].

1.8 Tonal concerns

A discussion of some tonal concerns is necessary as a precursor to an investigation of the Iṣẹkírì language tonal phonology which will be examined in Chapter Four. These concerns include the tone bearing unit in the language, as well as its tone typology, and tone features. An understanding of these issues paves way for a better perception of the tone system and proper typological placement of the language.

1.8.1 The tone bearing unit (TBU) in Iṣẹkírì

The surface realization of a tone is usually linked with a prosodic unit. Two prosodic units that serve as tone bearing units (TBU) in African languages are the mora(μ) and the syllable(σ) (Odden, 1995; Akinlabi, 2000; Yip, 2002; Cahill, 2017). Yip (2002) proposes some criteria for ascertaining if the TBU in a language is the mora or the syllable. The mora is said to be the TBU if the language has:

(i) nasals that bear tones but onset nasals that do not bear tones
(ii) light mono-moriac syllable with only one tone and heavy bi-moriac syllables with two tones

The above are also schematically represented in Yip (2002:73). The schema is as shown in Figures 1.9a) and b) for (i) and (ii) respectively.

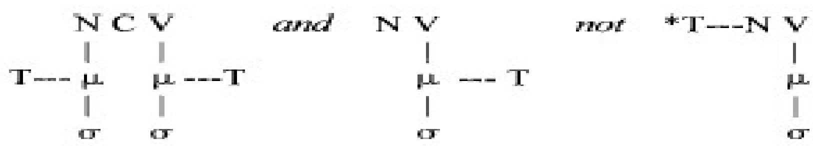


Fig. 1.9a). Representation of the mora as the TBU in a language

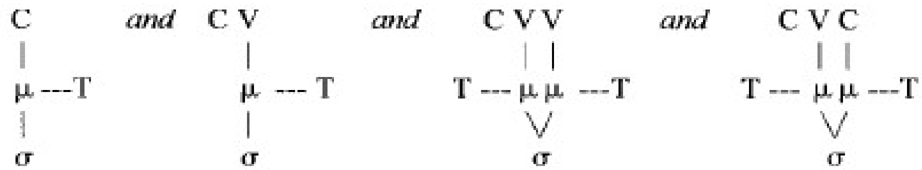


Fig. 1.9b). Representation of the mora as the TBU in a language

The syllable will be the TBU, if two different syllable weights can bear the same number of tones. Following the above criteria, the prosodic element that can adequately be the TBU for the Iṣẹkírì language is the syllable. This is because the language does not have syllabic nasals and does not distinguish syllable weights. This is evident in the fact that all syllables in Iṣẹkírì are open syllables as shown in section 1.7.3 above. Thus the representation of the TBU for Iṣẹkírì is as represented in Figure (1.10a &b).

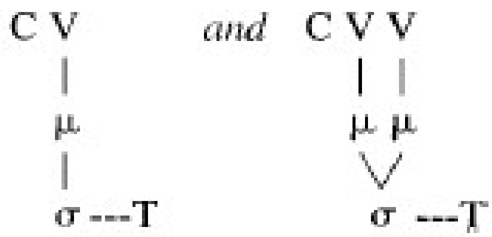


Fig. 1.10a). Representation of the syllable as the TBU in a language

(Yip, M. 2002. *Tone.* Cambridge: Cambridge University Press)

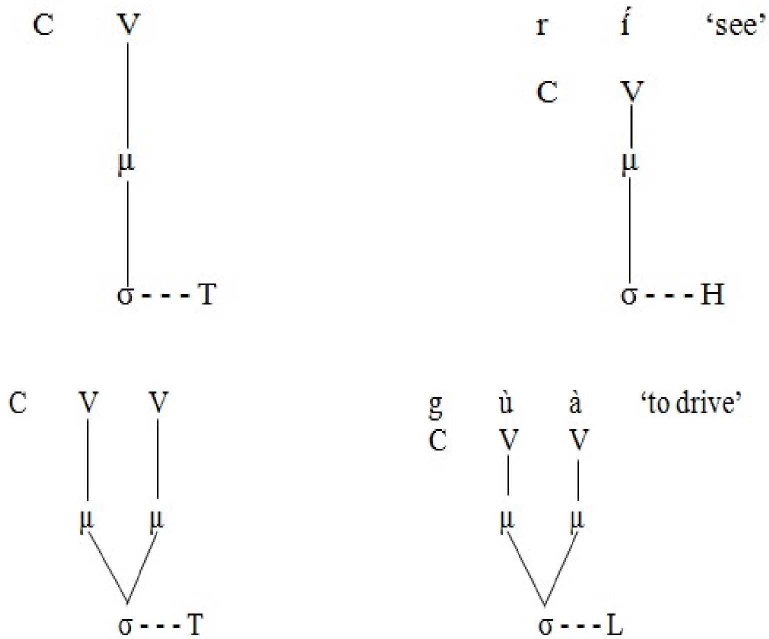
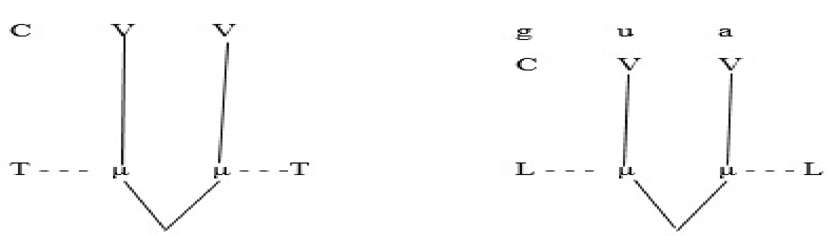


Fig. 1.10b). Representation of the syllable as the TBU in Iṣẹ̀kírì



Surface syllable types in Iṣẹkírì are V, CV and CCV, and one associated tone is permitted on a syllable which lends support for the syllable as the TBU and not the mora. If the mora were the TBU, then it will be expected that for the CVV syllable underlying structure, two distinct tones will be allowed on the CV and V thus giving a representation that is unattested in the language.

1.8.2 The Tonal Typology of Iṣẹkírì

One of the earliest attempts to typologize tone languages is found in Pike (1948). He recognized the differences between the tonal systems of tone languages and thus classified tone languages into two broad types, pitch register system and contour tone system. The pitch register systems are characterized in terms of levels of pitch while the contour systems are characterized in terms of the direction of pitch change. Welmers (1973) went further to distinguish between a discrete level tone language and a terraced level tone language within the register system. For the discrete level tone system, "…each level tone is restricted to a relatively narrow range of absolute pitch within a phrase and these tonemic ranges are discrete – never overlapping and separated by pitch ranges …" (Welmers, 1973:81) while the terraced tone system has "…restrictions in pitch sequences [such that] …after a non-low pitch, the next syllable may be low, or it may have the same non-low pitch, or it may have a slightly lower non-low pitch" (Welmers, 1973:82).

In addition to the typologies proposed by Pike (1948) and Welmers (1973), other parameters of tonal typology proposed in the tonal literature include categorization of tone languages based on tonal function. One of such classifications is on how tonal contrast are utilized in tone languages. The distinction is thus between Type A- languages with lexical tone and minor morphological uses of tone- and Type B- languages with lexical tone and major morphological uses of tone (Hyman, 2016). There is also the categorization of tone languages based on activeness of tones which is also divided into Type A "lethargic" (languages where tones are stable and without tonal morphology or alternations) and Type B "restless" (Hyman, 2016:9). Connell (2014) proposed the grouping of languages based on phonological and phonetic aspect of tone realization. The tonal typologies mentioned in this paragraph do not capture a clear cut classification for some languages as many

African tonal languages will readily fall in between these categories. This study therefore adopts Welmers (1973) classical categorization and given the types of tones attested in Iṣẹkírì, the language easily falls under the classification of a terrace system. One evidence for this assertion is that downstep as a feature of a terrace tone system manifest in Iṣẹkírì as will be discussed in Section 4.3.1.2.

1.8.3 Tone features

Tonal primitives (Hyman, 2010; Clements, Michaud and Patin, 2010) and tonal features (Clements, 1983; Pulleyblank, 1986; Snider, 1999; Yip, 2002; Hyman, 2011; McPherson, 2016) are commonly proposed for the representation of tones. The use of features in tonal representation has attracted a lot of attention and several feature systems have been proposed for tones in the literature. Yip (2002) proposed a feature system based on two binary features, namely, Register and Pitch. The 'Register' feature divides the pitch range into two with the feature [+/- Upper] and the 'Tone' feature subdivides each register into two with the feature [+/- high]. The feature [high] is renamed as [±Raised] by Pulleyblank (1986) to differentiate it from the segmental feature [±High]. This is illustrated in Figure 1.11.

+ Upper	+ Raised	H
	- Raised	HM
- Upper	+ Raised	M
	- Raised	L

Fig.1.11. Tone features
(Pulleyblank, D. 1986. *Tone in Lexical Phonology.* Dondretch: Reidel)

The use of unary features [h/l] for Register and [H/L] for Tone has also been proposed but "… the resulting systems function in largely the same way" (McPherson, 2016:6). The feature system proposed by Yip and modified by Pulleyblank is assumed in our examination of the Iṣẹkírì tone system. This is particularly suitable in accounting for the tonological operations of tonal spread in the language. The feature system comprehensively accounts for this in a principled way. Details of this is in Section 4.3

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 Introduction

This thesis investigates the prosody of Iṣẹkírì. Literature that has significant and demonstrable bearing on the study and germane theoretical models are discussed to provide the relevant background for the study. Focus is on tonal behaviour and intonational characteristics and contours. One of the critical issues in tonal literature is the nature of downstep most especially in a language with three level tones like Iṣẹkírì and in intonational studies, attention has been on how best to account for phrasal F_0 contours. These issues are considered in our examination of relevant literature.

2.1 Previous studies on Iṣẹkírì phonology

A few studies have examined aspects of the phonology of Iṣẹkírì (Omamor, 1979; Otokunefor, 2002; Samuel, 2011; Ijama, 2014; Inoniyegha, 2014; Osewa, 2016), among others. However, most of these studies are unpublished long essays and undergraduate projects. These studies present the segmental inventory in Iṣẹkírì and examine some phonological processes which are attested in the language. Evidence from these studies

suggests that the phonemic inventory of Iṣẹkírì consists of twelve vowels. There are differences in the number of consonants from eighteen consonants in Omamor (1979) to twenty in Ijama (2014), Inoniyegha (2014) and Osewa (2016).

On the prosodic level, which is the concern of this study, Omamor (1979) and Osewa (2016) identify three level tones, H, M and L tones. Both studies further identify the LL, MM and MH tone patterns for disyllabic nouns and the H, M and L tones for monosyllabic verbs but did not examine other lexical categories. Omamor (1979) further notes that of the three contrastive tones in the language, the most unstable tone is the L tone. According to this study, in vowel elision situations, the L tone usually gets deleted when in contact with the H or M tone. This description of L tone behaviour contradicts the behaviour of Iṣẹkírì tones. Acoustic and auditory impression of Iṣẹkírì tones in this study suggest the contrary.

As may be noted in these studies (Omamor, 1979; Osewa, 2016), the discussion of tones does not go beyond an identification of tonal units, tonal patterns for nominal category and monosyllabic verbs and the behaviour of the L tone in Omamor, (1979). The full extent of tonal issues in Iṣẹkírì has not been analyzed. Comprehensive data and instrumental evidence are needed to establish tonal phenomena in Iṣẹkírì. Also, phrase level prosodic phenomenon is not addressed in the available works to us. These are some of the gaps in Iṣẹkírì scholarship this present study intends to fill.

2.2 Pitch lowering phenomena

Declination, downstep and final lowering are downtrend phenomena used for pitch lowering in the literature. Declination is a gradual lowering whose domain is across an utterance (Connell and Ladd, 1990; Egbokhare, 1990; Laniran, 1992; Gussenhoven, 2004; Zerbian and Barnard, 2008; Genzel, 2013; Downing and Rialland, 2017). Downstep has to do with lowering caused by a specific phonological tone and final lowering is a lowering at the end of an utterance (Laniran and Clements, 2003; Downing and Rialland, 2017). A distinction is often made in the literature between downdrift, also called automatic downstep, which is caused by a specific surface phonological tone and downstep or non automatic downstep; a lowering caused by a floating tone (Hyman, 1975; Connell and Ladd, 1990; Egbokhare, 1990; Laniran, 1992; Odden, 1995; Yip, 2002; Laniran and Clements, 2003; Gussenhoven, 2004). The issue of whether these two types of downstep should be treated as distinct phenomena or as the same has been a matter of interest in the literature. Sections 2.2.1 and 2.2.2 examine the phenomena of declination and downstep.

2.2.1 Declination

Declination is a downward inclination of fundamental frequency over an utterance. The gradual lowering of F_0 is evident in descriptions of declination. One definition of declination by Pierrehumbert and Beckman (1988:71) says it is " a backdrop phonetic process that unfolds gradually in time without regard to the phonological sequence of tones". Recognition of the gradual lowering of F_0 in time reflects the nature of declination. However, studies especially in African tone languages have shown that the amount of declination in some of these languages is actually dependent on tone type (Lindau, 1984; Connell and Ladd, 1990; Laniran, 2002; Fajobi, 2005), thus the phonological sequence of tones cannot be disregarded. The view of Pierrehumbert and Beckman (1988) seems to characterize the observation of declination in non tonal languages by other scholars such as Poser (1984). He assumes that declination is not dependent on the tonological system because it "... is not controlled by linguistic variables, that is to say, neither the tonal string nor the accents have any influence on declination" (Poser, 1984:259). A steeper downward slope has been tied to a sequence of low tones more than the mid or high tones in many tone languages (Lindau, 1986; Connell and Ladd, 1990; Laniran, 1992; Shih, 2000; Fajobi, 2005). Gussenhoven (2004) in line with the evidence found in some languages recognizes the effect of sequences of tones on declination. According to him, the effect of declination is "most straight forwardly observable in pronunciation of sentences with sequences of identical tones" (Gussenhoven 2004:98). The study of declination in African languages therefore sheds more light on this mechanism.

A cursory examination of pitch tracks of sequences of like tones in Iṣẹ̀kírì sentences largely confirms declination in low tone sequences observed in Yoruba (Connell and Ladd, 2000; Laniran, 2002; Fajobi, 2005), Akan (Genzel, 2013; Kugler,2017), Ibibio (Urua, 2001) and some other languages. However, data in Iṣẹ̀kírì do not appear to support the claim of declination in H tone sequences reported in Laniran (2002) and Fajobi (2005) for Yoruba. The uncertainty of declination in M and H tone sequences is observed in Connel and Ladd (2000:12) who acknowledge that "Even assuming that the declination itself is a real effect, it nevertheless seems fair to conclude from these results that backdrop declination does not exist in Yoruba to the degree documented by Lindau (1986) for Hausa...” This provokes the need for further research of this phenomenon in a sister language like Iṣẹ̣kírì. This study will determine this phenomenon in all tone types in Iṣẹ̣kírì and provide insights to the degree of declination based on tone type. Evidence to support the effect of tone type on declination is discussed in section 2.3.

2.2.2 Downstep

One of the key issues in the study of tone is the concept of downstep which has received much attention both in tonal and non tonal languages and which has been identified in Iṣẹ̣kírì in this study. The term downstep has been used differently by researchers. As earlier mentioned in the introduction of this section, the common usage is downdrift or automatic downstep for a phonetic lowering triggered by a specific surface phonological tone and downstep or non automatic downstep for a lowering caused by a floating or delinked low tone. An interesting distinction is also made in terms of terminological concern between automatic downstep, non-automatic downstep and downdrift (Connell, 2014, 2017). This phenomenon is also referred to as catathesis in Poser (1984) and a distinction is made between automatic catathesis and non automatic catathesis in line with the distinction for downstep. In this study, we stick to the terms downdrift and downstep. Downdrift is a phonetic lowering triggered by a surface L tone such that in a sequence of H tones with intervening L tones, the H tone following the low tone is lower than the preceding High tone (Connell and Ladd, 1990; Egbokhare, 1990; Omozuwa, 2010; Yip, 2002; Laniran, 2002; Laniran and Clements, 2003; Gussenhoven, 2004). The lowering is predictable from the context therefore, in a sequence H1L1H2H3L2L3H4, H2 is perceived to be lower than the preceding H1 as a result of the intervening low tone, L1 and H4 is lower than H2 and H3 due to the preceding L3. Downstep is lowering that is triggered by a floating or delinked tone (Laniran, 1992; Yip, 2002). A graphic illustration of downdrift and downstep reproduced from Gussenhoven (2004:100 – 101) is seen in Figs.2.1a and b. The lowering in H2 and H4 in Fig.(2.1a) is conditioned by L1 and L3 respectively but the downstepped H4 in Fig.(2.1b) is not preceded by a surface L.

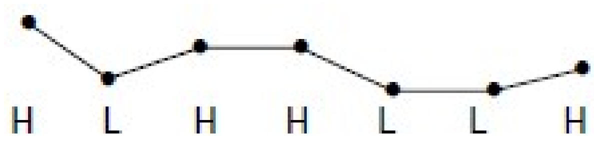


Fig.2.1a. A graphic illustration of downdrift **Fig.2.1b**. A graphic illustration of downstep (Gussenhoven, C. 2004. *The phonology of tone and intonation.* New York: Cambridge University Press.)

The question of whether downdrift and downstep should be treated as the same phenomenon has been argued for in various studies (Poser, 1984; Connell and Ladd, 1990; Gussenhoven, 2004). A widespread explanation for this position is that, more often than not, it can be shown that "non- automatic downstep can be traced diachronically or derivationally to automatic downstep, i.e. to the effect of a low tone that has been deleted" (Connell and Ladd, 1990:3). Many languages provide evidence that downsteps have their origin in the preservation of low tones but the way the floating low tone conditions downstep differs. The presence of the low tone is revealed in two instances in this example that shows downstep in Kanakuru (Gussenhoven, 2004).

Example 2.1

a) Jímù ɗáɗáu → [jím !ɗáɗáu] 'we used to play'
b) Kúrè mónó→ [kúré !mónó] 'my corn'

In (a) the low tone is preserved after the deletion of the vowel /u/ and in (b), there is a rightward spread of the high tone to the vowel /e/ and the low tone is displaced. In these two instances, the downstepped H is triggered by a floating low tone. This substantiates the argument for both downstep and downdrift to be treated as the same phenomenon. This idea will be pursued in this study as we shall determine the nature of downdrift and downstep in Iṣẹkírì.

Further evidence of the presence of a low triggering downstep is seen in Ẹdo. Omozuwa (2010) reports that the combined proceeses of downdrift, vowel elision and tone shift must occur in the environment of a H#L tone sequence across word boundary for downstep to occur. See example 2.2 from Omozuwa (2010:270).

Example 2.2

1a) /úwé # òwá/ → [úwó!wá] 'inside the house'
b) /úwé # ówá/ → [úwówá] 'inside the stall'
2a) /íɣó # òkpè/ → [íɣó!kpè] 'money for a palm wine tapper'
b) /íɣó # ókpè/ → [íɣókpê] 'money for flute'

A close examination of the Edo data reveals the effects of a floating low tone either through vowel deletion showing tonal stability or through a displaced low tone from a rightward spread of the H tone. Examples 1(b) and 2(b) where downstep does not occur provide further support for a floating low in the environment to trigger downstep. Although Omozuwa (2010) outlines three processes (downdrift, vowel elision and tone shift) for downstep to occur in Ẹdo, we are of the opinion that downstep in Ẹdo involves only the processes of vowel elision and rightward tone spread based on the data in example 2.2. Emai also substantiates the triggering effect of a floating low tone on downstep from the deletion of a low tone vowel with the illustration in Fig. 2.2 reproduced from Egbokhare (1990:264).

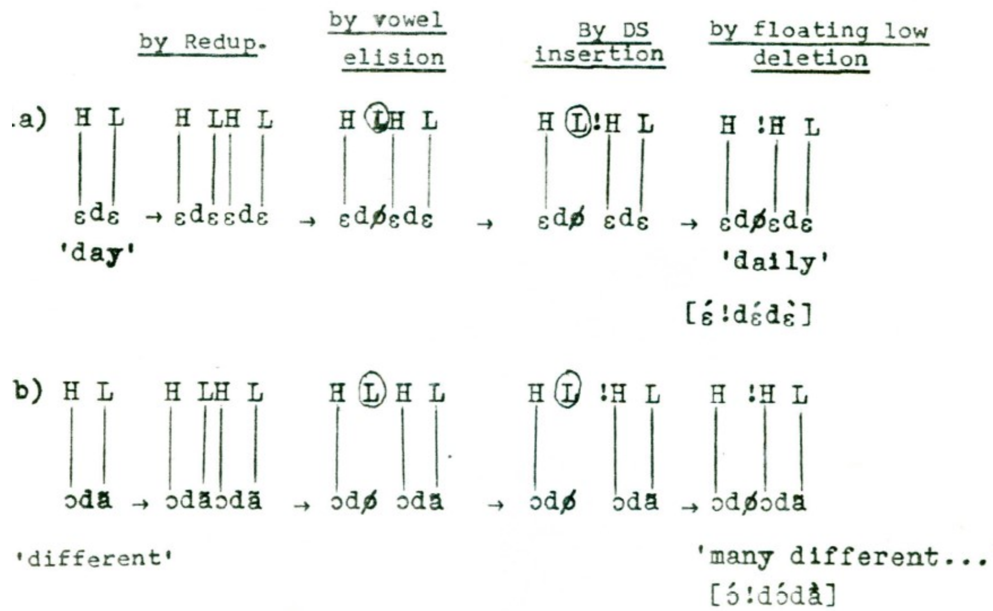


Fig. 2.2. Illustration of downstep in Emai
(Egbokhare, F. O. 1990. A phonology of Emai. PhD. Thesis. Dept. of Linguistics. University of Ibadan. xviii + 405pp)

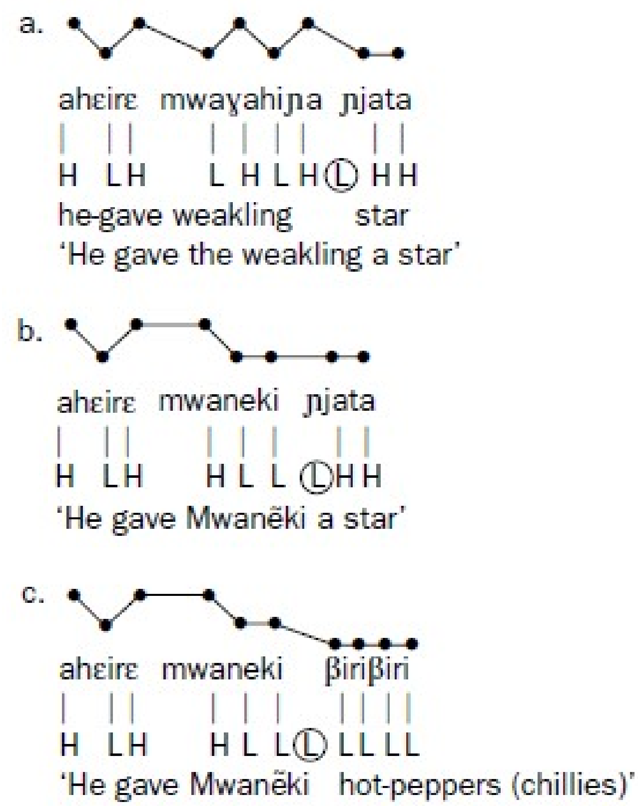
The downstepped H in Fig. 2.2 is set off after a low tone vowel preceding a high tone vowel is deleted in these examples of total reduplication in Emai.

One notable observation of the treatment of downstep in Yoruba literature (Connell and Ladd, 2000; Laniran, 2002; Laniran and Clements, 2003) is that concentration is on automatic downstep. Introductory notes in Connell and Ladd (2000) and Laniran (2002) recognize automatic downstep and non automatic downstep in their review on this phenomenon, all attention in these works are however on automatic downstep as data and experiments carried out are all concernced with downdrift. It will therefore be interesting to find out the factors that initiate downstep in Iṣẹ̣kírì.

The combination of downstep and downdrift are diverse. There are languages that use downstep without downdrift, there are those that manifest downdrift without downstep and others that present both downstep and downdrift. An example of a language with two phonological tones plus downstep is Kikuyu (Gusenhoven, 2004). Kikuyu presents data where downstep is triggered by a floating L and not an associated L.

Example 2.3

a) áhɛìrɛ́ mwàɣáhìɲá (L) !ɲjátá H!H
   ‘He gave the weakling a star’
b) áhɛìrɛ́ mwánɛ̀kì (L) !ɲjátá L!H
   ‘He gave Mwanɛ̃ki a star’
c) áhɛìrɛ́ mwánɛ̀kì (L) βìrìβìrì L!L
   ‘He gave Mwanɛ̃ki hot-peppers’



(Gussenhoven, 2004:102)

The downstepped H in (a) and (b) is attributed to a floating L and not an associated L. Thus Kikuyu manifest only downstep.

The co - occurrence of both downstep and downdrift is reported in Ibibio (Urua, 2001) a language with a contrastive H, L and! H tones. Data that provide evidence for downstep and downdrift are presented in tables 2.1 and 2.2.

Both the H tone and L tone reveal the property of downdrift in the Ibibio data in Table 2.2 and the downstepped H in Table 2.1. However, the origin or factors triggering the downstep is not offered here. The diversity of the processes of downtrend in African languages is seen in Table 2.3 from Downing and Rialland (2017).

Table 2.1. A sequence of H tones showing a downstepped H in Ibibio

	sé	**ň**	**ká**	**nî**	**ká**	**sé**	**ň**	**ké**	**!dé**	**Bá**	**kî̥t**
Tone:	H	H	H	H	H	H	H	H	!H	H	H
Hz:	260,78	312,10	268,67	267,10	257,81	266,47	265,19	252,83	232,83	224,49	224,72
Diff:		-51,32	43,43	1,57	9,29	-8,66	1,28	12,36	20,00	8,34	-0,23

Table 2.2. A sequence of H and L tones showing downdrift in Ibibio

	dé	**Bǐ**	**wá**	**yè**	**sú**	**kà**	**ké**	**sî**	**sǐ**	
Tone:	H	L	H	L	H	L	H	H	L	FLF
Hz:	271,39	256,66	237,62	200,34	228,68	196,17	210,62	220,99	172,65	165,28 (0.023s)
Diff:		14,73	19,04	37,28	-28,34	32,51	-14,45	-10,37	48,34	7,37

(Urua, E. 2001. The tone system of Ibibio. *Typology of African Prosodic Systems* U. Gut and D. Gibbons Eds. Bielefeld: University of Bielefeld. 65-85.)

Table 2.3. Languages with diverse downtrend phenomena

	Tones	Downdrift	Downstep	Final lowering
Akan	H/L	– (but "phonologized declination")	+	+ (Neutralisation of final L and H)
Basaa	H/L	+	+	–
Bemba	H/ø	+	+ due to OCP	+ (2 types of FL)
Chichewa	H/ø	+	–	+
Chimiini	H/ø	+	–	+
Embosi	H/L	–	–	+
Kɔnni	H/L	+	+	–
Mambila	T1, T2, T3, T4	+ (optional downdrift in T2, T3 alternating sequences)	–	+ (only with the lowest tone, T4)
Moro	H/ø	+	+ due to OCP	+
Shingazidja	H/ø	+	–	+
Tumbuka	H/ø	–	–	+
Tswana	H/ø	+	+ due to OCP	+ (only with final L)

(Downing and Rialland, 2017. Introduction. *Intonation in African tone languages* L. Downing and A. Rialland. Eds.1-16)

It will be interesting to find out if all tones in Iṣẹkírì manifest the property of downdrift, thus, following the guidelines of Egbokhare (1990), this study will investigate downdrift in lexical items and intransitive sentences where vowel elision does not occur. It has been reported that both downdrift and downstep involve local and global effects (Connell and Ladd, 1990; Inkelas and Leben, 1990; Laniran, 1992; Gussenhoven, 2004). The point at which the effect of downstep on the lowered H tone occurs can be exactly identified and subsequent High tones that are within the phonological phrase do not rise above the lowered H tone.

The origin or factors triggering downstep is not offered in most of these studies and this provides insight into some of the concerns of this study. The review of studies in intonation examines these issues in section 2.3.

2.3 Studies on intonation

Intonation is found to function in all languages, including tonal languages (Bolinger, 1978; Lehiste, 1979; Lindau 1983; Connell and Ladd 1990; Egbokhare, 1990; Laniran 1992; Fajobi 2005; Yul-Ifode, 2008; Downing and Rialland 2017). Some of the concentration in studies on intonation in tonal languages have basically been on distinguishing sentence types; statements and question type (Lindau, 1983; Egbokhare, 1990; Connell and Ladd 1990; Yul-Ifode, 2008). Experimental studies and the identification of the mechanisms that generate F_0 curves have however started receiving attention in some of these languages. A number of these studies are reviewed with concentration on studies that relate directly to the research objective of this study which involves discovering the mechanisms employed for the realization of F_0 contours in Isẹkírì and the intonation patterns evident in the language.

2.3.1 Statement intonation

Statement intonation is generally characterized by a downward fall of F_0 in many tone languages (Lindau, 1986; Connel and Ladd, 1990; Inkelas and Leben, 1990; Laniran, 1992; Fajobi,2005; Gezel, 2013; Kügler, 2017) and this is generally referred to as downdrift (Lindau, 1986) or F_0 downdrift (Poser, 1984). In some languages, downdrift is regarded as both an intonational phenomenon and an effect of local tone assimilations of highs occurring before low tones in sentences with alternating highs and lows. This is reported in Lindau (1986) for Hausa where the gradual decline of F_0 in sentences on high tones only cannot occur as an effect of local tone assimilations but is considered as a global statement intonation. Data from Lindau (1983:758) show downdrift in these three Hausa statements with the tone patterns HHHHH, HLHLHLH and HLHLHLHLHLHL.

Example 2.4

a) Muudi yaa zoo gidan 'Muudi came home'

b) Maalàm yaa àuni lèemoo 'The teacher weighed the oranges'

c) Maalàm yaa àuni lèemoo gàban gàrinmùu 'The teacher weighed the oranges in front of our house'.

These three statements with different tone patterns and lengths with superimposed gridlines describe statement intonation in Fig. 2.3.

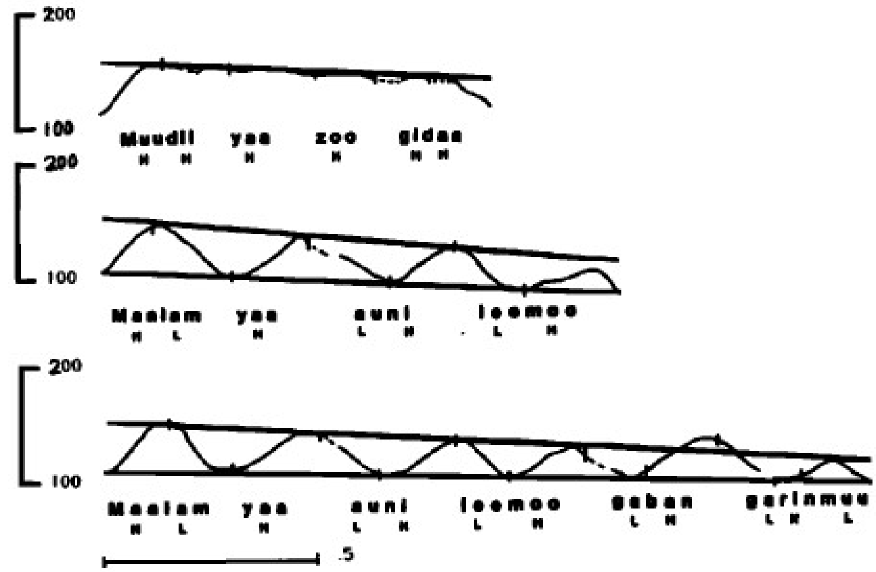


Fig.2.3. F_0 curves and intonation grids of statements of one Hausa speaker
(Lindau, M. 1986. Testing a model of intonation in a tone language. *JASA* 80: 757-764. Retrieved Dec. 22, 2013, from http:// acoustical society.org.)

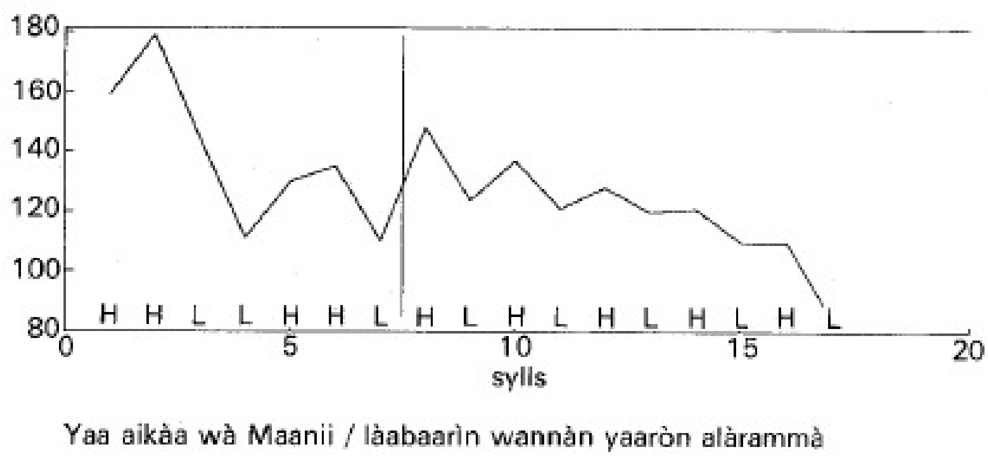


Fig. 2.4. A graph depicting a statement intonation in Hausa
(Inkelas, S. and Leben, W. 1990. Where phonology and phonetics intersect: the case of Hausa intonation. *Papers in Laboratory Phonology 1: Between the grammar and Physics of speech* G. Clements, J. Kingston and M. Beckam. Eds. 17-24.)

Sentences with alternating high and low tones in Fig.2.3 have much steeper slope than sentences with highs only, which have a fairly slow rate of slope, therefore, the Hausa statement intonation can be interpreted as an effect of combining a global statement intonation that can be seen in highs only, with a local tone assimilation rule that lowers highs following lows (Lindau, 1986). The final global slope can be described as an effect of both an almost universal downward slope in statement intonations, and more language specific modifications of that declination. The downdrift phenomenon of alternating highs and lows is further confirmed in Inkelas and Leben (1990) for Hausa with the illustrative diagram in Fig.2.4. They are however silent on a downward slope of highs only.

The use of the term 'downdrift' as a cover term for downdrift for the downward slope for all highs and alternating highs and lows in Lindau (1986) gives the impression that both mechanisms are the same. This does not provide a proper account of all the mechanisms that contribute to F_0 contours. A distinction between declination and downdrift as mechanisms of the declining F_0 values would give a better account of Hausa statement because declination is universal while downdrift is not. Also, declination may have a linguistic function.

Connell and Ladd (1990), Laniran (1992) and Fajobi (2005) note that pitch declines slightly in all-H and all-M sentences in Yoruba but declination is very noticeable in all-L sentences most especially in the last few syllables where the pitch of the final syllable falls throughout the syllable. Data from Laniran (2002) and Connell and Ladd (1990) are examined to show declination on like tones.

Example 2.5

Like tone sequences

All L: Dàpọ̀ kò rẹ̀wà, 'Dàpọ̀ did not buy beans'

Dàpọ̀ kò rẹ̀wà Ìgè 'Dàpọ̀ did not buy Ìgè's beans'

Dàpọ̀ kò rẹ̀wà bùn Jòyè 'Dàpọ̀ did not buy beans for Jòyè'

All M: Mo kiri eja 'I hawked fish'

Mo kiri eja Dibga 'I hawked Digba's fish'

Mo kiri eja bun Digba 'I hawked fish to give Digba'

All H: Dúpẹ́ mú Bọ́lá ‘Dúpẹ́ caught Bọ́lá’

Dúpẹ́ mú Bọ́lá féré ‘Dúpẹ́ picked Bọ́lá to play with’

Dúpẹ́ mú Bọ́lá gbé Gbádé ‘Dúpẹ́ made Bọ́lá to carry Gbádé’

(Laniran, 2002: 254)

Results from this data is shown in the following graph for one Yoruba speaker sorted out according to sentence length and tone from Example 2.5 above.

An interpretation of the rate of decline of the slope from the H tone sequences in the scattergram in fig. 2.5 does not seem to indicate that F_0 is lowered. Though the study declares a slight declination in these sequences based on statistical facts but it rightly remarks that “The slopes of the lines for H tone sentences are negative but not significantly different from 0 in some of the examples.” We examine further data in Yoruba in example 2.6.

Example 2.6

All H: Wón tún gbé túwó wá ‘They brought tuwo again’

All M: Omo won ni e lo fi se oko ‘It is their son that you marry’

All L: Èwù ònà àrà ò tàn ‘The colour of the garments on the way to Ara is dull’

(Connell and Ladd, 1990:8)

Declination is illustrated from example 2.6 for four speakers of Youruba in fig. 2.6

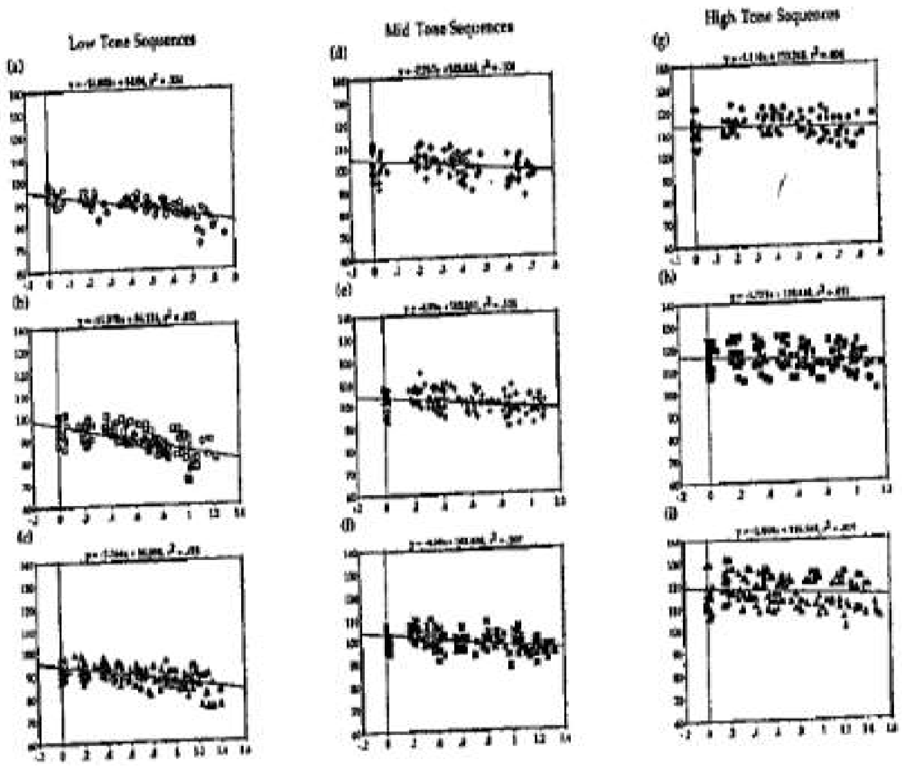


Fig. 2.5. Scattergrams of low, mid and high tone sequences in Yoruba declaratives (Laniran, Y. 1992. *Intonation in tone languages: the phonetic implementation of tones in Yoruba*. PhD. Thesis. Dept. of Linguistics. Cornell University. xv + 294pp.)

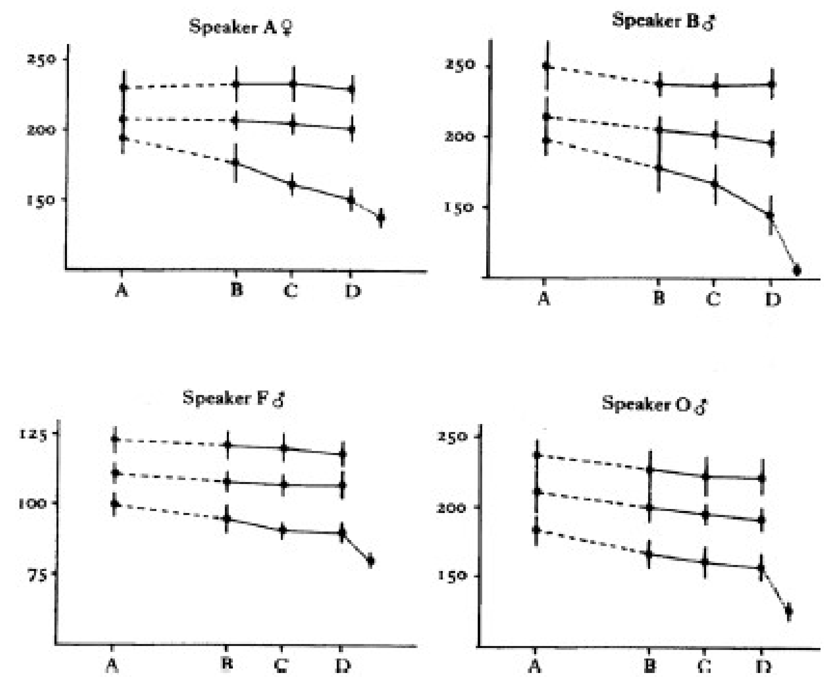


Fig 2.6. Average peak values of syllabes of like tone sentences.
(Connell, B. and Ladd, R. 1990. Aspects of pitch realisation in Yoruba. *Phonology* 7. 1: 1-29)

Connell and Ladd (1990) give an account of declination in all-L sentences for all the speakers and for all-M and all-H sentences, declination is said to be slight for speakers B, F and O and is almost absent for speaker A. We observe however that there is a slight declination in all-M and all-H sentences for speakers B and O but not for speaker F.

The Yoruba data presented show that declination varies with tone type. Pitch declines more in L tone sentences than in the all M and all H sentences. However, while Laniran (1992) and Fajobi (2005) categorically state that all H tones show less declination than all M tones, Connell and Ladd (1990) treat declination in these two sequences of tones as almost the same and refer to it as "...a slight declination in the all-H and all-M sentences". Interestingly, the empirical facts for Yoruba are not clear as the effect of declination on these tone types does not seem to convey the same result. The narration between the speakers may suggest that this property is not important. The scepticism expressed by Connell and Ladd (1990) is observed by Lindau who reports that Hombert (1974) shows that sequences of all highs in Yoruba do not decline at all. This is confirmed by preliminary investigation in Iṣẹ̀kírì where sequences of all highs appear not to decline which is one focus of this study.

2.3.2 Yes/No question intonation

Early characterization of Yes/No questions considered this question type as a rising intonation generally. The assumption is that this characterization is almost universal (Bolinger, 1978). Studies have shown that languages differ as to the characterization of Yes/No questions. This is most obvious in many African languages which led to the conclusion by Rialland (2007: 34) that "Intonation question marking proves to be more diverse than might have been expected". The prosodic typology proposed by Rialland (2007) will serve as a basis for reviewing Yes/No questions in some of these languages. The prosodic markers for this question type are broadly divided into two classes: markers that exemplify languages with rising intonation and markers that exemplify languages without a rising intonation. For a language to fall under any of these classes, it must possess at least one of the markers.

High pitched Yes/No question markers:

a) Cancellation/ reduction of downdrift, register expansion
b) Raising of last H(s).
c) Cancellation/ reduction of final lowering.
d) Final high tone or rising intonation (final H%).
e) Final HL melody

(Rialland, 2007: 36)

Languages in the second category have at least one of the following markers as a prosodic cue for Yes/No questions.

Non High pitched Yes/No question markers:

a) Final Low tone or falling intonation (final L%).
b) Final polar tone or M tone.
c) Lengthening.
d) Breathy termination.
e) Cancellation of penultimate lengthening.
f) Vowel (open).

(Rialland, 2007: 36)

We review languages that show features that seem to characterize the Yes/No question type in Iṣẹ̀kírì. The question intonation is characterized by a final rise in most of the languages under the high pitched category, although other local factors come into play. Question intonation and downdrift interact in remarkable ways in many languages. Downdrift is said to be blocked or reduced in this sentence type in Hausa (Inkelas and Leben, 1990), Chichenwa (Downing, 2017), Wolof (Rialland, 2007), Emai (Egbokhare, 1990), Akan (Genzel, 2013). The Hausa question type is "usually characterized as being similar to the intonation in statements but with a less steep slope as well as an added local rise of the final high tone" (Lindau, 1986:761). Results from an experiment carried out in Hausa show that Yes/no questions are characterized by a global suspension of the statement downward slope to zero slope and a local feature of significantly raised pitch of the last high tone. This is shown in fig. 2.7 from Lindau (1986) with yes/no on high tones only and on alternating high and low tones.

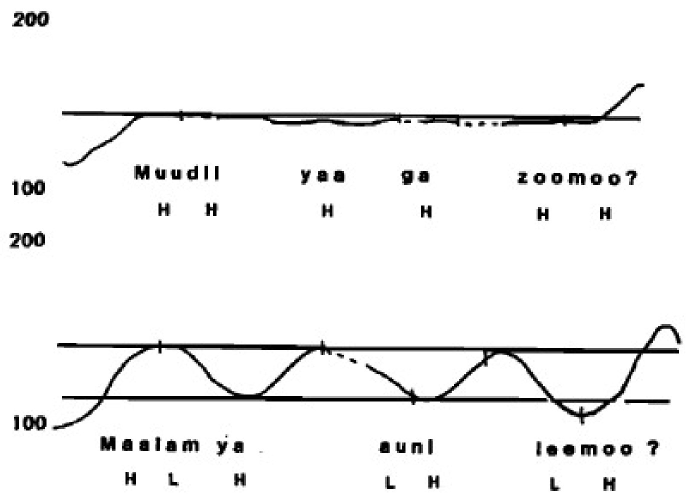


Fig. 2.7. F_0 curves and intonation grids of Yes/No questions in Hausa

(Lindau, 1986:761)

The grids in Fig. 2.7 do not show a lowering of F_0 slope. Lindau (1986:762) states that "The zero slope is the major systematic global property of intonation in Hausa" and notes that the average F_0 is higher in questions and attributes this to the lack of descending slope rather than a raised register. The locally raised high is at times followed by a fall. The suspension of downstep characterizes this question type as shown in Fig. 2.8.

Downdrift is suspended as the high tones following lows in the last phrase in Fig. 2.8 are not lower than those preceding them compared to the high tones in Fig. 2.4 where there is a lowering of highs as long as they occur in the context of a low tone. Lindau (1986) and Inkelas and Leben (1990) agree on a suspension of downdrift in Hausa. Lindau (1986) however, questions the marker of a raised register for Hausa. He recognizes that average F_0 is higher in questions than statements but results from his experiment do not point to a raised register. The slopes of both statement and question differ but the frequency of the first high tone of the statement and that of the Yes/No question do not show any significant difference. This observation is not substantiated with specific F_0 values nor is there any comment on what should be considered as significant between these sentence types. Furthermore, a possible explanation for higher average F_0 in questions is not provided.

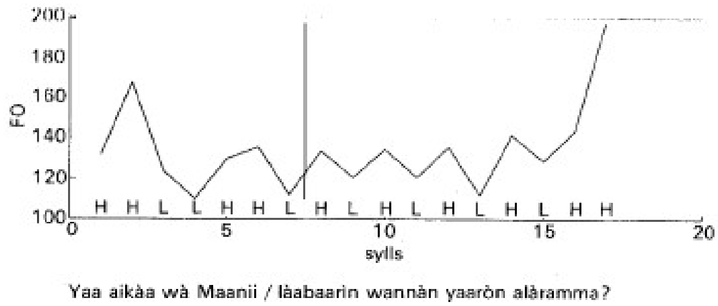


Fig. 2.8. A graph depicting a Yes/No question in Hausa
(Inkelas and Leben, 1990:23)

Intonation prosody for yes-no questions in Chichewa has an obligatory rise-fall over the final two syllables of the intonational phrase and downstep is suspended as illustrated in this pitch track for the utterance.

(Koodí) pali a-lakatili améne á-ná-takása chidwí mwá íiwe (Downing, 2017)
Q LOC-be 2-poet

Downdrift is strongly reduced in Wolof. The statement and its interrogative equivalent are largely distinguished by register expansion where phrasal high tones are realized higher and downdrift reduction. The pitch curves in Fig.2.10a and b illustrate this.

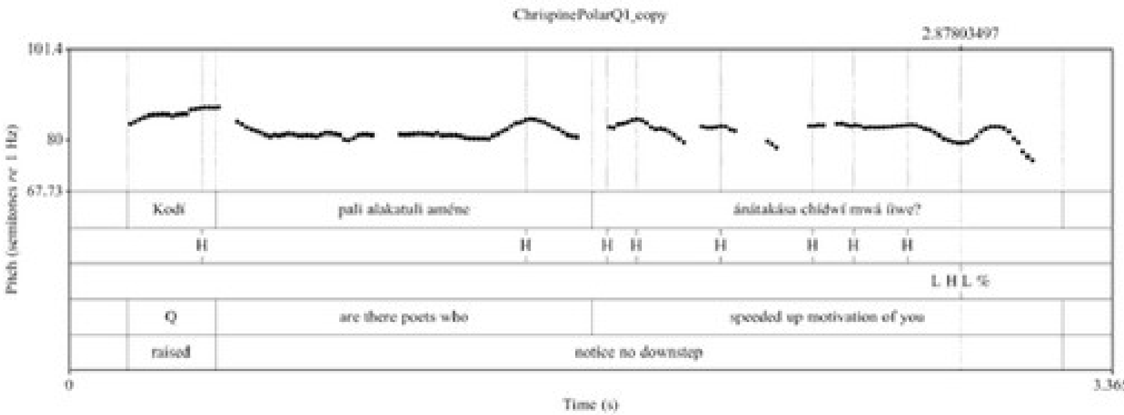


Fig.: 2.9. Pitch track of Yes/No question in Chichenwa

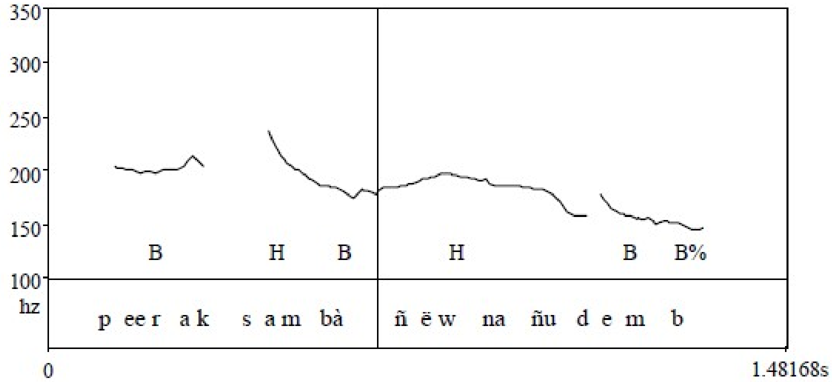


Fig.: 2.10a. Pitch track of statement intonation in Wolof

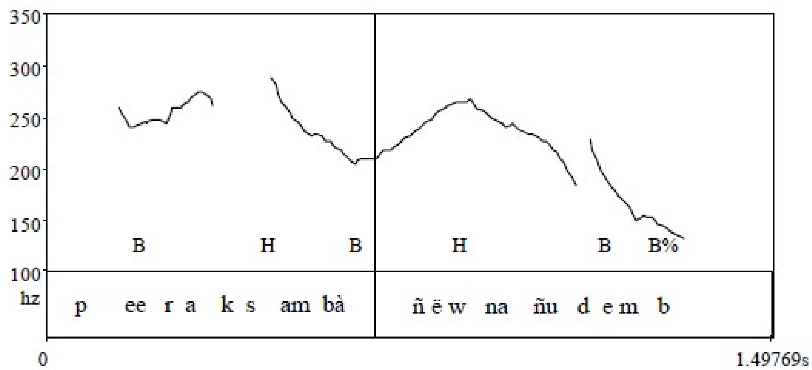
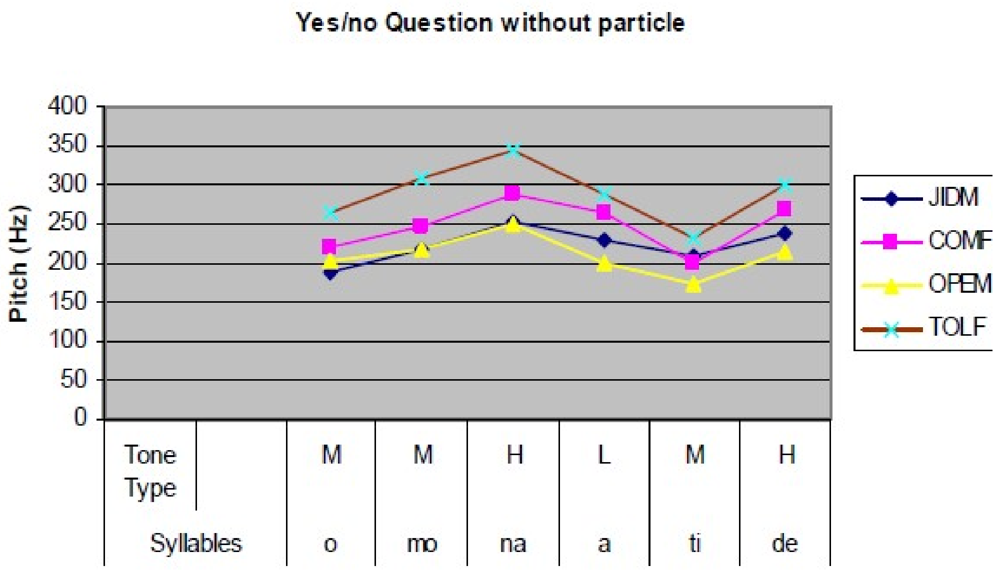


Fig.: 2.10b. Pitch track of Yes/No question in Wolof

Fajobi (2005:200) reports that "...downdrift is not suspended in this question type in Yoruba; it is compromised internally with a narrower percentage fall and a lower mean absolute slope than for statements" Figs 2.11 and 2.12 illustrate the Yes/No question and its statement counterpart for the sentence *Omo náà ti dé* 'The child has arrived'. The Yes/No question is characterized by a higher pitch range and a raised utterance final syllable which is what differentiates this question type and the statement intonation.



Fig, 2.11. An intonation graph for Yes/No question in Yoruba

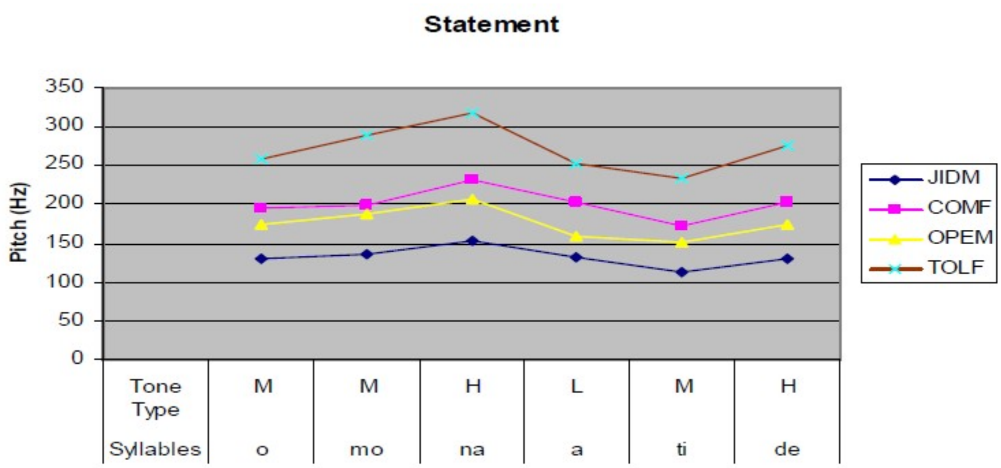


Fig. 2.12. An intonation graph for statement intonation in Yoruba

Figures 2.11 and 2.12 show that downdrift is not suspended in the Yes/No question. Adequate data to test the continuation of downdrift in the Zero Particle Yes/No question is not provided in this study as only one sentence example is presented.

Iṣẹkírì seems to combine the feature of raised pitch register in Yes/No question compared to the statement counterpart, which confirms this same observation in Yoruba. However, a terminal falling F_0 appears to be the point of divergence with Yoruba. These features in Iṣẹkírì intermix the question markers of both the high- pitched and non high pitched Yes/No question markers proposed by Rialland (2007). This fact and the divergence from Yoruba in terms of the reduction of downdrift make it a matter of interest to examine Yes/No intonation in Iṣẹkírì.

2.3.3 Wh question intonation

The features of the Wh question are closer to the statement intonation. In Hausa and Yoruba, the Wh question is characterized by a downward F_0 slope. The rate of decline is however not as steep as is found in statements. It is observed in Hausa that this question type "...always have a fall after a final high tone" (Lindau, 1986:763). This is illustrated in Figs. (2.13) and (2.14).

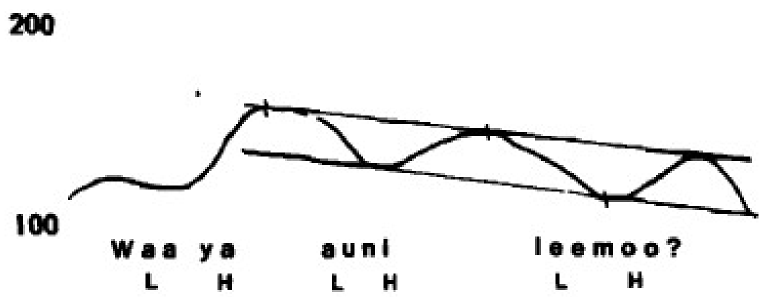


Fig. 2.13. F_0 curve and question in Hausa (mixed tone sentence)

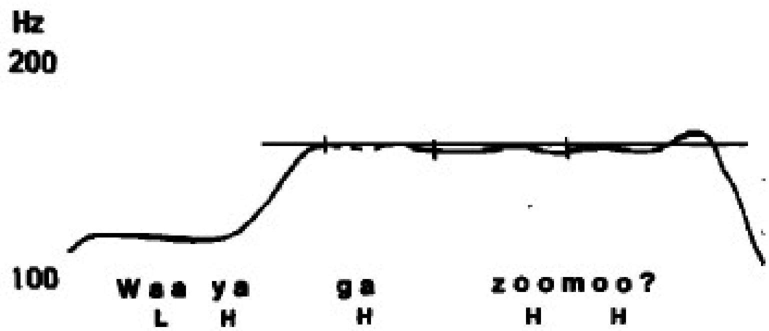


Fig. 2.14. F_0 curve and intonation grid of Wh question in Hausa (high tone sequence)
(Lindau, 1986:763)

.

Fig 2.13 shows the gradual declining slope of the alternating highs and lows in the Hausa question *Wàa ya àuni lèemo?* ‘Who weighed the oranges?’ (Lindau, 1986:763). This is however not the case in the high tone sequence in Fig. 2.14 which shows a zero slope similar to the Yes/No question in Hausa.

The Wh question is also characterized by a downward F_0 slope in Yoruba. Fig. 2.15 demonstrates this.

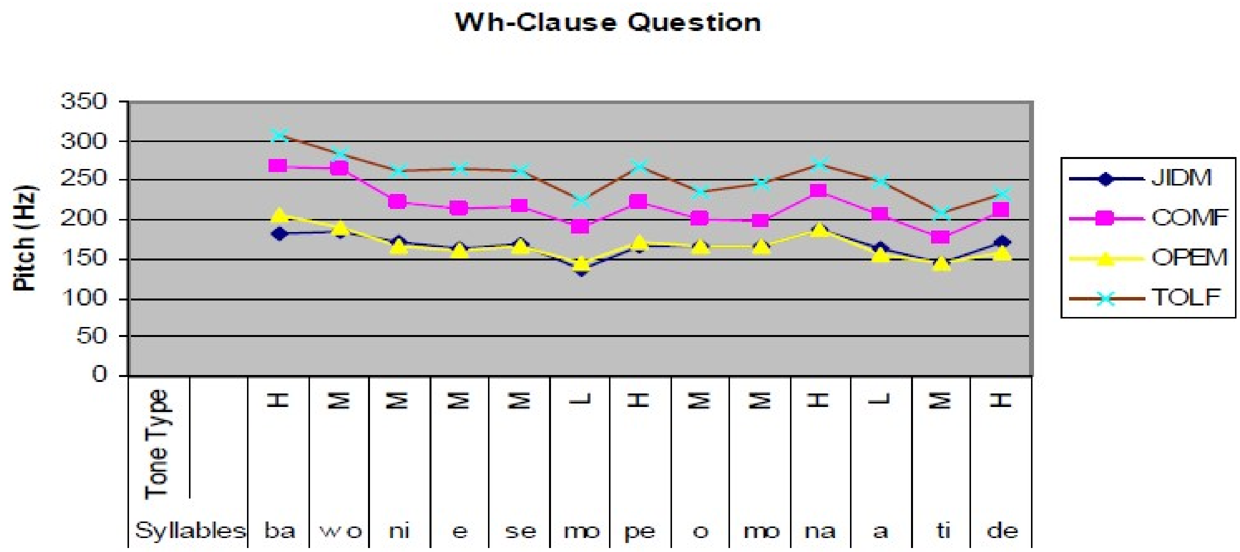


Fig. 2.15. An intonation graph for Wh question in Yoruba

An intonation graph for the Yoruba question *Báwo ni ẹ̀ṣe mọ̀ pé ọmọ náà ti dé?* ‘How did you know that the child has arrived” presented in Fajobi (2005:203) is replicated in Figure 2.15. Downdrift in this example is not suspended. Further study of this question is necessary as Fajobi (2005:208) concludes that “... the status of Wh- clause is inconclusive but every indication shows that in Yoruba it would likely be said on a falling tune”. This further buttresses the need for an instrumental study in a sister language like Iṣẹkírì.

The critical questions this study will answer drawing from our research questions with respect to declination are;

a) Does declination occur on a sequence of H, M and L tones in Iṣẹkírì?
b) If yes, at what rate?
c) Is there a correlation between sentence length and declination?
d) Can the effect of declination be separated from that of final lowering?

With respect to downdrift and downstep the following questions arise;

a) What is the nature of downdrift and downstep in Iṣẹkírì?
b) What is the phonetic equivalence of H tones in these two mechanisms?

For final lowering, the basic questions that arise are;

a) Does final lowering occur in all tone types in Iṣẹkírì questions?
b) What is the effect(s) of final lowering on the syllable where it occurs?

A comparative grid of Iṣẹkírì and Yoruba is presented below to highlight interesting points of similarity and significant areas where Iṣẹkírì diverges in interesting ways from Yoruba.

Table 2.4. A summary of phrasal phenomenon in Iṣẹkírì and Yoruba

DOWNTREND	TONE	IṢẸKÍRÌ	YORUBA
Declination	**H**	NO	YES (Laniran 1992; Fajobi 2005)
	M	YES	YES (Laniran 1992; Fajobi 2005)
	L	YES	YES (Connell & Ladd, Laniran, 1992; Fajobi, 2005)
Downdrift		YES	YES (Connell & Ladd, 1990; Laniran, 1992)
Downstep		YES	?
Final lowering		YES	YES specified only in a sequence of L tones in statements (Connell & Ladd, 1990; Laniran, 1992)
INTONATION YNQ	**Higher overall pitch**	YES	YES (Connell & Ladd, Laniran, 1992; Fajobi, 2005)
	Final syllable lengthening	YES	YES (Fajobi, 2005)
	Higher intensity	YES	? ?
	Intonation	Falling	Rising (Fajobi, 2005)
	Downdrift	YES	Compromised (Fajobi, 2005)
	Final lowering	YES	NO (Fajobi, 2005)
Wh question	**Final lowering**	YES	NO (Fajobi, 2005)
	Intonation	Falling	?

KEY:

YES	indicates the presence of the phenomenon
NO	indicates an absence of the phenomenon
??	indicates unavailabity of literature on the phenomenon
?	indicates inconclusiveness of available literature on the phenomenon

2.4 Theoretical review

There have been different proposals in the analysis of the asymmetric behaviour of tone and in the analysis of intonation. This section reviews some of these proposals under two subsections; tone analysis accounts and intonation models.

2.4.1 Tone analysis accounts

Efforts at analyzing the asymmetric behaviour of tones have been varied and these include accounts in terms of contrastive specification (Mester and Ito,1989; Steriade, 1987), underspecification (Akinlabi, 1985; Pulleyblank, 1986; Odden, 1995; Meyers, 1998), the incorporation of tonal markedness into the formulation of faithfulness constraints (Pulleyblank, 2004), and the fusion analysis (Turner, 2006). This section briefly reviews these theoretical approaches.

2.4.1.1 Theory of contrastive specification

The theory of Contrastive Specification (from now on CS) as proposed by Mester and Itô (1989), and Steriade (1987) holds that contrastive properties must be specified in underlying representation (Long, 2013). This means that tone asymmetry is the result of phonological rules rather than that of representation. What this means is that in asymmetry, all the features are present underlyingly. Therefore, the representation of the lexical tones in a language like Isẹkírì with three contrastive tones will be as shown in Figure 2.16. The L, M and H tones exist and are active. To account for tonal asymmetry under CS, a number of phonological rules will apply as shown in this illustration from Isẹkírì *nέ ōɣó* 'have money' and *ʃε̃́ ēgĩ̄* 'split wood' in Figure (2.17a). Vowel elision then applies and the vowel deletion process will produce the following outcome in Figure (2.17b). The vowel /ε/ in (a) and (b) is deleted leaving the H tone floating. The floating H tone is then linked to the next tone bearing unit to the right displacing the M tone. Illustrations with Figures 2.16, 2.17 and 2.18 are on the following page.

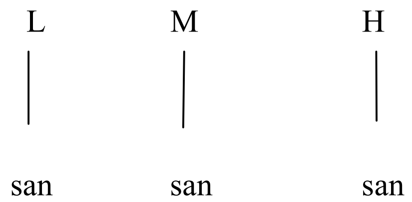


Fig. 2.16. A phonological representation of tones in contrastive specification

Fig. 2.17a). An illustration of the input to vowel elision in *nɛ́ ōɣó* 'have money' and *ʃɛ́ ēgĩ̄* 'split wood'

Fig. 2.17b). An illustration of vowel elision in *nɛ́ ōɣó* 'have money' and *ʃɛ́ ē*g*ĩ̄* 'split wood'

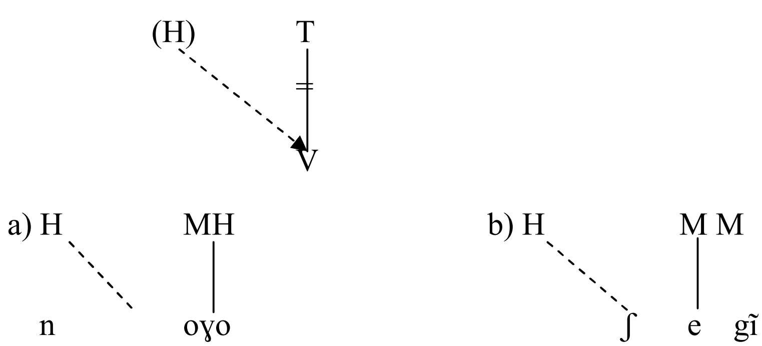


Fig. 2.18. An illustration of floating H-linking

These illustrations show the different rules in operation that produce the surface structure of a deleted M tone. For this Iṣẹ̀kírì example, three different rules apply but in languages with richer tone patterns than Iṣẹkírì, as many as six to seven rules are needed to account for M deletion. A major challenge of CS is the plethora of rules. The dependence of the realization of the mid tone on these rules makes analysis cumbersome and complicated. Moreover, CS account does not offer reasons why it is the mid tone that is asymmetric to the other two tones in languages like Iṣẹkírì and Yoruba. This challenges the adequacy of CS in accounting for tone asymmetry and the need for a more economical theoretical approach.

2.4.1.2 Underspecification account

The underspecification theory holds that not all contrastive properties are specified underlyingly which means that tone may be unspecified even if it is contrastive. This account interprets the retention of H and L tones over the M tone in vowel contact situation and in contour formation as the specification of the H and L tones as against the absence of specification of the M tone. In a three-tone language, tone deletion will be to M in the neutralization of tonal contrasts (Odden, 1995) therefore M lacks tonal specification in such a tone system. The two tone features [Upper] and [Raised] have the unmarked value [-Upper] and [+Raised] which are underlyingly redundant (Akinlabi, 1985; Pulleyblank, 1986). [-Upper] and [+Raised] together define a mid tone which means that "the mid tone in Yoruba will be left completely unspecified underlyingly" (Akinlabi, 1985:61). A deletion of any underlying high or low tone leaves the tonal tier without any tone specifications to which default values will be assigned before getting to the surface. In a two-tone system, the feature [raised] is unnecessary so the contrast between H and L is expressed as the contrast between [+Upper] and 0 by default which is [-Upper] (Odden, 1995). The underspecification theory appears a more attractive theory to account for tone asymmetry because it specifies the reason for the choice of the M tone for deletion. Thus, tone asymmetry emerges from phonological representation which is shown in Fig. 2.19

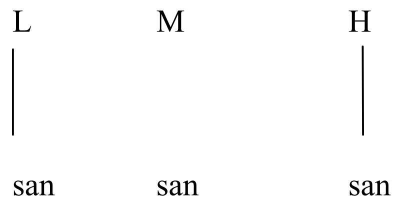


Fig. 2.19. A phonological representation of tone in the underspecification account

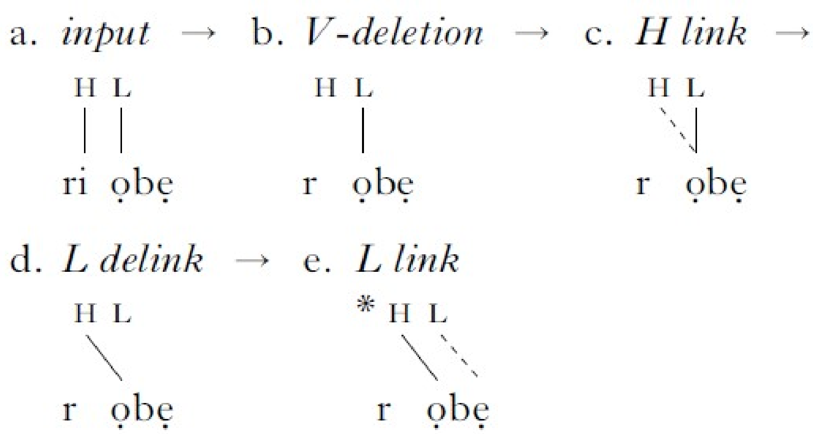


Fig.:2.20. An illustration of the output of floating L relinking

However, the theory brings up fresh challenges. Problem arises in data where a floating L set free by the reassociation of a H is not relinked to a supposed toneless mora (Pulleyblank, 2004; Turner, 2006; Long, 2013). The example in Figure 2.20 from Pulleyblank (2004) illustrates this.

In *rí ọ̀bẹ* 'see knife', the attested form after vowel elision is [rɔ́b!ɛ̄] and not [rɔ́bɛ̀]. It would have been expected that if the M tone is unspecified, then the floating L should dock on the toneless [ɛ] via L relinking. This is however not the case. Pulleyblank (1986) in trying to overcome this challenge, posited a 'Relinking Condition' that prevents tone association from applying when a tone delinked by a rule in a given cycle cannot be relinked. This solution is arbitrary because there is no logical reason for relinking to occur in one context and not in another therefore "The ad-hoc nature of the Relinking Condition clearly suggests that an unspecified approach to the behaviour of M tones does not succeed fully" (Pulleyblank, 2004:413). It is pertinent to point out that data from Iṣẹkírì does not pose a problem for the underspecification theory because a nominal LM pattern that presents a challenge to an underspecification analysis is not attested in the language. However, in line with one of the objectives of this study, which is to offer an analysis that will contribute not only to the Iṣẹkírì language but also to Yoruboid studies, a theoretical approach that can adequately analyze data in all Yoruboid languages will be attractive to our study.

2.4.1.3 Tone fusion analysis

Another account proposed in the literature is the tone fusion analysis (Turner, 2006). Turner (2006) faults the loss of tone hypothesis that results in a phonetic M tone, citing cases of vowel elision in which both the H tone and the L tone are delinked from the hiatus vowel such that the remaining vowel surfaces with a M tone in Moba Yoruba. He questions the motivation for delinking the L tone. The explanation offered in Akinlabi (1985) is that the delinking of the L tone is because of its spread unto a following mora since it no longer needs its original mora as a host. This explanation has not been acceptable because the spread of L tone onto a following H tone does not usually require the L tone to be delinked as the spread applies across board. An illustration of this is seen in the figure below from Turner (2006:161).

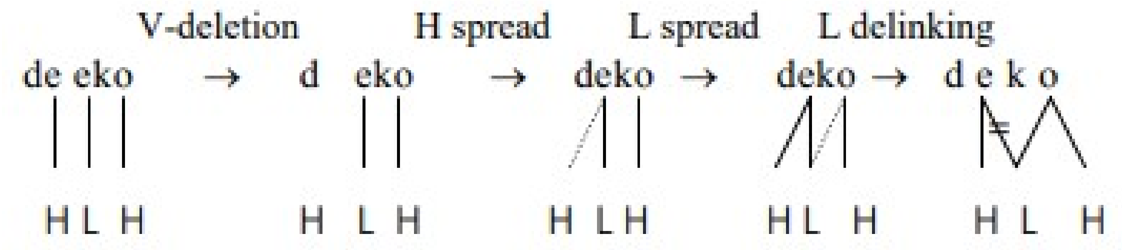


Fig.:2.21. An illustration of the the spread of L tone onto a following H tone

(Turner, C. 2006. Tone fusion in Moba Yoruba. *Selected Readings of the 35^th^ Annual Conference on African Linguistics* J. Mugane et al Eds. Somerville, MA: Cascadilla Proceedings Project.www.lingref.com, document #1306.)

An alternative analysis argued for by Turner (2004) is the tone fusion analysis. In the tone fusion analysis, two tones that are underlyingly associated with two vowels compete for one vowel on the surface. Snider's geometry of tones which consists of four autosegmental tiers is used to explain tone fusion. The register tier and tonal tier contain features which specify the quality of a tone. A lower case "h" indicates a higher register than the previous one while a lower case "l" indicates a lower register. The tonal tier defines the pitch of the tone relative to its register. A relatively high pitched tone is represented by a capital "H" and a relatively low pitched tone is represented by a capital "L".

Snider's geometry of tone is used to give a representation to tone fusion such that when vowel elision takes place, the tonal root nodes of these two tones are fused and this results in a M tone that has the following representations.

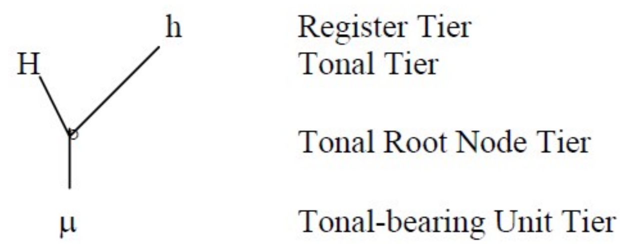


Fig. 2.22. Features of tone in tone fusion analysis

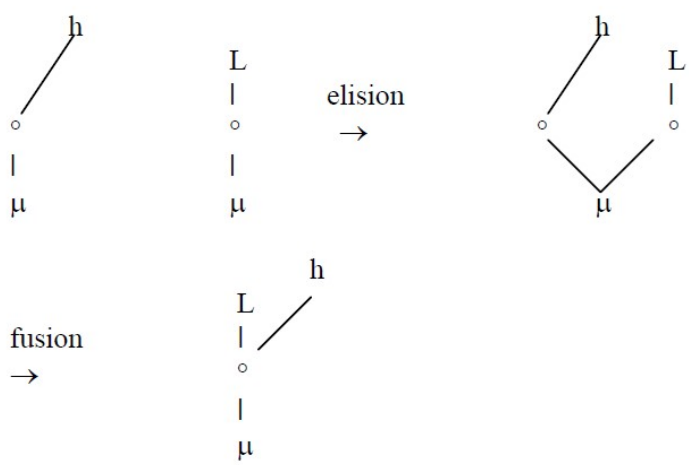


Fig. 2.23. The M tone representation in tone fusion analysis

The advantage of this analysis according to Turner is that “it does not require any unmotivated delinking of tones.” The assertion of an advantage of this theory can be viewed from two perspectives. One, while this analysis appears to address the issue of the delinking of the L tone which is one area of controversy surrounding the underspecification account, it creates a fresh problem of proposing two M tones which is referred to as “the derived M tone from deletion and the natural M tone”. Two, the analysis also fails to proffer an explanation as to why it is the M tone that is affected by vowel elision in Mọ̀bà Yoruba.

2.4.1.4 Markedness as faithfulness encoding

Pulleyblank (2004) questioned the underspecification analysis by referring to it as problematic because M tones “…cannot be unspecified at the surface” (Pulleyblank, 2004:413) and also, the interpretation of unlinked tones in some configurations is not straightforward as discussed in section 2.4.1.2. An alternative proposal offered is the “markedness as faithfulness encoding” where a scale of tonal markedness is directly encoded into the formulation of faithfulness constraints (Pulleyblank, 2004). In this analysis, M tones are present but unmarked, therefore cases of vowel hiatus resolution in representations where a floating L comes before a linked M “poses no conceptual problems”.

A markedness constraint such as *H for example is incorporated into a featural MAX constraint MAX (T) to give a constraint MAX [H]. Thus for Iṣẹkírì, we can have the encoded markedness scale into the faithfulness constraints with the constraint hierarchy MAX [H] >>MAX [L] >>MAX [M] to account for the stability of the low tone in vowel deletion in the verb noun construction *jẹ ọ̀jẹ̀* /dʒɛ̄ ɔ̀dʒɛ́/ illustrated in this tableau

Tableau 2.1. Emergence tableau for/ dʒɛ̄ ɔ̀dʒɛ̀ / ‘eat food’

/ dʒɛ̄ ɔ̀dʒɛ̀ /	MAX [H]	MAX [L]	MAX [M]
a.[dʒɔ̄dʒɛ̀]		*!	
☞b.[dʒɔ̀dʒɛ̀]			*

Two challenges confront the above analysis. One is the ranking of MAX [H] above MAX [L]. Data reveal that L tone is not deleted but preserved when in contact with H tone leading to a rising contour tone. Therefore, the basis for the ranking of MAX [H] over MAX [L] is not clearly accounted for and this leads us to the second issue with this analysis. The frequency effects used to determine a preference of H over L and L over M is unpredictable and this is obvious as observed by Pulleyblank (2004:422) that "It is important to note that the factors determining frequency are many and various, and will in many cases work in conflicting ways".

The issues raised in the theories reviewed in this section which include over generation of rules, the ad-hoc nature of the Relinking Condition proposed to resolve the problem of the relinking of L tones, the unpredictability of the frequency scale for determining a preference of H tones amongst others pave the way for a more explanatory and elegant theory that is more intuitively relevant to data and this is presented in section 2.5.

2.4.2 Intonation models

A considerable number of intonation models abound in the literature. This is a pointer to a lack of consensus on the best way to describe intonation in languages. Accordingly, "Research on intonation has long been characterized by a number of unresolved basic issues and fundamental differences of approach. For many years these precluded the emergence of any widely accepted framework for the description of intonational phenomena" (Ladd, 2008:1). Some well-known models are the British School, the Lund School, Autosegmental-Metrical model, Lindau's model and a host of others. Four approaches amongst the numerous models available in the literature on intonation will be considered and these are; The British School of Intonation model, the Lund School model, the Autosegmental-Metrical model and Lindau's model. The British School model is chosen for review because of its status as one of the earliest models in intonation studies, the Lund School is also reviewed because its analysis detaches lexical prosody from phrase and sentence prosody which points to the interaction of local and global factors. The Autosegmental-Metrical model is reviewed because it is one of the most popular and influential model and Lindau's model accounts for intonation in a tone language.

2.4.2.1 The British School

The British School of Intonation is one of the earliest models of intonation. It was particularly developed by Palmer (1922) mentioned in Fox (2000) who recognized the syllable on the main accent fall as the nucleus. An early version of this model was made up of a tripartite structure for the tone-group which is made up of head, nucleus and tail. This was later extended by other British scholars to a pre-head, a head, a nucleus and a tail. One basic characteristic of this school is the inclusion of accentual features, specifically, the phrasal accent into intonation. An example of the representation for the analysis of the utterance *I don't like that sort of thing* in Fox (2000:278) is seen in this example.

Example 2.7

Head	*Nucleus*	*Tail*
I don't	like	that sort of thing

Some other British scholars represent intonation pattern as a string of dots with the bigger dots representing accented syllables.

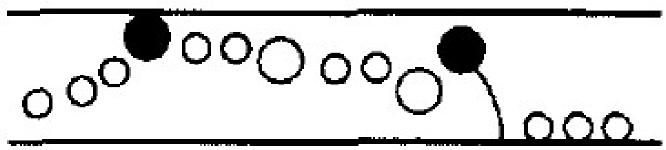


Fig. 2.24. An intonation pattern marked by a string of dots

One advantage the description of intonation in this model has is that it is straightforward and therefore has pedagogic origins because of its simplicity. It however lacks a precise theoretical model. Grice and Baumann (2007) note that "it is difficult to relate tonetic or interlinear transcriptions to F_0 traces". It will therefore be difficult if not impossible to adopt it for an experimental study and with the emergence of modern models the British School model is less frequently used.

2.4.2.2 The Lund school

The Lund School follows the works of Garding and her colleagues at Lund. Garding's model deals with intonation and the tonal accents of Swedish and other Scandinavian languages to which it was applied. This model is "based on an analysis which separates lexical prosody from phrase and sentence prosody" (Garding, 1983:11). This illustrative diagram from Garding describes the way intonation is modelled.

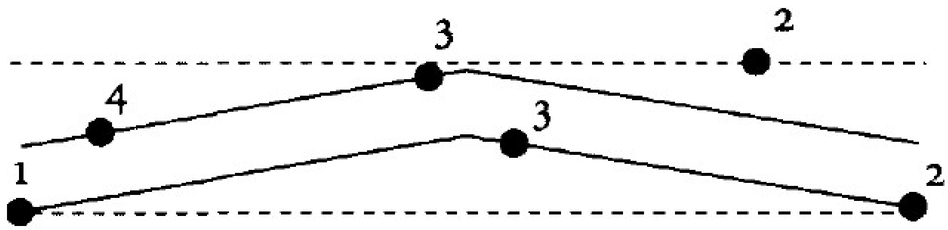


Fig. 2.25. The Lund school intonation model

This model has the attraction of determining F_0 contours from global and local factors but it poses a problem for a language with three tones because the intonation curve has to be generated within two lines. This is made more explicit in section 2.4.2.4 which presents Lindau (1986) model; a modified version of the Lund school model.

2.4.2.3 Autosegmental-Metrical theory of intonation

The term Autosegmental-Metrical (AM) model was coined by Ladd (1996). This model started with the works of Pierrehumbert (1980) and Pierrehumbert, and Beckmann (1988) and has received a lot of attention in the literature. A critical assumption of AM proposed by Pierrehumbert (1980) is that the phonological primitives giving rise to intonation contours are discrete tones associated with particular positions in the metrical structure which are connected by interpolation functions. The autosegmental nature of tones shows a separate tier for tones (H, L) just like for segments (vowels and consonants) which are associated to hierarchically organized prosodic constituents (Gussenhoven, 2004; Hellmuth, 2006). Simply put "The model is autosegmental because it has separate tiers for segments (vowels and consonants) and tones (H, L). It is metrical because it assumes that the elements in these tiers are contained in a hierarchically organized set of phonological constituents … to which the tones make reference" (Gussenhoven, 2004:123). Pitch movements are represented as sequences of tones rather than configurations. The same phonological concept which is tone is used to model lexical tones and intonation. Thus intonational pitch contour, which is postlexical tones, can be successfully analyzed as a series of pitch targets or tones which are associated autosegmentally with the prosodic structure of the utterance (Hellmuth, 2006). The greatest advantage AM has is that, its basic properties, most especially the notion of 'the unity of pitch', means that the theory can be used to describe any language irrespective of typological difference. The theory however does not account for separate global effects.

2.4.2.4 Lindau's model of intonation

Lindau (1986) model of intonation is a modified form of the model developed by Gårding (1983). The model was applied to Hausa a two tone language. Lindau's model separates rules for intonation and tones. According to him "Intonation is represented as sloping grids of (near) parallel lines, inside which tones are placed. The tones are associated with turning points of the fundamental frequency contour. Local rules may also modify the exact placement of a tone within the grid" (Lindau, 1986:757). Final contour is arrived at "by concatenating the tonal points using polynomial equations", which is an interaction between global and local factors.

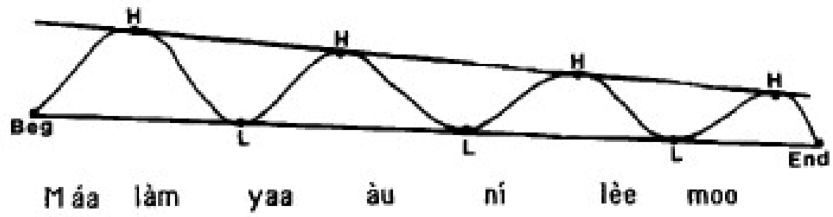


Fig. 2.26. Lindau's model of intonation

Lindau's model though suitable for a two tone language like Hausa is not appropriate for Iṣẹ̀kírì a three tone language because it will be difficult to represent the High, Mid and Low tones within two parallel grid lines. For this model to account for data presented in this study, there has to be either a third line to account for the target of a third tone or a definition of the position of this tone. An attempt at such modifications would produce a convoluted grid.

2.5 Theoretical framework

The study adopts the Acoustic-Phonetic Approach (Rabiner and Juang, 1993) and Optimality Theory (Prince and Smolensky, 1993) as frameworks. The Acoustic-Phonetic Approach (APA) provides an understanding of the acoustical structure of the speech signal and the acoustic features of speech sounds and Optimality Theory (OT) shows how constraints on the output of grammar are satisfied, the relationship between constraints on output structures and the operations that transform inputs into outputs. The relationship between input and output is clearer in that all possible output forms are represented for EVAL to choose the optimal output representation. This theory is particularly ideal in recognizing relations and patterns and provides a better analysis of tonal behaviour and intonation in Iṣẹ̀kírì.

2.5.1 Acoustic-Phonetic Approach (APA)

Acoustic-Phonetic Approach is a phonetic approach used in different areas of speech analysis such as speech recognition, accent classification, speech activity detection, and so on, to analyze speech and interpret the speech signal. This approach according to Rabiner and Juang (1993: 42-43) "…is based on the theory of acoustic phonetics that postulates that there exist finite, distinctive phonetic units in spoken language and that the phonetic units are broadly characterized by a set of properties that are manifest in the speech signal, or its spectrum overtime." Following from this, the stages of an acoustic-phonetic approach are speech analysis, feature detection and segmentation and labelling (Rabiner and Juang, 1993). The speech analysis section makes available the spectral representation of the properties of the speech signal. Various softwares are available to extract and measure phonetic features. This study uses Praat to achieve this. An illustration of feature extraction is given in Chapter 3. The next stage of an an acoustic-phonetic approach is the feature detection unit which "…converts the spectral measurement to a set of features that describes the broad acoustic properties of the different phonetic units" (Rabiner and Juang, 1993: 42). According to Koffi (2020), this indicates the presence or absence or value of a feature.

The segmentation and labelling stage involves the segmentation of the speech signal into steady acoustic areas which is followed by the attachment of one or more phonetic labels to each segmented region. This results in a phoneme pattern characterization of the speech (Rabiner and Juang, 1993). This is illustrated with the Iṣẹkírì word *īrɔ̄* 'hair' in Fig. 2.27.

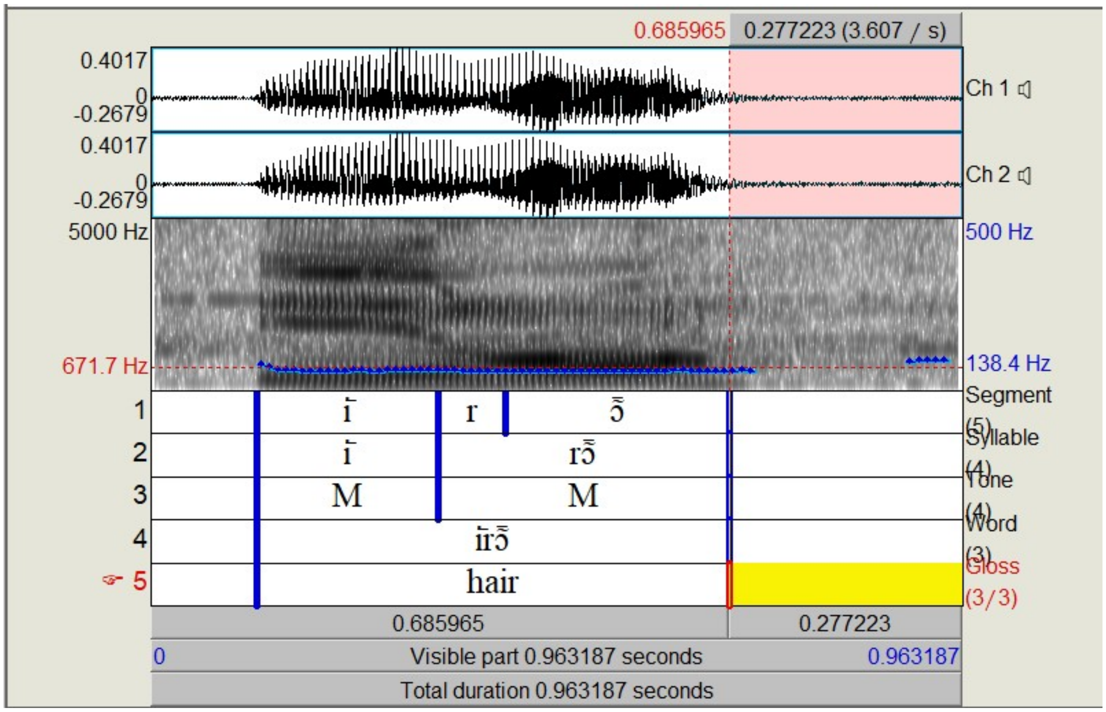


Fig. 2.27. Segmentation and labelling of *īrɔ̄* ‘hair’

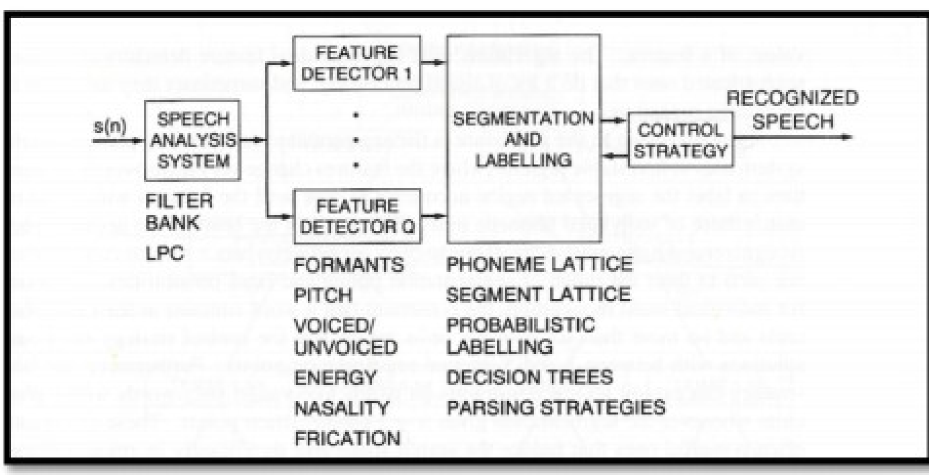


Fig. 2.28. The steps of an acoustic-phonetic approach

A pictorial representation of the Acoustic-Phonetic Approach process adapted from (Rabiner and Juang, 1993: 42) is shown in Figure 2.28.

Koffi (2020) notes that one goal of speech analysis is to extract important acoustical structural parameters, which can be thought of as a means of data reduction and an enrichment of information-bearing units. APA achieves this through the speech analysis unit and moves on to feature detection which is followed by segmentation and labelling to produce the acoustic configuration that analyzes and interprets the speech signal. Figure 2.29 exemplifies an acoustic representation that illustrates our acoustic analysis of tonal units and contours in this study.

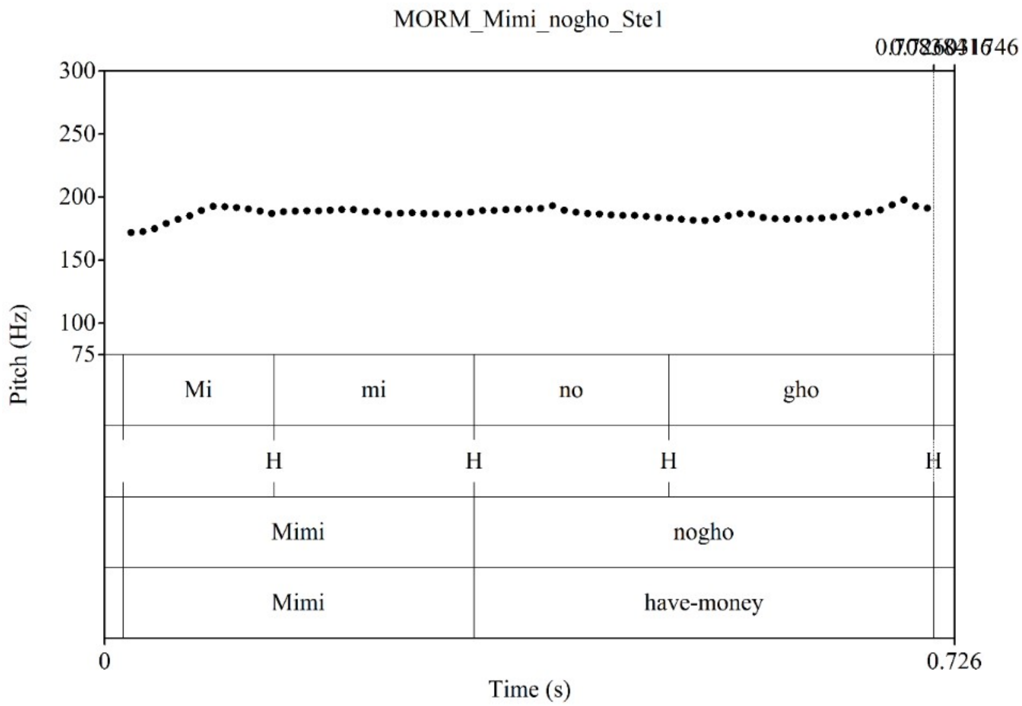


Fig. 2.29. An acoustic representation of a tonal contour

2.5.2 Optimality theory

This study adopts Optimality Theory (OT), an approach to linguistic study which was first laid out by Prince and Smolensky (1993). OT is used for a formal analysis of tone and intonation in this work. The preference for OT for the analysis of the behaviour of the M tone and intonation, is hinged on the explanatory transparency it offers through the ranking of constraints. Economy and simplicity issues raised in earlier reviews will be shown to find answers in OT in this study. It has been noticed that some morpho-phonological phenomena in tone languages can be better explained with the help of OT (McCarthy and Prince, 1993; Yip, 2002). Economy and simplicity are two main reasons for using OT for theoretical analysis of the language of study. In general, OT evaluates tonal occurrences in an egalitarian fashion through the interaction of constraints. OT differs significantly from rule-based accounts in that there are no rules; rather, a given surface form is derived from an underlying form by means of a universal set of ranked and violable constraints on well-formedness. The fundamental idea in OT is that Universal Grammar consists of a set of constraints on representational well-formedness and from these individual grammars are constructed (Prince and Smolensky, 1993; Sunday and Oyatokun, 2016).

An OT grammar consists of a set of universal, violable constraints on output representations, ranked in a language-specific way. There are two sets of constraints: faithfulness constraints which demand that the input and output are identical to each other, and markedness constraints, which demand that output representations are unmarked (Levelt and Levelt, 2000). Constraints are usually in conflict and will often be violated. Depending on the language, violations of some constraints are regarded as worse than violations of some others, and this is expressed by the constraint ranking. The ranking of constraints is thus language-specific.

Principles of Optimality Theory

Some fundamental principles underlie OT:

a) Violability: constraints are violable but violation is minimal.

b) Ranking: constraints are ranked differently based on the language, that is, on language-particular basis.
c) Inclusiveness: A set of candidates that are admitted by very general considerations of structural well-formedness are evaluated by the constraints hierarchy.
d) Parallelism: Best-satisfaction of the constraint hierarchy is computed over the whole hierarchy and the whole candidate set (McCarthy and Prince, 2001).

Basic Components of Optimality Theory

OT has three basic components. These are GEN, CON and EVAL. An overview of the components is presented below.

a) GEN: This is the generator. It is the operational component of the grammar. This component takes an underlying representation known as the input and creates a set of possible surface forms. GEN constructs a set of candidate output forms that deviate from the input in various ways. GEN generates all the analyses of input that "are admitted by very general considerations of structural well-formedness" (McCarthy and Prince, 1993:2). That is, GEN generates an infinite number of probable output candidates. For example, for an input /ʤɛ̄ ɔ̀ʤɛ̀/ 'eat food' in Isẹkírì, output forms would include [ʤɛ̄ʤɛ̀], [ʤɛ̄ɔ̀ʤɛ̀], [ʤɔʤɛ̀], [ʤūʤɛ̀], [ʤɛ̃̄ɔ̀ʤɛ̀], [ʤɛ̄lɔ̀ʤɛ̀] and so on.
b) EVAL: EVAL is the evaluator, it evaluates a candidate set with respect to particular rankings of the constraint inventory Con (Dekkers, Van der Leeuw and Van der Weijer, 2000). It chooses a member of this set to be the actual output of the grammar. That is, it selects the most optimal output by considering a set of universal constraints CON. The optimal candidate becomes the surface representation.
c) CON: CON is the universal constraint component. It is a set of universal constraints which all languages share but rank differently. It is made up of two basic types of constraints: markedness constraints and faithfulness constraints. Faithfulness constraints make sure that output forms are similar to input representations and that all segments in the output are present in the input. These

constraints include constraints such as MAX, DEP, IDENT. Markedness constraints, on the other hand, demand that output forms be unmarked and these include ONSET, OCP and so on. There are some essentials of a valid ranking which include the fact that constraints to be ranked must conflict, the constraint that favours the winner must dominate the constraint that favours the loser.

The Constraints

The patterns of language are best explained through a hierarchy of violable constraints (Prince and Smolensky, 1993). Constraints are essential recognized mechanisms (together with other mechanisms) used to ascertain a winning output representation. These constraints are assumed to be universal in OT, as they apply to all languages. Language specificity is accounted for by ranking. As mentioned earlier, constraints are of two basic types- markedness constraints and faithfulness constraints. The set of constraints used in this study are the family of tonal faithfulness constraints MAX-IO (T) and DEP-IO (T) constraints and the markedness constraints are Multiple (T), alignment, acoustic and GROUND PRINCIPLE constraints. The MAX-IO (T), Multiple (T) and GROUND PRINCIPLE constraints are used for our tone asymmetry analysis and the DEP-IO (T), acoustic and alignment constraints are utilized for the analysis of intonation. The constraints are derived from UG constraints; however, as noted in Yip (2002:82), "…in the tonal domain there is no standardized consensus on the names and precise formulation of the constraints." This study, therefore, adopts constraints of particular interest to asymmetric behaviour of the mid tone in Isẹkírì. A full exposition of these constraints is offered in Chapter four where the analysis of tone and intonation is given. A graphic representation of an OT grammar (Barlow and Geirut, 1999) is given below.

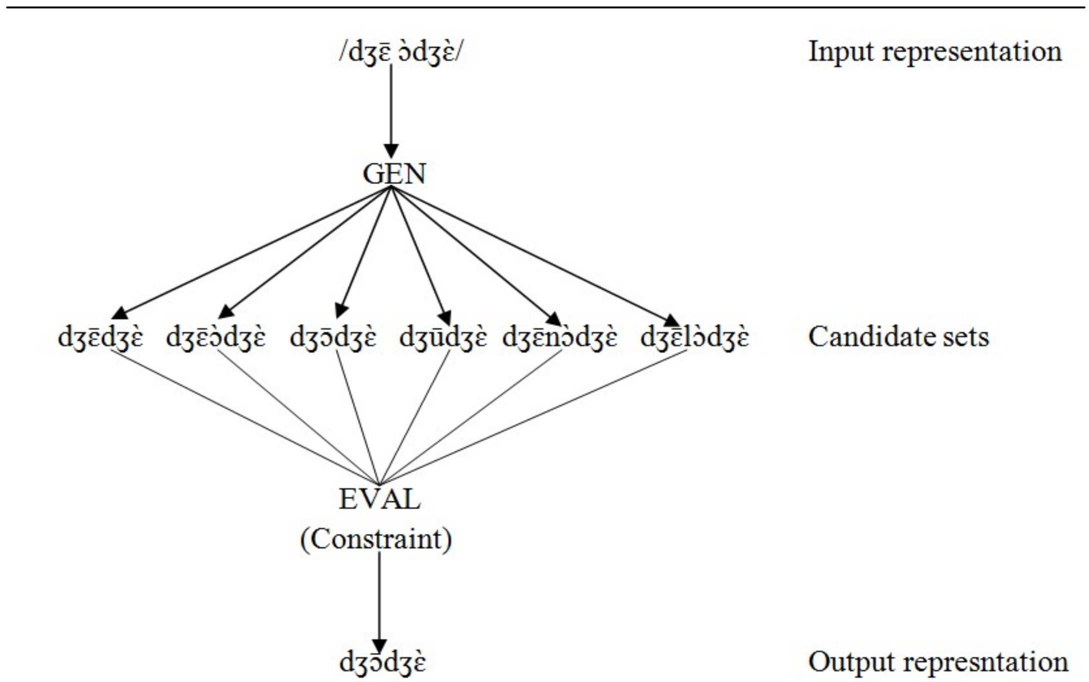


Fig. 2.30. OT Grammar Representation of /ʤɛ̄ ɔ̀ʤɛ̀/ 'eat food'

Fundamentals of Analysis

The most important part of any OT analysis is a collection of constraints rankings. Generally, an input receives a set of output candidates. These candidates are evaluated against the constraint hierarchy. The output candidate that is best evaluated is the one which least violates the hierarchy of constraints. This candidate, called the winner, is the actual output for that input. The other candidate or candidates are losers, that is, though they are generated by GEN from this same input, according to EVAL, they are not the most harmonic candidates.

The elements of a ranking argument are illustrated with a tableau. An illustration of an OT procedure is shown in the Isẹ̀kírì example in Tableau 2.2.

Tableau 2.2. The emergence of *Tuọ́kpẹ́ wúlí* 'Tuọ́kpẹ́ is at home'

Input /twɔ́k͡pɛ́ wúlí/ ⟶ Output [twɔ́k͡pɛ́ wúlí 0%]

/twɔ́k͡pɛ́ wúlí/	ALIGN 0% (Rt, ip)	Dep T	*Finσ-I
☞a. [twɔ́k͡pɛ́ wúlí 0%]			*
b.[twɔ́k͡pɛ́ wúlíH%]	*!		
c.[twɔ́k͡pɛ́ wúlìL%]	*!	*	
d.[twɔ́k͡pɛ́H% wúlí]	*!		*

Candidate (a) is called the optimal candidate; it is the actual output form for the given input. Candidates (b), (c), and (d) are losers; they are derived by GEN from the same input but are not the most optimal, according to EVAL. Each violation of a constraint is indicated by an asterisk (*) and an exclamation point (!) is used to show that a candidate has been knocked out of the competition. This happens when a candidate violates a high ranking constraint. The pointing finger (☞) indicates the optimal candidate.

2.6 Conclusion

This chapter has focussed on literature that has significant bearing on the study. It highlighted gaps that previous investigations did not address and also presented an assessment of the different concepts related to this study. Downtrend phenomena such as declination and downstep which are often used in the description of tone and intonation were discussed and empirical studies on tonal behaviour and intonational characteristics were surveyed. Previous theoretical accounts offered for the analysis of tone and intonation were considered and the Acoustic Phonetic Approach and Optimality theory frameworks adopted for this study were presented. An examination of related literature indicated areas of interest which this research will address.

CHAPTER THREE
METHODOLOGY

3.0 Introduction

This chapter presents the procedures for data collection and analysis in this study. The research design, informants from whom data for the study were elicited, method of data collection and corpus of speech data that address the research questions are discussed.

3.1 The research design

The ethnographic design was employed for this study in accordance with the requirements of a qualitative research. This is because the study involved a systematic investigation based on naturalistic data. The study therefore adopted the primary source of data collection which involves face to face interviews and interactions with informants. Interviews using word lists, oral presentation of different linguistic situations, stories and sentence materials were conducted. Digital recordings of elicited and natural conversation of speech were converted to .wav format. Each measurement provided five tokens of each item of the paradigms. Data were subjected to statistical and philological analyses. These processes are discussed in the following sections.

3.2 Selection of informants

Primary data was gathered from Iṣẹ̀kírì-speaking informants. The inclusion criteria for selecting the informants comprised demographic variables such as age, place of birth and place of early childhood. Basically, the informants were native speakers (ten males and seven females) purposively selected for their proficiency and duration of stay in near homogenous Iṣẹ̀kírì communities, six each from Abigborodo and Gbokoda and five from Gbodo. Speakers of the language who were born and brought up in major towns like Warri and Sapele were excluded from the study. This was because of the high intensity of language contact between Naija and the Iṣẹkírì language in Warri and Sapele, and the domineering role of Naija which might have influenced the Iṣẹkírì spoken by these speakers. The informants used for this study were within the age range of 50 and 80 years. However, data were elicited from one male speaker below 50 years following recommendations from some older persons in the community who acknowledged his competence in Iṣẹkírì.

The exclusion of informants below age 50 was guided by the prevailing situation in the language area where these category of speakers use Naija more than the Iṣẹkírì language. Ethical approval was obtained from the informants for their metadata to be used and Table 3.1 shows the metadata of the informants. In the acoustic speech stream, informants were identified with the first three letters of their names and a last letter indicating the sex which is M for male informants and F for female in the acoustic diagrams. Thus, we have as an example for the informant Morrison, a male respondent represented as MORM in all acoustic figures and illustrations.

Table 3.1. Metadata of informants

S/N	Name	Sex	Age	Occupation	Informants acronym
1.	Mr Henry Ọrru	M	59	Teaching	ORUM
2.	Mr. Oludewa Ọmastọnẹ	M	58	Business	OMAM
3.	Mr Morrison Ejuogharan	M	65	None (Retiree)	MORM
4.	Mr Ernest Ekpoto	M	48	Politics	ERNM
5.	Chief Esanye Nana	M	71	None (Retiree)	ESAM
6.	Mrs Ariengho Alero	F	76	None (House wife)	ARIF
7.	Mrs Oludewa Alexzander	F	54	None (House wife)	OLUF
8.	Mrs Bose Ojeabulu	F	56	Tailoring	OJEF
9.	Mrs Edema Mabel	F	69	None (House wife)	EDEF
10.	Mrs Morrison Felicia	F	56	Trading	FELF
11.	Miss Omawumi Igbiaye	F	60	None (House wife)	OMAF
12.	Mr Tuoyo Ayirimi	M	65	Fishing	AYIM
13.	Mrs Mejẹbi Olley	F	56	Trading	MEJF
14.	Mr Torise Ejuogharan	M	51	Fishing	TORM
15.	Mr. Egert Ogbemi	M	63	Fishing	OGBM
16.	Mr. Aboyowa Okotie	M	60	Business	ABOM
17.	Mr. Edon Tonukarin	M	53	Trading	TONM

3.3 Data Collection

An impressionistic observation of data with vowel elision in Omamor (1979) prompted a preliminary perceptual investigation of the behaviour of the tonal units in the phonological process presented. To confirm or refute this impression, data with vowel elision were drawn from two speakers of Iṣẹkírì as a preliminary perceptual experiment and this experiment identified areas of fruitful research. Twenty (20) lexical items (10 from Omamor (1979:217) and 10 from Osewa (2016:57-59) with the high, mid and low tone and collocations of these lexical items in V-V sequences with H#M, H#L, M#L, L#M and M#M tones, were combined into phrases that resulted in vowel elision. The fact that Omamor (1979) is a pioneering work on Iṣẹkírị Phonology and Osewa (2016) is the researcher's earlier study is the rationale for the choice of these lexical items from these works. These words and phrases were produced by one speaker (Mr Henry Orru, an Iṣẹkírị language teacher). A second speaker, Omatsone, was told to identify the tones he heard in the individual words and in the phrases after elision. The same procedure was followed through for speaker two and the result from this preliminary investigation provided a need for further investigation of the tonal units and tone system of Iṣẹkírị.

Data were collected electronically with the aid of a digital audio recorder in the .wav format. Series of recordings were carried out in a sound proof room in the University of Benin Phonetics Laboratory and w-records Media Enterprise recording studio. This was done for 11 of the informants who were invited to Benin and paid for this. The choice of holding most of the recording in a sound proof room was to reduce the influence of ambient noise on our acoustic results. Recordings for the other informants were carried out in the field. Prior to recording, they were told of the need of a recording devoid of noise. This proved quite challenging but recordings were done at an agreed time of between 9:30 a.m and 12:30 p.m. when there was relative peace. Also, the recordings were conducted in the room with the windows shut which was not comfortable but proved quite helpful and these recordings were also utilized.

Lexical items from the wordlist and data comprising utterances were edited into separate AIFF (Audio Interchange Formant File) audio files using the Audacity software, a free online software which can be used to play, visualize, modify and cut sounds. The

Audacity software proved a very useful instrument for segmenting words, phrases and sentences as the waveform display was distinct and it was possible to play selected portions of this display. This made it easy for the relevant token to be exported into the Praat software for annotation and acoustical analysis. The recordings were transcribed using the i2speak tool before being subjected to analysis.

3.4 Nature of Data

The corpus for this study contain natural speech, semi- spontaneous speech and controlled speech. The choice of both planned and spontaneous speech for this research is to have broad-based data that is representative of the Iṣẹ̀kírì speech form which will help us arrive at answers to the research questions. The spontaneous speech is made up of narratives (stories, proverbs and history of the Iṣẹ̀kírì people) which provide an excellent opportunity for the informants to employ several types of sentences. The semi- spontaneous speech consists of speech that evokes Wh questions while the controlled speech are speech materials designed to illustrate possible mechanisms (such as downdrift, downstep and declination) employed in the language of study; thus utterances with particular tone sequences were targeted. This allows us to observe and identify significant F_0 contours, determine the contributing factors to F_0 contours, and discover specific intonation features.

Seven sets of data labelled A – G were drawn from our corpus. This was to ensure that we had the right data. Data set A comprise sentences extracted from transcribed and translated narratives (28 stories, 15 proverbs and 5 narrations on the Iṣẹ̀kírì people and their monarchy) and a total of 128 sentences were obtained here.

The speech corpus in Data set B was made up of semi-spontaneous speech, that was obtained through an oral presentation of different linguistic situations (such as, 'Ask your wife where she went yesterday', 'A man and his wife are fighting, ask the cause of the fight', 'Ask who ate the food you left on the table') intended to induce utterance types that comprise the Wh question. 224 sentences were evoked from responses to these situations. See example 3.1

Example 3.1

a) bōkɔ́ wó rè nɔ́lā

Where PRON go PREP-yesterday

'Where did you go to yesterday?'

b) nēsɛ̄́dʒɔ̀dʒɛ̀ tówórímɛ́dʒɛ̀

Who eat PST- food PREP-head-table

'Who ate the food on the table?'

Data set C consist of a total of 1010 sentences of like tones differing in length with each participant providing five tokens of each sentence. Sentence length ranges from four (4) to seventeen (15) syllables. Sentences with high tones only are 480 (5 tokens of 6 sentences multiplied by 4 speakers), sentences with mid tones only are 480 (5 tokens of 6 sentences multiplied by 4 speakers) and sentences with low tones only are 450 (5 tokens of 6 sentences multiplied by 4 speakers). The 13 syllable low tone sentence for MORM was discarded due to inconsistencies.

Example 3.2

a) bíbí bírí méjíwá wá rɛ̃́

Conj come ASP

'Bíbí and Méyíwá have come.'

b) bíbí bírí méjíwá némí wá nónúwé

Conj can come Prep-today

'Bíbí and Méyíwá can come today.'

Example 3.3

a) ɔ̄mɔ̄nɔ̄kɛ̃̄ tɛ̄rɛ̄ sērɛ̄dʒā

Child- male PRON pick fish

'The boy picked fish.'

b) ɔ̄māgɛ̄nɛ̄ k͡pā̃ ōmī ɔ̄mɔ̄nɔ̄kɛ̃̄ tɛ̄rɛ̄

fetchPST water child - male PRON

'Ọmagẹnẹ fetched the boy's water.'

Data set D comprise 140 sentences with mixed tones which is intended to investigate the nature of downstep in Iṣẹkírì, see example 3.5

Example 3.4

a) ó rè kúrò démè wá.
PRON goPST PREP-PRON come
'He left before I came'.

b) ēdʒwɔ́nɛ̄lóɣò wínɔ́rɔ̄̃ g͡bá sʊ̃̀
ASP- BE sleep
'Ejuónẹlóghò is sleeping.'

Sentences meant to investigate Yes/No question in Iṣẹkírì make up Data set E with a total of 1304 sentences. In this data set, sentences are also developed, where same nouns and verbs are used as much as possible to see if intonation is responsible for F_0 differences and contours (Appendix II). An example of Yes/No question in Iṣẹkírì is given below.

Example 3.5

a) bíbí bírí méjíwá wá rɛ̃́?
Conj come ASP
'Have Bíbí and Méyíwá come?'

b) ó rè kúrò démè wá?
PRON goPST PREP-PRON come
'Did he leave before I came?'

Table 3.2. Summary of full set of sentences

S/N	DATA ITEMS	SPEECH STYLE	TOKENS
A.	Extractions from narratives	Spontaneous speech	128
B.	Wh Questions from 20 situations	Semi-spontaneous speech	224
C.	Sentences with like tones	Controlled speech	1010
D.	Sentences with mixed tones	Controlled speech	140
E.	Yes/No sentences	Controlled speech	1304

A self-structured Word list drawn from the Ibadan 400 Word list and the SIL Comparative African Word list made up data set F. The word list was made up of different lexical items that express different facets of life including body parts, animals, food items, numerals, kinship terms, names of various objects, verbs, adjectives, and so on divided into a set of nouns, pronouns, adjectives, adverbs and verbs. Words were considered in isolation to determine surface tonal contrast. This study used acoustic methods to determine these tone contrasts by showing their pitch tracks and the pitch range at which each tone level is realized. See Appendix I for Data set F.

Data set G were relevant phrases that occur in different environments such as morpheme boundary and word boundary (drawn from noun- noun and verb-noun collocations). To ensure that diverse tonal combinations are elicited for each tonal phenomenon, phrases with different tonal patterns were carefully put together to show how the different tones behave in context.

Example 3.6

M LL

a) Jẹ ọ̀jẹ̀ /dʒɛ̄#ɔ̀dʒɛ̀/ [dʒɔ̀dʒɛ̀]

'eat' 'food'

H MM

b) ṣẹ́ egin /ʃɛ́#ēgĩ/ [ʃégĩ]

'break''wood'

H MH

c) nẹ́ ogó /nɛ́#ōɣó/ [nóɣó]

'have''money'

L MM

d) lọ̀ ogoló /lɔ̀#ōgōló/ [lōgōló]

'grind''pepper'

It is pertinent to draw attention to the effects of segments on F_0 values. Studies have shown that there is an interaction between pitch, vowel height and consonants (Poser, 1984; Sigh, 1997; Laniran, 1999; Fox 2000; Yip, 2000, Gussenhoven, 2004). The segmental composition of an utterance has possible effects that influence F_0 values and as such difficulties arise in the study of F_0 contour. One of such difficulties is that the intrinsic pitch of high vowels tends to have higher F_0 than low vowels. An examination of the effects of vowel height on tones in Isẹ̀kírì (in a segmental effect experiment with a controlled consonantal environment) shows that there is a difference of about 8 to 9 Hz between the high vowels and the low vowel /a/ for the different tones. The difference in F_0 values for /u/ however show a higher range. Particular attention was not on the vocalic elements of the syllable formative but where the influence was noticed to have significant influence on the F_0 contour, this was discarded. The F_0 values are shown in Tables (3.3a) – (3.3c).

Table: (3.3a). F_0 values for H-toned vowels in Hz

Rí	rú	ré	ró	rɛ́	rɔ́	rá
160.1	175.7	162.5	157.6	159.3	155.7	151.6

Table: (3.3b). F_0 values for M-toned vowels in Hz

rī	rū	rē	rō	rɛ̄	rɔ̄	rā
134.8	133.4	134	126.2	125.5	126.5	125.4

Table: (3.3c). F_0 values for L-toned vowels in Hz

rì	rù	rè	rò	rɛ̀	rɔ̀	rà
127.2	129.5	126.5	125	125.4	120.4	122.6

Adjacent consonants also influence F_0; voiced consonants disturb F_0 curves downward while voiceless consonants apart from disrupting F_0 curves during obstruction of air passage in their production also disturb F_0 curves upward. These effects are greatest immediately after a consonant. One of the ways this can be largely avoided is by measuring F_0 well into the vowel. Poser (1984) suggests two ways these effects can be evaded; (i) consonants with the greatest perturbing effects on F_0 contour should be avoided, and (ii) the set of utterances should be formed in a way that "compared values are comparable with regard to segmental content" (Poser, 1984:9). In essence identical syllables should be compared so that the segmental effects are the same. While this is tenable in the treatment of tonal contrast where the study in most cases compares identical syllables, it is however difficult and almost impossible to constrain spontaneous speech. Thus consonantal effects in this study are mitigated by measuring F_0 well into the vowel.

3.5 Method of Analysis

Lexical items were grouped into classes based on observed patterns. Pitch patterns on individual syllables were examined in order to determine the basic tonal units and tone levels operational in Iṣẹkírì. The study used acoustic measurements and methods to determine these tone types through a display of the pitch tracks and pitch range at which each tone level is realized.

From the phrases and excerpts, collocating words were observed to identify possible morphophonemic occurrences and phonological/ tonal processes and from these, tonal behaviours were observed. Sentences were arranged according to sentence types and these were further grouped according to tone types and sentence length.

Acoustic analysis was done within the Acoustic Phonetic Approach using Praat 6.0.30 version, developed by Boersma and Weenik (2017). Different acoustic signals such as spectrum, pitch, duration, and amplitude are displayed by Praat. A Praat display of a spectrograph of a waveform and pitch is represented in Figure 3.1.

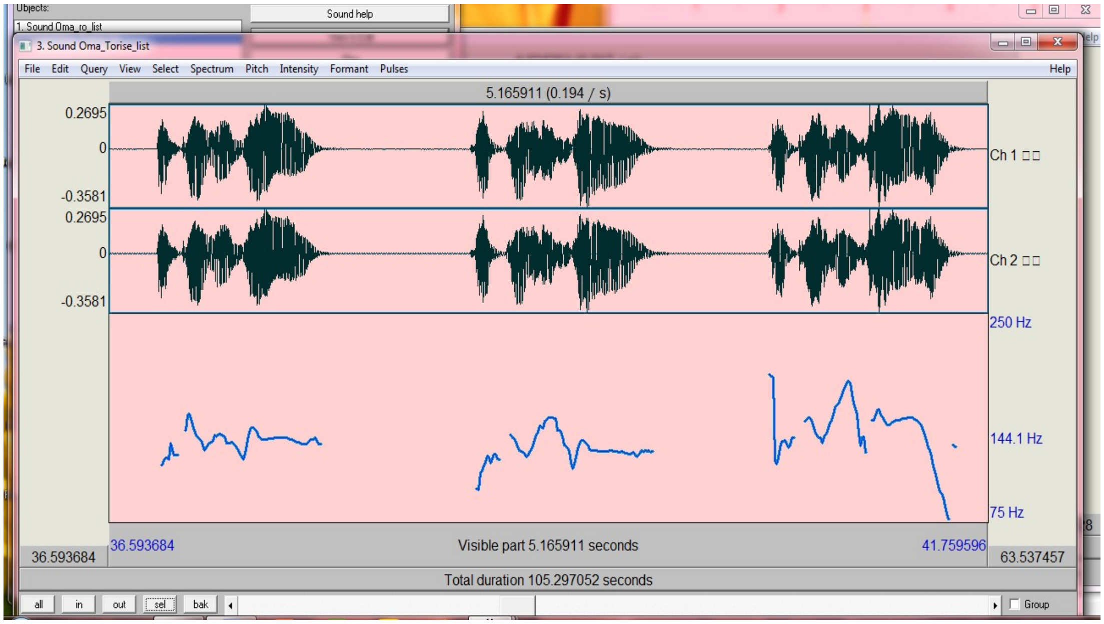


Fig. 3.1. Praat 6.0.30 Display

Audio files and text grid were created from Praat for annotation. The audio files of the extracted words and sentences were opened to display the F_0 of the utterances. F_0 values were taken from the maximum F_0 peaks for the H tones at approximately 181.28Hz, the mid point values for the M tones at approximately 143.56Hz and the minimum valley for the L tone at approximately 105.19Hz on the vowel portion of each syllable and these values were exported into Minitab spreadsheet. These were converted into an overall intonation curve through appropriate application of functions. Formal analysis of tone and intonation is within the Optimality Theory (OT) of Prince and Smolensky (1993). The study proposes a version of OT modified to include constraints of implicational statements to analyze data on tones. A full discussion of OT was presented in section 2.5.

Linear regression was used to determine whether a significant F0 downward trend occurred in sentences with similar phonological tones. The significance threshold is set at a p value of less than 0.05. To ascertain the particular mechanism at work in L tone sentences, the F0 decline of the slope of the final syllable was compared to the F0 decline of the slope of the preceding part of the sentence to see if it is significantly different from that of the preceeding part of the sentence. Statistical analysis was conducted using the Minitab statistical tool. A sample of this is shown in Figure 3.2.

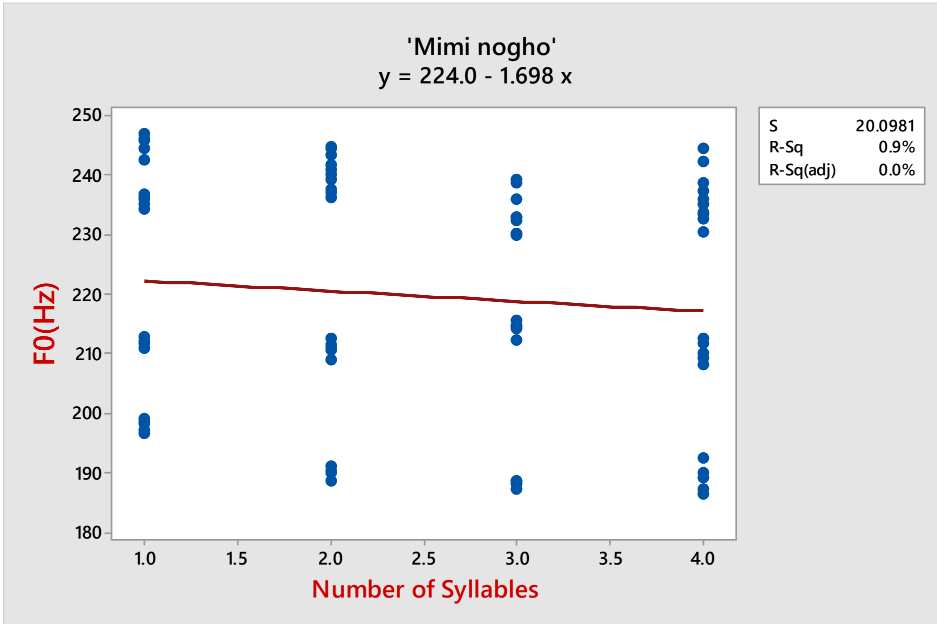


Fig. 3.2. A Minitab display of a regression line

Figure 3.2. is a Minitab display of a regression line. The F_0 values are represented by the blue dots while the regression line is represented by red line. The dependent variable is F_0 in hertz which is on the vertical side of the fitted line plot and the independent variables are the tone type and sentence length. The sentence length is represented by the number of syllable on the horizontal area of the regression plot.

3.6 Conclusion

This chapter has described the methodology used for conducting this research. The research design was sketched out and the informants from whom data for the study were elicited were profiled. The variables that were taken into account in the selection of informants were explained. The corpus of speech data used to answer the research questions were described and the procedure for data collection and mode of analysis were also outlined. The research questions are sufficiently addressed using this process.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF FINDINGS

4.0 Introduction

The findings on pitch features at word and phrasal levels in Iṣẹ̀kírì are presented and discussed in this chapter. It examines lexical pitch features, tonal processes, the mechanisms by which intonation in Iṣẹ̀kírì may manifest and the tone – intonation interaction in the language.

4.1 The nature of Iṣẹ̀kírì tonal system

This section seeks to provide answers to our research question one which is centered on the nature of the Iṣẹ̀kírì language tonal system. This is accomplished by investigating the realization of tones and the tone patterns evident in the language.

4.1.1 Tone realization in Iṣẹ̀kírì

The basic tonal inventory of a language is best established by determining the phonetic properties of individual words and the phonemic contrast. To achieve this, monomorphemic words in Iṣẹ̀kírì are examined in isolation.

4.1.1.1 Tone in monomorphemic words

Monomorphemic words in Iṣẹ̀kírì can be monosyllabic, disyllabic and in rare occurrences polysyllabic. Monosyllabic words are more often than not non-nominal lexical items because Iṣẹ̀kírì nouns are disyllabic or polysyllabic. These words are examined in order to evaluate the tone types in the language through their acoustic properties. The tones that manifest on these words in isolation are identified in the tonal data for the different word classes in Tables (4.1), (4.2) and (4.4). We have discussed in section 3.3 that the segmental composition of an utterance has possible effects that influence F_0 values and one of such difficulties is that the intrinsic pitch of high vowels tends to have higher F_0

than low vowels. An examination of the effects of vowel height on tones in Isẹ̀kírì (in a segmental effect experiment with a controlled consonantal environment) shows that tone pitch - vowel height effect is minimized for the mid vowel /o/. Also, sonorants tend to have minimal effects on pitch than other consonants. Therefore, for the purpose of our acoustic illustrations for the high, mid and low tones, an identical word with the trill /r/ and the mid vowel /o/ is selected for same segmental effects.

4.1.1.1.1 The high tone

The high tone in Iṣẹ̀kírì is a phonetic high pitch on a syllable. It occurs in every environment of a word in non-nominal elements; word initially, word medially and word finally. In nominal elements, its occurrence in word initial environments is limited to only a few polysyllabic words. Table 4.1 shows examples of words that attest high tone syllables.

Table 4.1. Tonal data for high toned (H) monomorphemic words

Nouns (2nd σ)	**Gloss**	**Verbs**	**Gloss**	**Others**	**Gloss**
/ēdʒú/	eye	/bí/	give birth	/lá/	big
/ūɣɔ́/	navel	/gĩ́/	say	/dṹ/	black
/īmɔ́/	nose	/dɛ̃́/	fry	/g͡bã́/	wise
/ɛ̄dʒí/	teeth	/bú/	abuse	/sĩ́/	long
/ɛ̄rú/	slave	/g͡bá/	sweep	/já/	quick
/ūná/	fire	/fɛ́/	want	/ɣã́/	costly
/ɛ̄sú/	bone	/kɔ́/	build	/fɛ́/	clean
/ūg͡bó/	farm	/nɛ́/	have	/g͡bó/	old
/ɔ̄sá/	father	/sé/	close	/wó/	heavy
/īkṹ/	waist	/rí/	to see	/kɔ̃́/	full

Acoustically, high tones have a specified pitch target that is reached late into the syllable in Iṣẹkírì. The H tone rises from the beginning of the syllable to a level high far into the syllable for its full realization. Thus tonal specification for the H tone is realized as an acoustic high target at 181.28Hz as illustrated in Figure 4.1.

In this example, the pitch rises through out the syllable and the F0 target of the high toned word ró occurs late in the syllable. Akinlabi and Liberman (2002) report that "in languages like Igbo and Yoruba, other things equal, the phonetic target value of a tone – the highest F0 of a High tone, or the lowest F0 of a Low tone – is found at the end of the span of time corresponding to the associated tone-bearing unit". Figure 4.1 provides evidence for this phenomenon in Isẹkírì. Also importantly, high tones in successive syllables in lexical items occur on the same pitch register. The pitch track of the word *ēkútélé* 'rat' in Figure 4.2 exemplifies this.

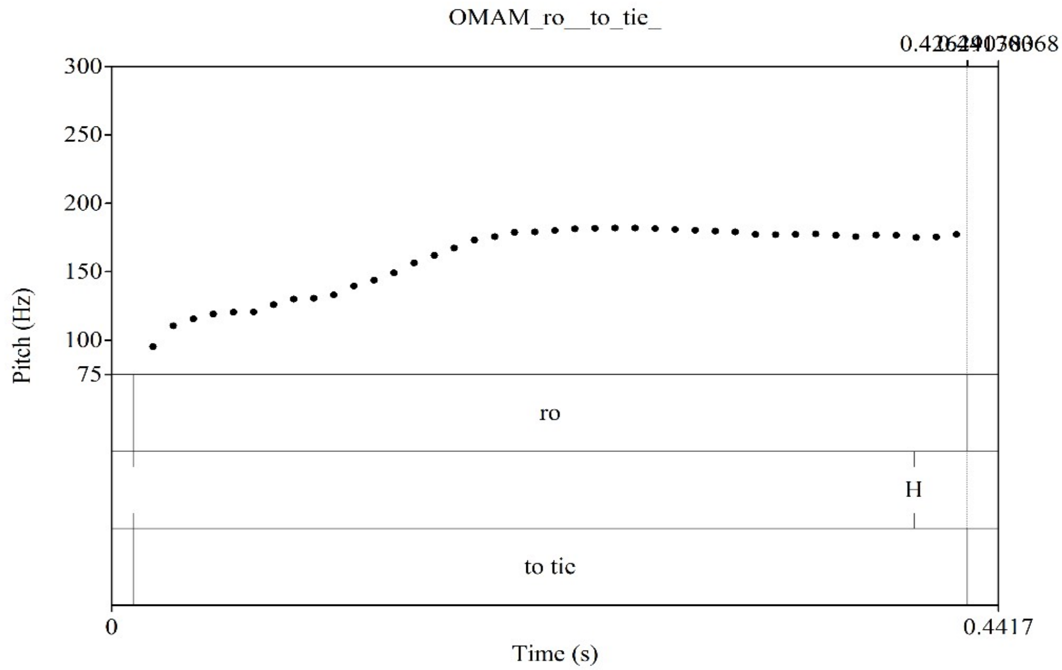


Fig. 4.1. Pitch track for the Iṣẹ̣kírì word *ró* ‘to tie'

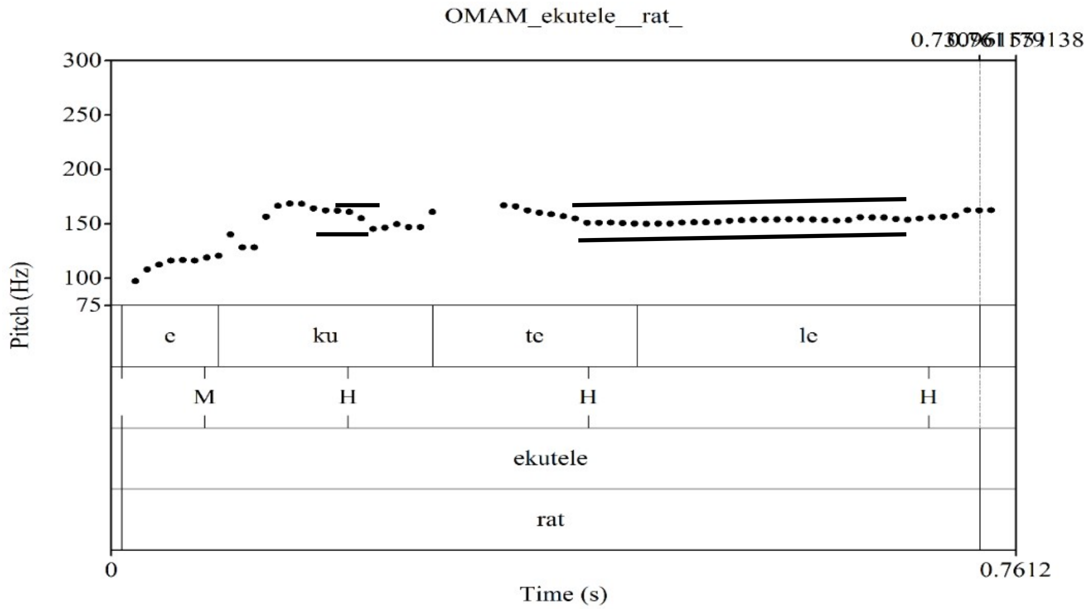


Fig. 4.2. Pitch track for the Isekiri word 'ekutele' 'rat'

The high tones in the last three syllables in Figure 4.2 are all realised on approximately the same pitch level, which is 163.71Hz, 160.85Hz and 162.97Hz for the syllables *ku*, *te*, and *le* respectively. In contrast, a sequence of high tones with an intervening low occur on remarkably different pitch levels as seen in the word *ímìlá* 'cow' with 160.41Hz for *í*, 127.19Hz for *mì* and 131.09Hz for *lá* illustrated in the pitch graph in Figure 4.3. It is pertinent to point out that simple forms with HLH formations are very rare in Iṣẹkírì. A comparison of this form with the compound word *ɔ́*g*ɛ̄dɛ́jìbó* 'banana' points to the fact that the high tones of the HLH sequence are realized on different pitch levels as seen in the F_0 values; 147.93Hz for *ɔ́*, 150.52Hz for *dɛ́* and 131.81 for *bó* in Figure 4.4.

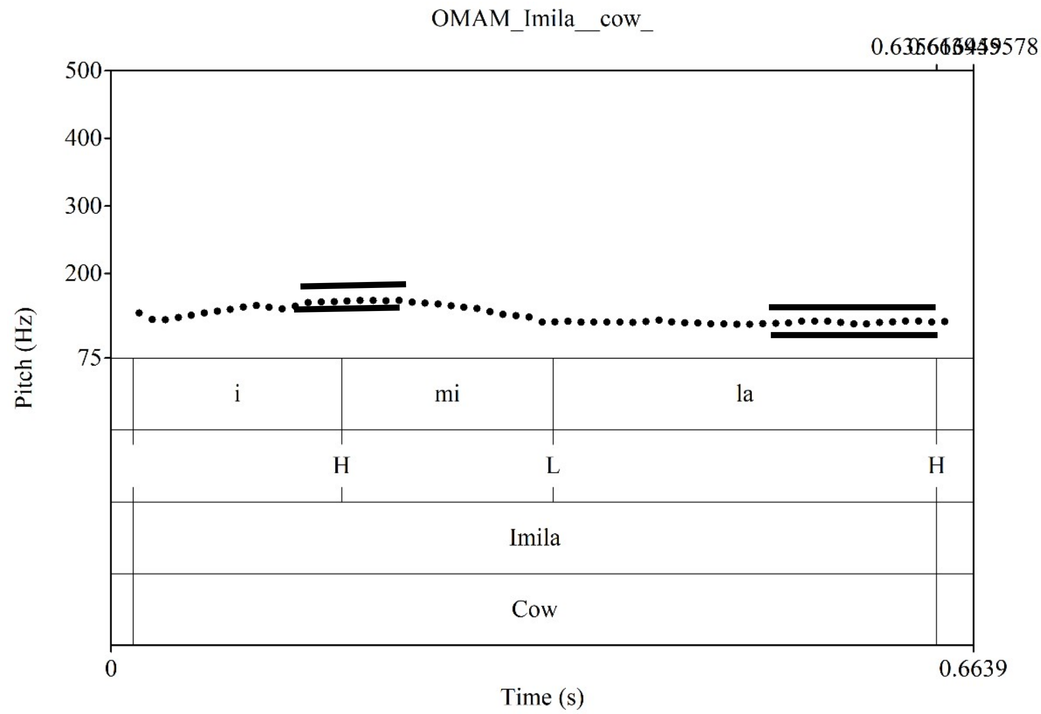


Fig. 4.3. Pitch track for the Isẹkírì word *ímìlá* ‘cow'

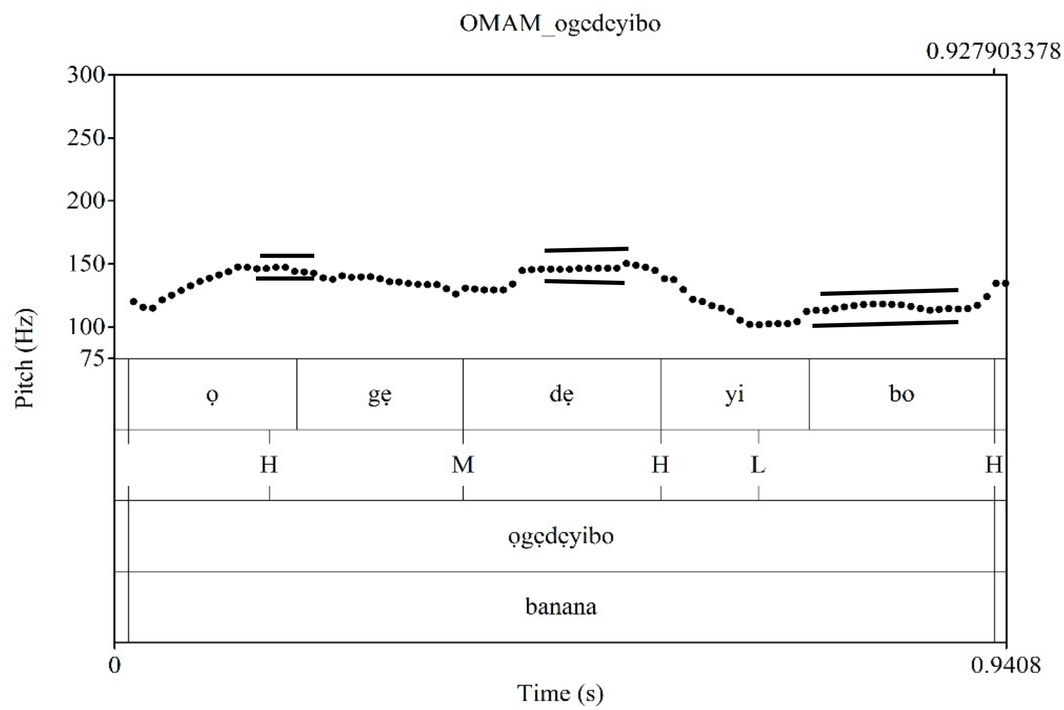


Fig. 4.4. Pitch track for the Isẹkírì word *ọ́gẹdẹ́yìbó* ‘banana'

The high tones in Figure 4.4 are phonologically identical but are realized on two different pitch registers. The first two high tones on *ɔ́* and *dɛ́* are realized on the same pitch level although there is an intervening mid tone, the third high tone on the final syllable *bó* is realized on a different pitch register as a result of the preceding low tone demonstrating the phenomenon called automatic downstep or downdrift which is fully accounted for in Section 4.3.1.2. Thus, a sequence of high tones with an intervening low tone is realized on a different pitch register while a sequence of high tones with an intervening mid tone or without an intervening low tone is realized on the same pitch level.

4.1.1.1.2 The mid tone

The mid tone is phonetically realized on a mid-pitch. This tone is often represented with the symbol [¯] but is, however, not marked in lexical representations in Iṣẹ̀kírì writing convention. It occurs in every environment of a word: word initially, word medially and word finally. The mid tone also occurs in all word classes, as shown in Table 4.2. The pitch tracks of a word demonstrating the mid tone in isolation and in a sequence of mid tones in lexical items are in Figures 4.5 -–4.8.

Table 4.2. Tonal data for mid toned (M) monomorphemic words

Nouns (1st &2nd σ)	Gloss	Verbs	**Gloss**	**Others**	**Gloss**
/ōgū̃/	war	/bā̃/	plait	/nī/	strong
/ūbō/	a place	/dʒɛ̄/	eat	/rɛ̄/	wet
/ōdē/	compound	/jī̃/	to uproot	/gō/	tall
/ɔ̄ʃɛ̄/	soap	/sā̃/	to pay	/dēdē/	all
/ōdʒō/	a coward	/wū/	to shout	/rō/	bitter
/ōkō/	bush	/jā/	to write	/gēgē/	immediately
/ūrɛ̄̃/	metal	/mɔ̄/	drink	/ɛ̄kōkō/	important
/ɛ̄rē/	hard work	/kɔ̄/	to crow	/gbɛ̄/	dry
/ɛ̄bī/	guilt	/k͡pā/	to kill	/ʃɛ̄/	effective
/ōwū̃/	native salt	/sɔ̄/	throw	/kōkōkō/	firmly

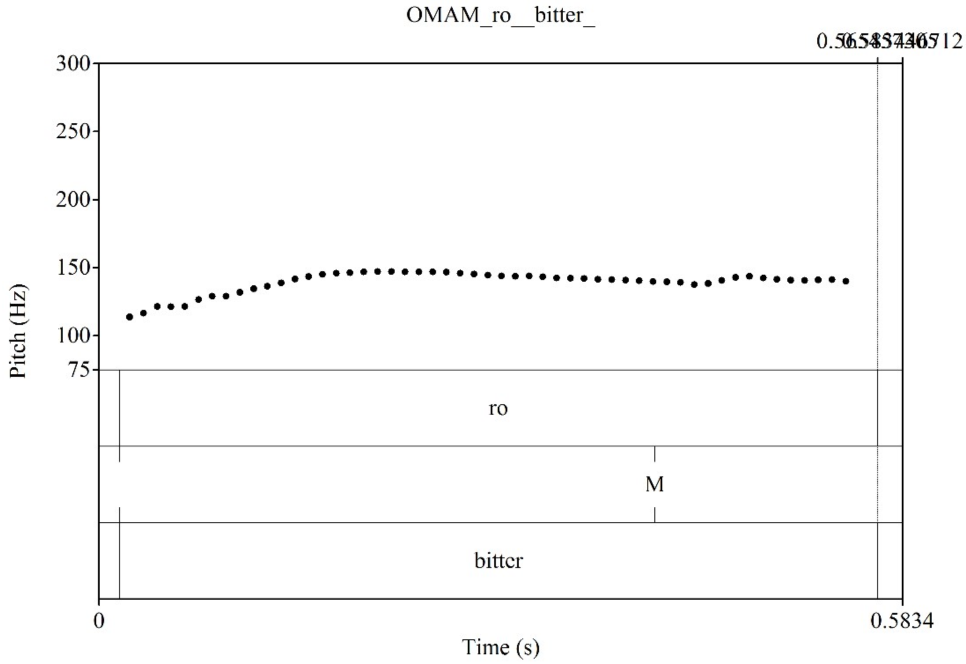


Fig. 4.5. Pitch track for the Iṣẹ̀kírì word *ro* ‘bitter'

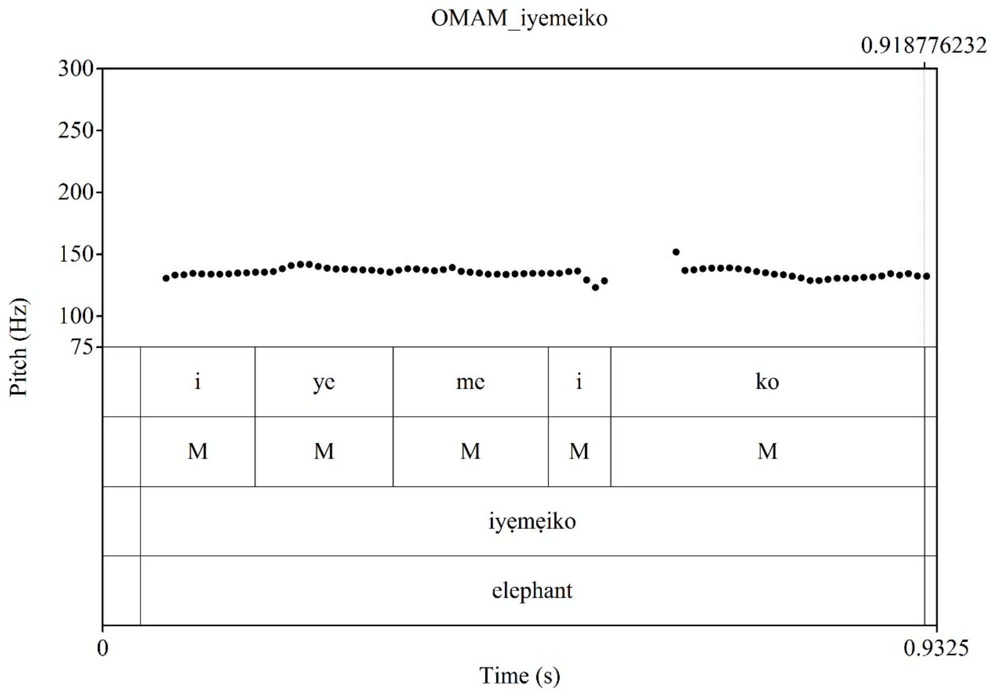


Fig. 4.6. Pitch track for the Iṣẹ́kírì word *iyẹmẹiko* ‘elephant'

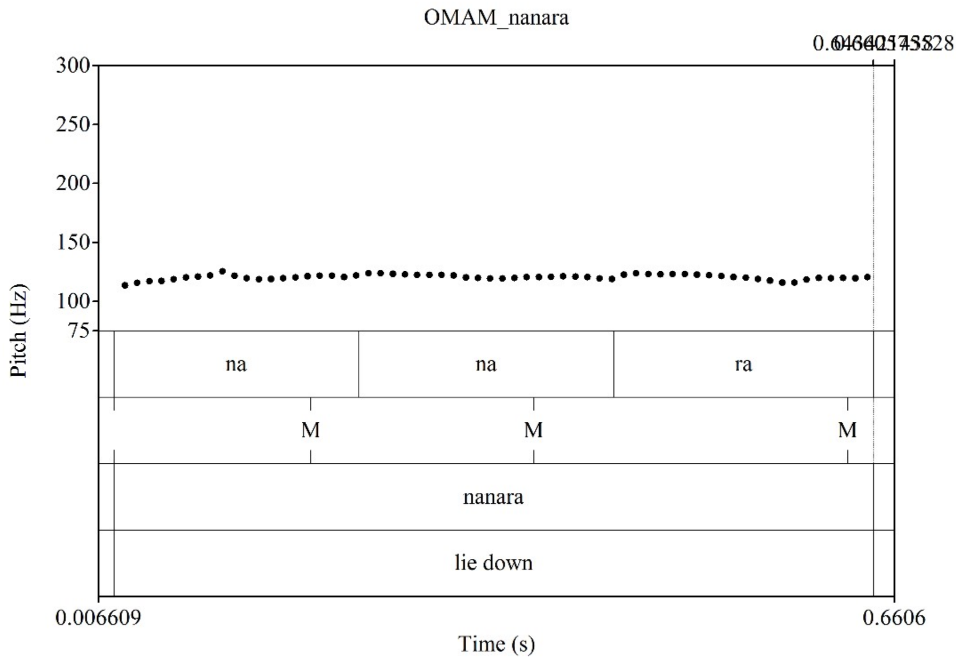


Fig. 4.7. Pitch track for the Iṣẹkírì word *nanara* ‘lie down'

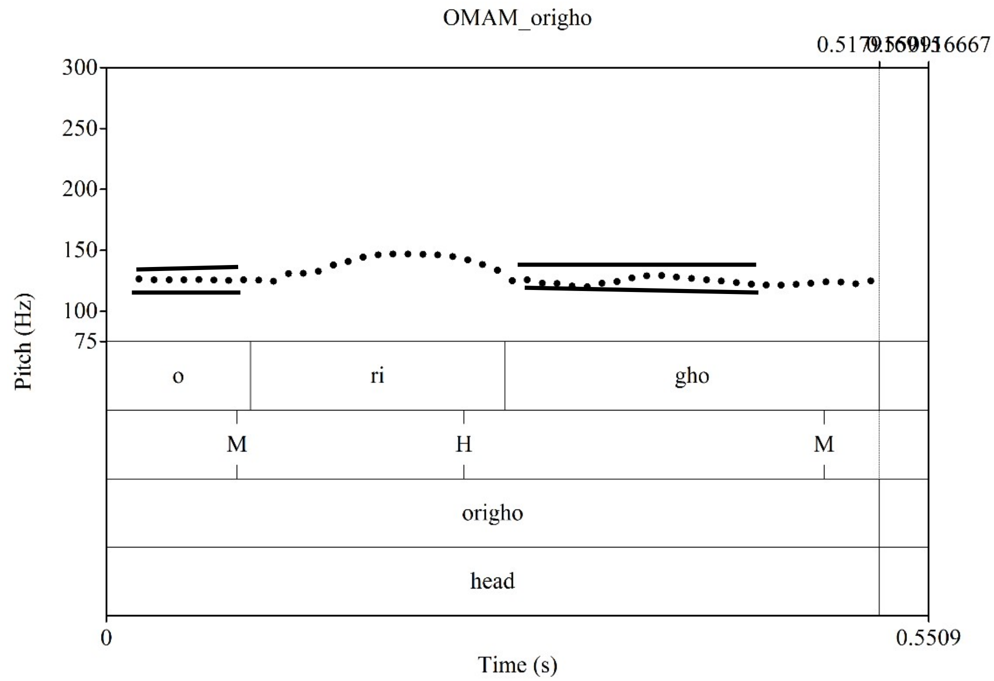


Fig. 4.8. Pitch track for the Iṣẹ̀kírì word *orígho* ‘head'

The mid tone occurs on a steady portion and, at times, from the beginning of the syllable. A sequence of mid tones is realized on the same register pitch in lexical items. This is with or without an intervening non-synchronic tone. The pitch track of the word *rō* sounded in isolation in Figure 4.5 shows the mid point value for the mid tone with the F_0 value at 143.56Hz.

A sequence of mid tones is also realized on the same register pitch in lexical items with or without an intervening non-synchronic tone. This was evaluated with the sequence of mid and the high tonal formation, given that data with a tonal formation of the mid and low tones sequences in lexical items is not found in our data corpus. This is a constraint in the tone conditions of the Iṣẹkírì language. Furthermore, the co-occurrence of tones is highly restricted in Iṣẹkírì disyllabic nouns, where only three tone patterns in nominal elements with a V-CV formation are attested. The tone patterns attested in the language for these nominal elements are Low-Low (LL), Mid-Mid (MM), and Mid-High (MH). The interaction of the M and L tones will however be investigated in our examination of phrasal F_0 trends.

An acoustic quantification of the F_0 of a mid tone on the initial and final syllables in successive syllables tends to be equal as their mean values indicate. The mean F_0 of the initial and final syllables of the three Iṣẹkírì words in Figures 1.6 -1.8, *īj ɛ̄m ɛ̄ īkō* ‘elephant’, *nānārā* ‘lie down’ and *ōrí ɣō* ‘head’ with the tonal formation MMMM, MMM and MHM is illustrated, viz:

Table 4.3. F_0 values of the M tone of initial and final syllables

Word	1st σ F_0 (mean values in Hz)	Final σ F_0 (mean values in Hz)
ījɛ̄mɛīkō	133.71	133.3
nānārā	119.77	120.48
ōríɤō	125.61	124.09

4.1.1.1.3 The low tone

The low tone is phonetically realised on a low pitch (see values in Table 4.7). The low tone in Ịṣẹ̣kírì can occur in every environment in all lexical categories, nouns, verbs, adjectives or adverbs, etc. Table 4.4 shows lexical items in which the low tone occurs.

The acoustics of low tones shows that the low tone is realized as a final low in isolation. In a sequence of low tones in successive syllables, there is a gradual lowering of F_0 which terminates as a final fall on the last syllable. An illustrative example of the low tone is shown in the pitch track of *rò* 'to think' sounded in isolation with F_0 value at 105.19Hz, in Figure 4.9.

Table 4.4. Tonal data for low toned (L) monomorphemic words

Nouns (1st &2nd σ)	Gloss	Verbs	**Gloss**	**Others**	**Gloss**
/ùɣà/	compound	/fò/	fly	/sã̀/	good
/òkũ̀/	a rope	/nɛ̀/	choose	/dĩ̀/	thick
/ɔ̀sà/	orange	/g͡bà/	take	/rɔ̀/	soft
/ìkũ̀/	dirt	/gũ̀/	climb	/rì/	far
/ɔ̀k͡pà/	a trap	/fɔ̀/	speak/wash	/jɔ̀/	happy
/ɛ̀rɛ̀/	sin	/dʒà/	fight	/dɛ̃̀/	red
/ɔ̀kɔ̀/	boat	/kà/	count	/tètè/	quickly
/òwũ̀/	voice	/k͡pè/	call	/jɔ̃̀/	sweet
/àʃɔ̀/	type of fish	/sè/	cook	/rù/	lean
/ɛ̀ɣò/	a show	/rɛ̃̀/	walk	/g͡bè/	rotten

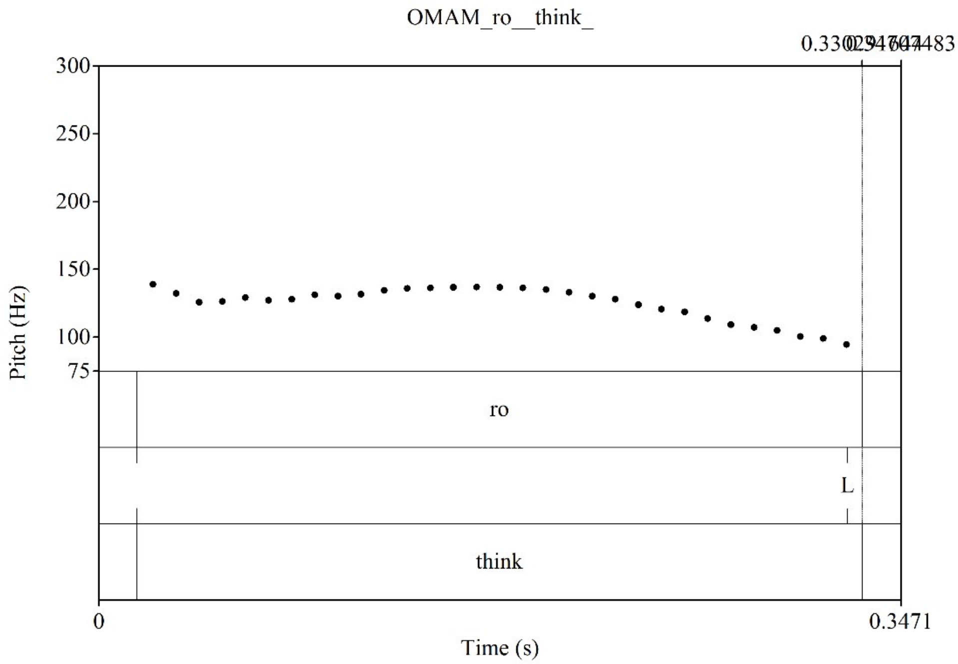


Fig. 4.9. Pitch track for the Iṣẹ̣kírì word *rò* 'think'

The phonetic target value of rò which is that of a low tone is found at the end of the syllable. A quantification of the syllables in the Iṣẹkírì words /ɛ̀ɣɔ̀rìɣɔ̀/ ‘smoke’ and /òlòlò/ bottle shows a gradual fall in F0 in successive syllables. This is demonstrated in Table 4.5.

It is noticed that the difference between the penultimate and final syllables is high; 22.88Hz between rì and ɣɔ̀ in ɛ̀ɣɔ̀rìɣɔ̀ and 35.77Hz between the penultimate syllable lò and the final syllable lò in òlòlò, confirming the presence of a final lowering. Final lowering is an abrupt F_0 fall at the end of an utterance. A gradual F_0 decline and final lowering are observed in the pitch tracks in Figures (4.10) and (4.11) for ɛ̀ɣɔ̀rìɣɔ̀ ‘smoke''and *òlòlò* ‘bottle’ respectively. Final lowering will be examined in Section 4.3.1.3.

Table 4.5. F_0 values of successive syllables of two Low-toned Iṣ ▪ kírì words

Word	1st σ F_0(Hz)	2nd σ F_0(Hz)	3rd σ F_0(Hz)	4th σ F_0(Hz)
ɛ̀ɣɔ̀rìɣɔ̀	125.71	120.93	114.09	91.21
òlòlò	141.37	136.44	100.67	-

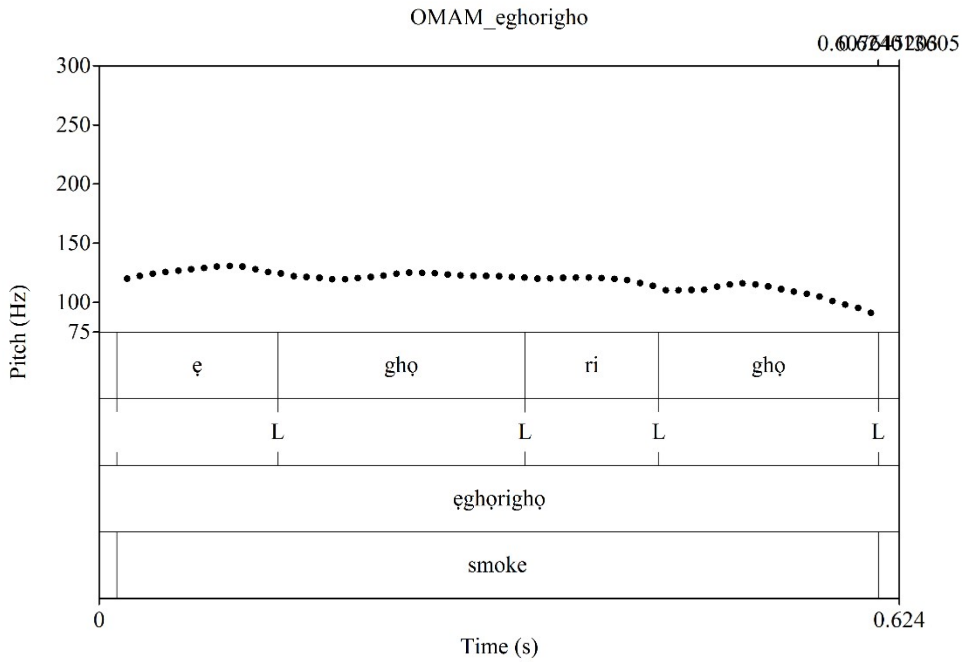


Fig. 4.10. Pitch track for the Iṣẹkírì word *ẹ̀ghọ̀rìghọ̀* ‘smoke'

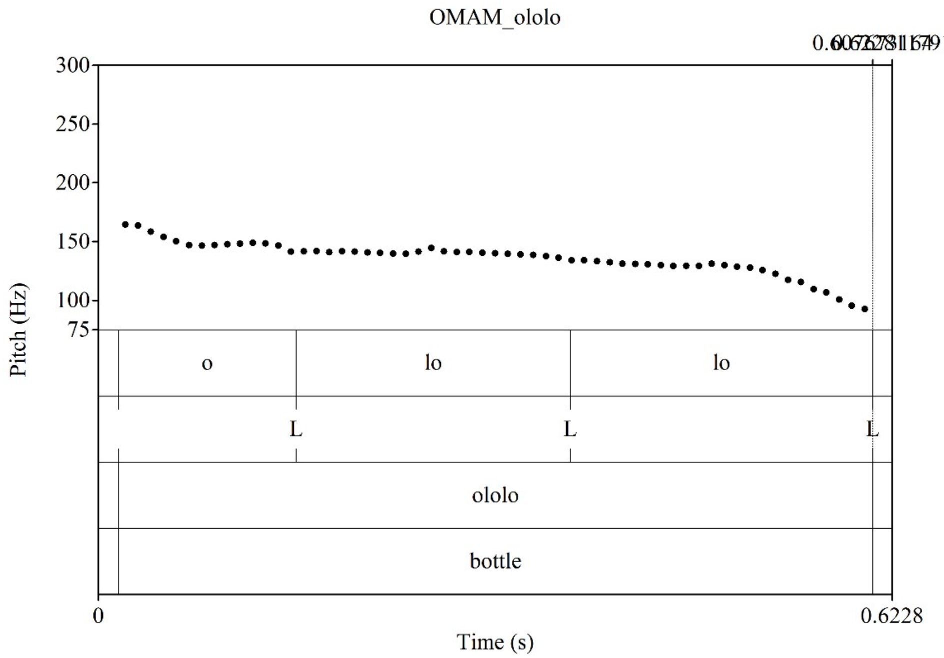


Fig. 4.11. Pitch track for the Iṣẹkírì word *òlòlò* ‘bottle'

The data in Tables 4.1, 4.2 and 4.4 reveal the basic tonal inventory of the Iṣẹkírì language. It can be extrapolated from the data and acoustic descriptions that there are three distinct tonal categories in Iṣẹkírì, namely, the high, mid and low tones. The H, M, or L tone is found on verb words and the other grammatical words. The VCV structure of nouns permits only the M or L tone on the initial syllable as the H tone does not occur word initially. The first syllable of these nouns reveals a two-way tonal distinction between the mid tone and the low tone while the second syllable reveal a three-way tonal distinction. Surface tonal contrasts are described with illustrative examples in the following section. The lexical tones attested in Iṣẹkírì from Tables 4.1, 4.2 and 4.4 are described in Table 4.6.

Table 4.6. Description of Iṣẹ̀kírì lexical tones

Tone name	Pitch feature	Pitch level	notation
High	+Upper +Raised	H	ˊ
Mid	-Upper +Raised	M	ˉ
Low	-Upper –Raised	L	ˋ

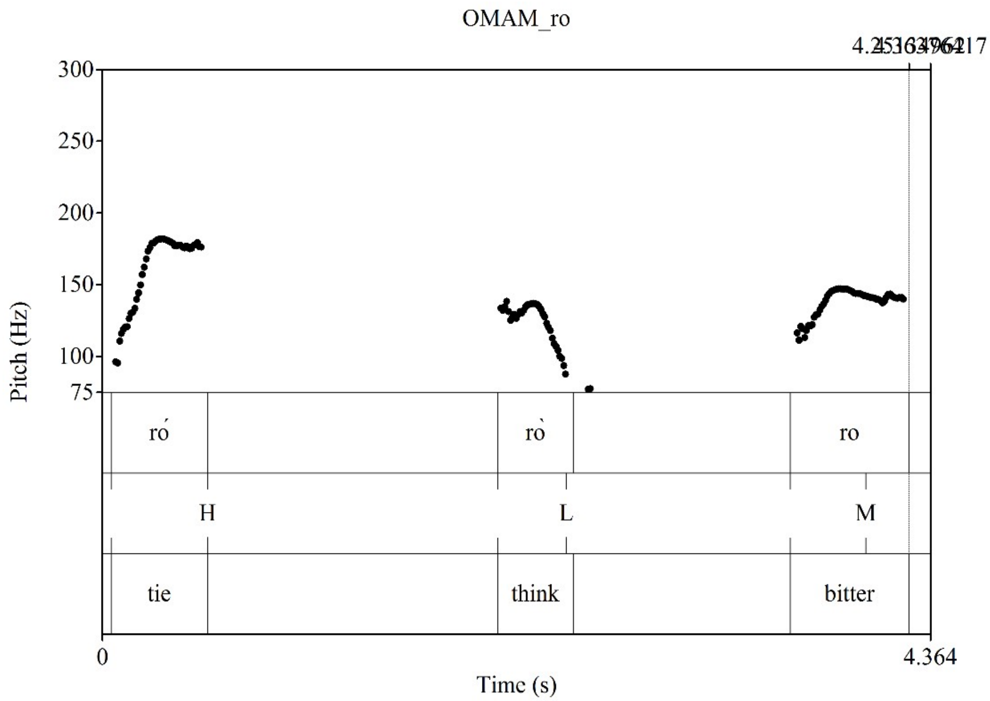


Fig. 4.12. Pitch tracks for the Iṣẹkírì words *ró* ‘tie’, *rò*‘think’and *ro* ‘bitter'

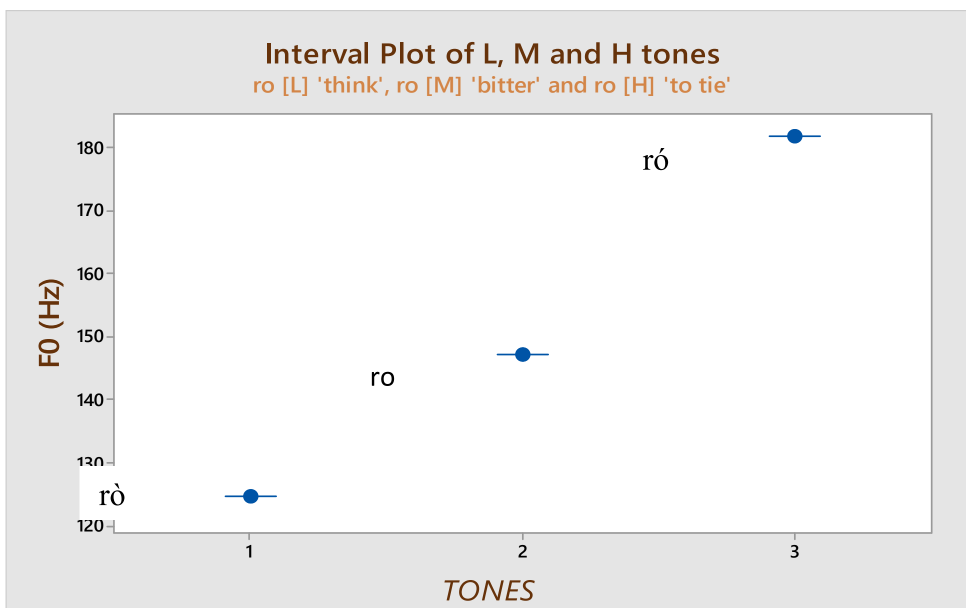


Fig. 4.13. An interval plot showing the H, M and L tones in Iṣẹkírì

Level tones are identified by a discrete level of relative pitch (Michaud, 2017). In Iṣẹ̣kírì, they are monodirectional because the F_0 serves as the single defining cue. They are further demonstrated in Figures (4.12) and (4.13) showing the pitch tracks of the three tone types and the interval between them respectively.

4.1.1.2 Tonal contrasts

A study of words pronounced in isolation reveals the occurrence of three contrasting tones: high tone, mid tone and low tone. Lexical tonal contrast is readily demonstrated in all environments in Iṣẹ̣kírì non-nominal words. Minimal sets contrasting the high, mid and low tones in the first syllable of nouns are remarkably unattested, given an apparent tonotactic restriction on high tone in word-initial position in nouns. The contrast on the initial syllable of a VCV nominal element is usually a two-way contrast between the L and M tones. Sets of segmentally homophonous words differing in pitch are considered to demonstrate tonal contrast. Consider the following data:

i) Lexical tonal contrast in non-nominal monosyllabic elements

Example (4.1)

Word	Tone	Gloss	
(a)	/ro/:	H	to tie (wrapper)
		M	bitter
		L	to think
(b)	/bi/:	H	to give birth
		M	to beg
		L	to change direction
(c)	/rɔ/:	H	read
		M	to pour
		L	soft
(d)	/kɔ/:	H	learn, build
		M	to crow
		L	reject
(e)	/sã/:	H	to tie
		M	to pay
		L	good
(f)	/ru/:	H	open
		M	bubble
		L	lean

(g)	/g͡bo/:	H	old
		M	to bark
		L	stationary
(h)	/jɔ/	H	slippery/ liquid form
		M	remove
		L	happy
(i)	/wu/:	H	to swell
		M	shout
		L	like

These homophonous sets demonstrate a three-way phonological tonal contrast in Iṣẹkírì. The pitch tracks of the lexical item *ro* in Figure (4.12) are plotted into the graph in Figure (4.14) showing a clear tonal distinction between the H, M and L tones.

The plotted pitch graph reveals distinct pitch tracks for the triplet, demonstrating a clear three-way contrasts in Iṣẹkírì pitch pattern. The three-way pitch distinction yields a three-way tonal distinction, as our data corpus demonstrates. A consideration of F_0 values of pitch in some of the lexical items in Table 4.7 also show significant differences that support the tone taxonomy of Iṣẹkírì tones into high, mid, and low tones.

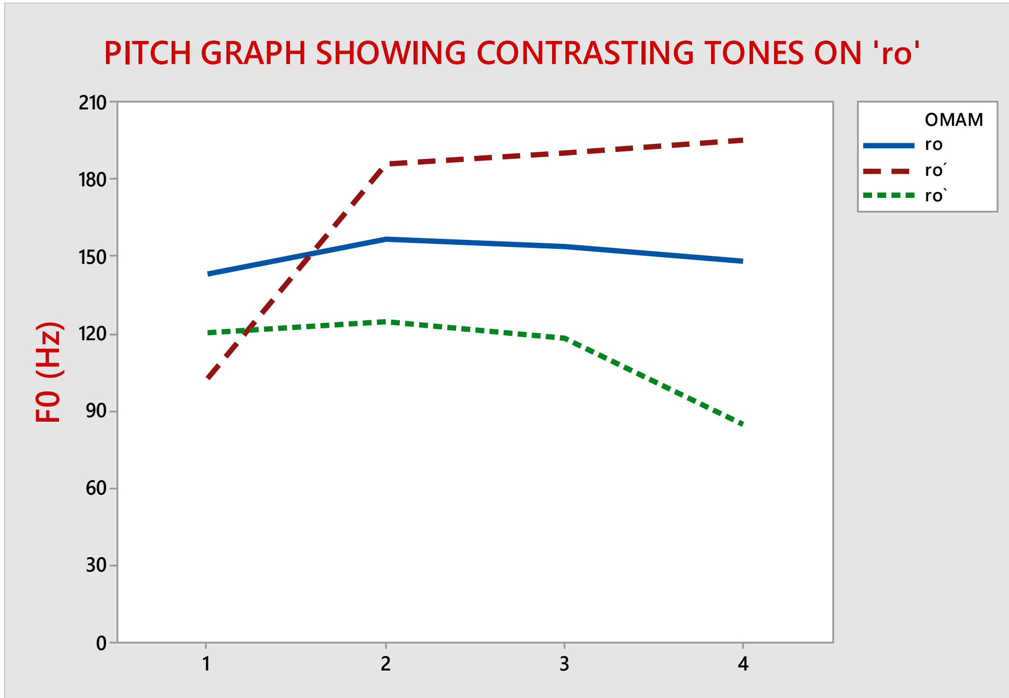


Fig. 4.14. Pitch graph for the Iṣẹ̀kírì words *ró*'tie' *rò*'think'and *ro* 'bitter'

Table 4.7. F_0 values showing pitch levels of H, M and L tones in Iṣẹ̣kírì

TONE:	**H**	**M**	**L**
	F_0 (Hz)	**F_0 (Hz)**	**F_0 (Hz)**
WORD			
rɔ	181.91	137.89	109.49
sã	189.41	140.97	107.64
bi	184.22	140.61	119.89
ru	189.1	148.65	100.28
jɔ	171.89	130.92	99.37

From the above, the mean F_0 values are approximately at 183Hz for High tone, 140Hz for Mid tone and 107Hz for Low tone. The differences are wide that indicate the distinction among the tone types which putatively characterise the phonology of the language. This is further buttressed in the examples of tonal contrast in nouns, which demonstrates the contrasts in minimal pairs of the first syllable and minimal sets of the second syllable.

ii) Tonal contrast in nouns

Minimal sets contrasting the H, M and L tones in nouns are remarkably difficult to find, given an apparent tonotactic restriction on H tone in word-initial position in nouns. The contrast on the initial syllable of a VCV nominal element is usually a two-way contrast between the L and M tones. This exemplified in Example (4.2).

Tonal contrast on first syllable of V-initial nouns:

Example (4.2)

(a)	/alɛ/	LL	ground
		MH	evening
(b)	/ogũ/	LL	end
		MH	jealousy
(c)	/uwã/	LL	measure
		MH	tongue
(d)	/ɔkɔ/	LL	boat
		MM	husband
(e)	/ɔk͡pa/	LL	trap
		MH	walking stick
(f)	/awɛ/	LL	fast
		MH	a part of

Tonal contrast on the second syllable of V-initial nouns involves both a two-way and a three-way contrast. The three-way contrast is however, quite limited. The data in Example (4.3) show a two-way contrast on second syllable, while the data in Example (4.4) show a three-way contrast on the second.

Example (4.3)

M-H contrast

(a)	/arɔ/	MM	a lame
		MH	story
(b)	/ira/	MM	time
		MH	people

L-H contrast

(c)	/ikũ/	LL	dirt
		MH	waist
(d)	/ɛru/	LL	fear
		MH	a slave
(e)	/ere/	LL	gain
		MH	mat

Three-way contrast on second syllable (L-M-H contrast)

Example (4.4)

(a)	/ɛɣo/	LL	a show
		MM	horn
		MH	colour
(b)	/ogũ/	LL	end
		MM	war
		MH	jealousy
(c)	/ɛkoko/	LLH	buttocks
		MMM	important
		MHH	wood pecker'
(d)	/ikolo/	HLH	worm
		MMM	fancy
		MHM	larvae

The scatter plot and graph in Figures (4.15) and (4.16) clearly illustrates the three-way distinction on the Iṣẹkírì word /ɛɣo/

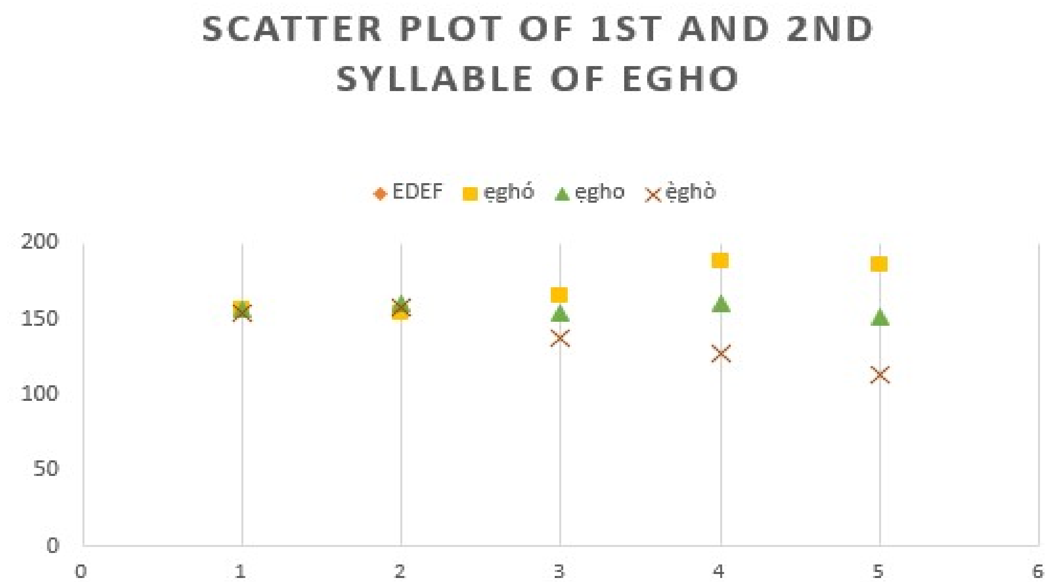


Fig. 4.15. Scatter plot showing a three-way contrast on the second syllable

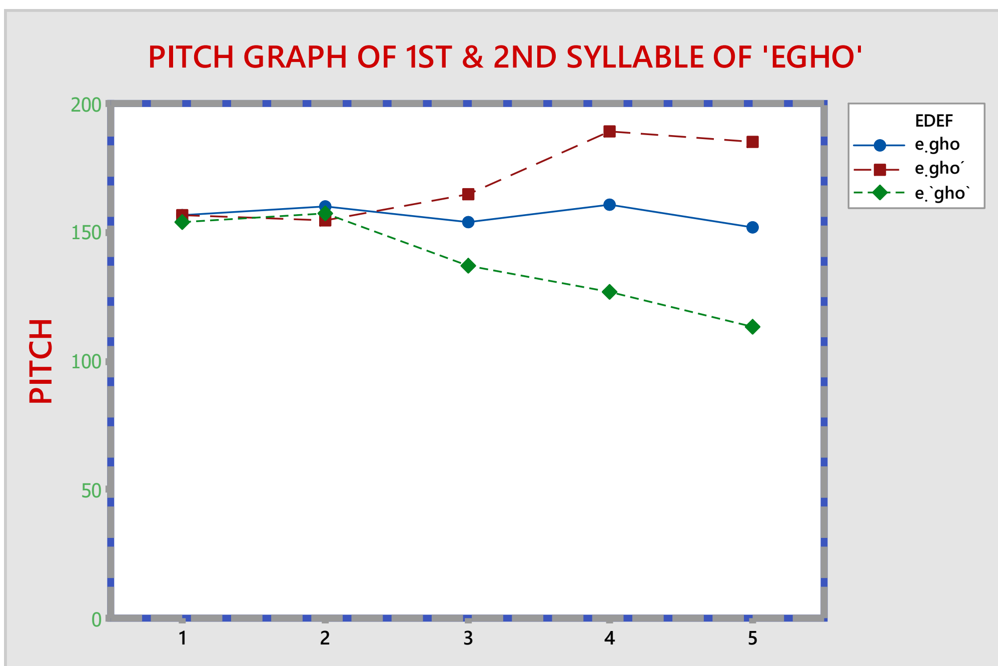


Fig. 4.16. Plotted pitch graph showing a three-way contrast on the second syllable

Acoustic measurements from which Figures (4.15) and (4.16) were derived confirm that there are three distinct tonal categories associated with the second syllable of /εɣo/, namely, the high tone (ε̄ɣ**ó** 'colour'), the mid tone (ε̄ɣ**ō** 'horn') and the low tone (ὲɣ**ò** 'a show'). These words are distinguished only by distinct tones.

4.1.1.3 Tonal realization of rising and falling tones in Iṣẹkírì

The high, mid and low tones have been shown to be phonemic in Iṣẹkírì. In addition to these three tones are two phonetic gliding tones; namely rising and falling tones. Contour tones are a combination of two level tones; the high and low tones. A rising tone is created where a high tone becomes a rising tone after a low tone and a low tone becomes a falling tone after a high tone. Some requirements are necessary for contour formation in Iṣẹkírì as they are definable in certain phonological contexts. The conditions for contour formation include similarity of vowels and the presence of two different tones on the vowels. This is exemplified in Examples (4.5) and (4.6). In Examples (4.5), an infinitival form of a verb occurs with the object of a verbal stem, which is usually a morphological extension of the infinitival verb form, such that the vowel of the infinitival verb gets elided and the tone of the elided vowel docks on the object of the verbal stem to form a contour tone. Example (4.6) illustrates contour formation in negation.

Example (4.5)

(a) mo ró ò → mo rô
PRON tie OP
'I tied it'

(b) mo rò ó → mo rǒ
PRON think OP
'I thought of it'

(c) mo nέ ὲ → mo nε̂
PRON have OP
'I have it'

(e) dedé múg͡bέ ὲ → dedé múg͡bε̂
Dedé give OP
'Dedé gave him/ gave it to him'

(f) mímí rà á → mímí rǎ
Mímí buy OP
'Mímí bought it'

An examination of negation and tone shows that contour tones typify negation in Iṣẹkírì. The final vowel of a noun or pronoun in the subject position is always deleted irrespective of the quality of the vowel and the negative marker /e/ or /a/ with a falling tone replaces the deleted vowel. The vowel [ê] with a falling tone characterizes negative statements while [â] is used for imperatives.

Example (4.6)

1. (a) mó dʒɛ̄rū̃ rɛ̃́
   PRON eat-something Perf
   'I have eaten'
   (b) méè tè dʒɛ̄rū̃ mê tè dʒɛ̄rū̃
   PRON-NEG Perf eat-something
   'I have not eaten'
2. (a) ùtjɛ̀jĩ́ rūlí
   go-Pst-house
   'Utièyín went home'
   (b) ùtjɛ̀jĩ́ éè rūlí ùtjɛ̀jɛ̂ rūlí
   NEG go-Pst-house
   'Utìèyín did not go home'
3. (a) ō rí ājā rō tjé
   PRON see wife PRON small
   'He saw his junior wife'
   (b) éè rí ājā rō tjé ê rí ājā rō tjé
   PRON-NEG see wife PRON small
   'He did not see his junior wife'
4. (a) āɣã̄ némí ʃārólūkúmɛ̀
   PRON can do-body-tortoise
   'They can fix the tortoise's body'
   (b) āɣā éè némí ʃārólūkúmɛ̀ āɣê némí ʃārólūkúmɛ̀
   PRON NEG can do body-tortoise
   'They could not fix the tortoise's body'
5. (a) ó fɔ̀ kɛ́rɛ̃̀

Pron talk-PST also

'He also talked'

(b) éè fɔ̀ kɛ́rɛ̏ ê fɔ̀ kɛ́rɛ̏

PRON-NEG talk also

'He didnot also talk'

6. (a) máà dʒɛ́ mâ dʒɛ́

PRON-NEG agree

'Don't agree'

7. (a) máà wá mâ wá

PRON-NEG come

'Don't come'

8. (a) máà dȁ́ ȁ̄ ɣò mâ dȁ́ ȁ̄ ɣò

PRON-NEG test OP see

'Don't try it'

Data in all cases show contour tones often result from the process of vowel elision which is induced by the VV concatenation.

Iṣẹkírì data reveal the composite nature of contour tones. Contour tones in most languages have been analyzed as a sequence of level tones which evidence from this study favours. There has however been calls as to the unitary nature of contour tones in some languages. The argument is that the decomposition of contours into levels cannot describe the tonal systems of languages like Vietnamese and Thai (Michaud, 2008) because the contour tones in these languages are phonetically complex and are therefore non-decomposable (Michaud and Vaissière, 2015). Contours in most African languages including the language of study show that they consist of either a low tone followed by a high tone or a high tone followed by a low tone. Figures (4.17a &b) and (4.18a&b) compare the F_0 contours of a falling contour and a low tone on one hand and those of a rising tone and a high tone on the other.

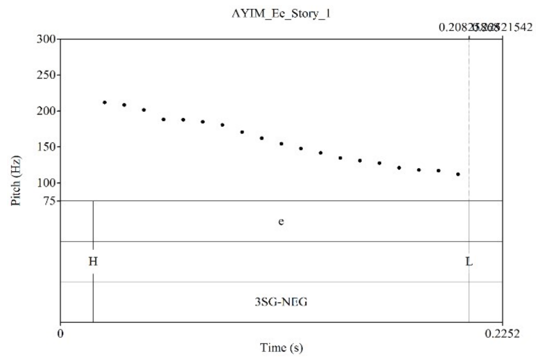


Fig. 4.17a). Pitch track of a falling tone

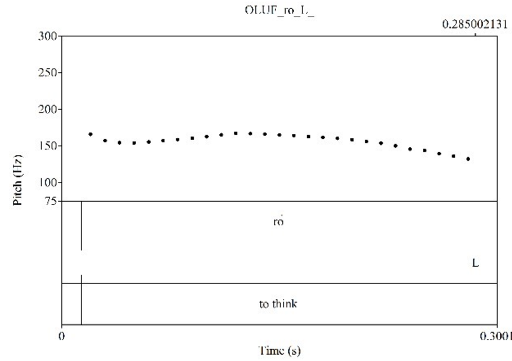


Fig. 4.17b). Pitch track of a low tone

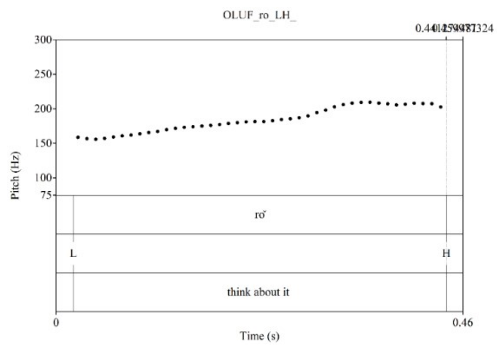


Fig. 4.18a). Pitch track of a rising tone

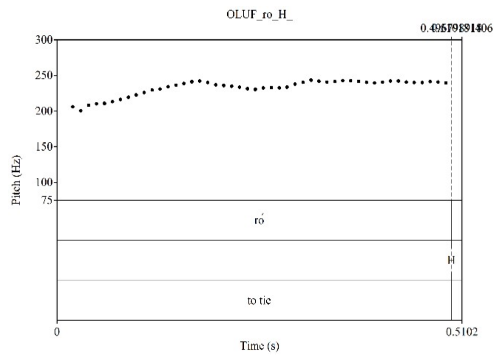


Fig. 4.18b). Pitch track of a high tone

The realization of a falling contour is observed in the F_0 movement in Figure (4.17a) that begins as a high and ends as a fall in the realization of a HL sequence. This is clearly different from the initial slight rise in the realization of the low tone in Figure (4.17b). In Figure (4.18a), an LH sequence is realized as a rise observed in the F_0 movement.

The phonetic realization of Iṣẹkírì tones is presented in the pitch graph in Figure (4.19).

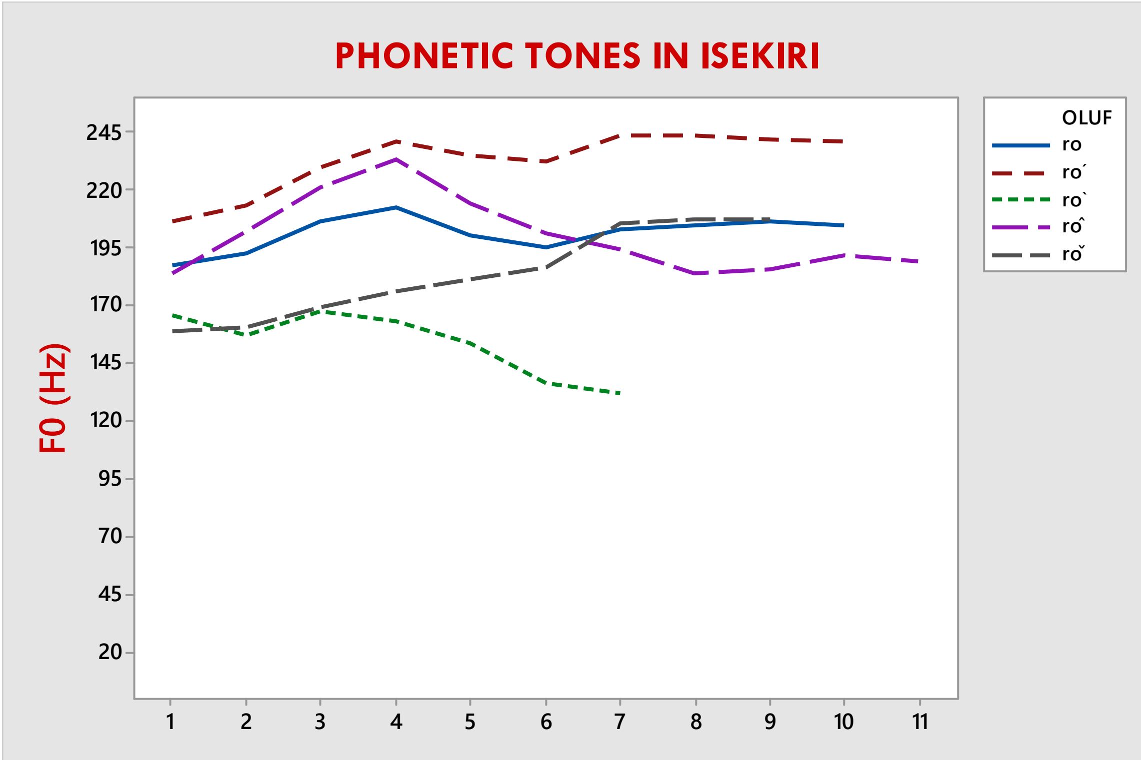


Fig. 4.19. Pitch graph of Iṣẹ̀kírì phonetic tones

The pitch graph in Figure 4.19 shows the five phonetic tones in Iṣẹkírì, the High tone, Mid tone, Low tone, Rising and Falling tones.

4.1.2 Tone patterns in Iṣẹkírì

This section examines the tone patterns that are evident in Iṣẹkírì lexical items. These patterns are investigated by examining the tonal pattern of disyllabic and polysyllabic nominal elements and those of other lexical items. The first and second syllables of the polysyllabic nouns are isomorphic with those of the disyllabic nouns.

4.1.2.1 Tone patterns of disyllabic nouns

The co-occurrence of tones is highly restricted in Iṣẹkírì disyllabic nouns with only three attested tone patterns in nominal elements with a V-CV shape. The logically possible tone patterns following the L, M and H tones combination are shown in (a), while the possible combinations attested in the language are shown in (b).

(a)	LL	ML	HL	b)	LL	~~ML~~	~~HL~~
	LM	MM	HM		~~LM~~	MM	~~HM~~
	LH	MH	HH		~~LH~~	MH	~~HH~~

The patterns ruled out in set (b) are expected but not attested in the language thus the tone patterns attested in the language for these nominal elements are Low-Low (LL), Mid-Mid (MM), and Mid-High (MH) (Cf. Omamor, 1979, Osewa, 2016). Examples of these patterns are shown in (4.7a), (4.7b) and (4.7c) respectively.

The Low-Low tone pattern

Example (4.7a):

(i)	àlẹ̀	/àlɛ̀/	‘ground’
(ii)	ẹ̀ghò	/ɛ̀ɣò/	‘a show’
(iii)	àràn	/àrã̀/	‘worm’
(iv)	èrè	/èrè/	‘gain’
(v)	ẹ̀rù	/ɛ̀rù/	‘fear’
(vi)	ìtọ̀	/ìtɔ̀/	‘urine’
(vii)	ìbù	/ìbù/	‘sand’
(viii)	ìgbẹ̀n	/ìg͡bɛ̃̀/	‘jaw’
(ix)	ìkùn	/ìkũ̀/	‘dirt’
(x)	ọ̀fọ̀	/ɔ̀fɔ̀/	‘word’

The Mid- Mid tone pattern

Example (4.7b):

(i)	arọ	/ārɔ̄/	'lame'
(ii)	atsọ	/āʃɔ̄/	'cloth'
(iii)	egho	/ēɣō/	'horn'
(iv)	ekpo	/ēk͡pō/	'oil'
(v)	ọla	/ɔ̄lā/	'yesterday'
(vi)	ọjọ	/ɔ̄ʤɔ̄/	'eighty'
(vii)	ọkọ	/ɔ̄kɔ̄/	'husband'
(viii)	okun	/ōkū̃/	'ocean'
(ix)	eji	/ēʤī/	'rain'
(x)	odin	/ōdī̃/	'dumb person'

The Mid- High tone pattern

Example (4.7c):

(i)	ẹbí	/ɛ̄bí/	'family'
(ii)	ubí	/ūbí/	'birth'
(iii)	oghó	/ōɣó/	'money'
(iv)	alẹ́	/ālɛ́/	'evening'
(v)	awẹ́	/āwɛ́/	'a part of'
(vi)	eré	/ēré/	'mat'
(vii)	ẹdá	/ɛ̄dá/	'creation'
(viii)	efí	/ēfí/	'coal'
(ix)	ekó	/ēkó/	'Lagos'
(x)	ẹkọ́	/ɛ̄kɔ́/	'lesson'

4.1.2.2 Tone patterns of polysyllabic nouns

An examination of the polysyllabic nouns in our data shows that the LL, MM and MH tonal patterns are observed in the first and second syllables of these nouns with the third syllable having any of the H, M or L tone. Thus, nine tonal patterns occur in polysyllabic nouns; LLL, LLM, LLH, MML, MMM, MMH, MHL, MHM, and MHH. This is seen in the data below:

Example (4.8)

a)	i)	èkòkó	/ɛ̀kòkò/	'buttocks'	LLH
	ii)	òrìṣẹ̀	/òrìʃɛ̀/	'God'	LLL
	iii)	ògùmè	/ògùmɛ̀/	'drum'	LLL
	iv)	èkòró	/ɛ̀kòró	'hat'	LLH
	v)	ògòló	/ògòló/	'pepper'	LLH
	vi)	ìmìdákà	/ ìmìdákà/	'cassava'	LLHL
	vii)	ìyàwu	/ìjàwū/	cotton'	LLM

	viii)	àbìba	/àbìbā/	‘mat’	LLM
	ix)	àkpẹ̀rẹ̀	/àk͡pɛ̀rɛ̀/	‘basket’	LLL
	x)	ẹ̀gbède	/ɛ̀g͡bèdē/	‘needle’	LLM
b)	i)	ọkẹrẹn	/ɔ̄kɛ̄rɛ̃̄/	‘male’	MMM
	ii)	obirẹn	/ōbīrɛ̃̄/	‘female’	MMM
	iii)	ọlarẹ	/ɔ̄lārɛ̄/	‘elder’	MMM
	iv)	ikorobá	/īkōrōbá/	‘bucket’	MMMH
	v)	ekpikpò	/ēk͡pīk͡pò/	‘skin’	MML
	vi)	itekun	/ītēkũ̄/	‘a lie’	MMM
	vii)	iyẹmẹrẹko	/ijɛ̄mɛ̄rɛ̄kō/	‘elephant’	MMMMM
	viii)	akidọn	/ākīdɔ̃̄/	monkey’	MMM
	ix)	umọta	/ūmɔ̄tā/	‘snail’	MMM
	x)	uwanguẹ́	/ūwã̄gwɛ́/	‘salt’	MMH
c)	i)	orígho	/ōríɣō/	‘head’	MHM
	ii)	orúsùn	/ōrúsũ̀/	‘yam	MHL
	iii)	ukpúkpọ̀rọ̀n	/ūk͡púk͡pɔ̀rɔ̃̀/	‘stone’	MHLL
	iv)	ọlájà	/ɔ̄ládʒà/	‘king’	MHL
	v)	onúwé	/ōnúwé/	‘today’	MHH
	vi)	imẹ́jẹ̀	/īmɛ́dʒɛ̀/	‘table’	MHL
	vii)	ọrúkọ	/ɔ̄rúkɔ̄/	‘name’	MHM
	viii)	ẹsétè	/ɛ̄sétè/	‘plate’	MHL
	ix)	iṣúṣu	/īʃúʃū/	‘faeces’	MHM
	x)	imíyò	/īmíjò/	‘maize’	MHL

Although there is a tonotactic restriction on H tone in word-initial position in nouns, four lexical items in our data show the H tone word initially, namely *ólukúmẹ̀* ‘tortoise’, *ímìlá* ‘cow’, *íkòló* ‘worm’ and *ọ́gẹdẹ́yìbó* ‘banana’. These occurrences not withstanding, the attested patterns observed for disyllabic nouns are LL, MM and MH and LLL, LLM, LLH, MML, MMM, MMH, MHL, MHM, and MHH for polysyllabic nouns.

4.1.2.3 Tone patterns of verbs

Iṣẹkírì verbs are canonically of the form CV, and do not have any tonotactic constraints thus all monosyllabic verbs can bear the H, M or L tone.

Example (4.9)

a)	i)	rí	/rí/	'to see'	H
	ii)	bó	/bó/	'to peel'	H
	iii)	nẹ́	/nɛ́/	'to have'	H
	iv)	wú	/wú/	'to swell'	H
	v)	sé	/sé/	'to lock'	H
b)	i)	rin	/rĩ̄/	'to sink'	M
	ii)	jẹ	/dʒɛ̄/	'to eat'	M
	iii)	so	/sō/	'to tie'	M
	iv)	yan	/jã̄/	'to smoke (fish)'	M
	v)	gbo	/g͡bo/	'to bark'	M
c)	i)	nẹ̀	/nɛ̀/	'to send'	L
	ii)	sùn	/sũ̀/	'to sleep'	L
	iii)	rẹ̀n	/rɛ̃̀/	'to walk'	L
	iv)	jà	/dʒà/	'to fight'	L
	v)	dà	/dà/	'to pour'	L

While the basic verb stem in Iṣẹkírì is monosyllabic, disyllabic verbs which often are a combination of two or more monosyllabic verbs or a combination of a verb and a noun (which might have been lost) referred to as complex verbs can take any of the tones in the language. Thus, we can have any of the LL, LM, LH, ML, MM, MH, HH, HM, HL tonal pattern illustrated in Table 4.8. Some of the resultant tone patterns of disyllabic verbs are derived from the phonological and morphological processes such as the HH pattern in *bínọ́* 'angry' bí + inọ́, *dájú* 'to insult' dá + ejú and so on.

Table 4.8. Tone patterns of Iṣẹ̀kírì disyllabic verbs

Verbs	**Tonal pattern**	**Gloss**
bɔ̀ɣɔ̀	LL	pass
bùdʒɛ̄	LM	bite
dàkű	LH	to kneel
bīrɔ̀	ML	ask
kērĩ̄	MM	sing
ʃēré	MH	play
ʃálɛ̀	HL	descend
g͡bádʒɔ̄	HM	gather
bínɔ́	HH	angry

4.1.2.4 Tone patterns of adjectives

Most Iṣẹkírì adjectives in their simple forms are monosyllabic and like the verbs can bear any of the H, M or L tones. There are a limited number of polysyllabic adjectives. Some of the disyllabic and polysyllabic adjectives are derived from the morphological process of compounding illustrated in *búrɛ́gwà* 'ugly' which is derived from the words *búrú* 'bad' and *ɛ̀gwà* 'beauty'. Disyllabic adjectives can also be derived from other morphological factors such as partial reduplication in *fīfɛ̃̄* 'white'. The monosyllabic adjectives showing the H, M and L tones are in Example (4.10a). The disyllabic and polysyllabic adjectives do not have a regular tone pattern as any of the tones can combine on these words as seen in Example (4.10b).

Example (4.10a)

a)	i)	dún	/dṹ/	'black'	H
	ii)	gbó	/g͡bó/	'old'	H
	iii)	ghán	/ɣã́/	'costly'	H
	iv)	lá	/lá/	'big'	H
	v)	wó	/wó/	'heavy'	H
	vi)	go	/gō/	'tall'	M
	vii)	ro	/rō/	'bitter'	M
	viii)	ni	/nī/	'strong'	M
	ix)	rẹ	/rɛ̄/	'wet'	M
	x)	gbẹ	/g͡bɛ̄/	'dry'	M
	xi)	yọ̀	/jɔ̀/	'happy'	L
	xii)	rọ	/rɔ̀/	'soft'	L
	xiii)	rù	/rù/	'lean'	L
	xiv)	sàn	/sã̀/	'good'	L
	xv)	gbe	/g͡bè/	'rotten'	L

b)	i)	kéré	/kéré/	'small'	HH
	ii)	kùtú	/kùtú/	'short'	LH
	iii)	dede	/dēdē/	'all'	MM
	iv)	sẹ̀nguà	/sɛ̃̀gwà/	'beautiful'	LL
	v)	kpòrò	/k͡pòrò/	'big'	LL
	vi)	fifen	/fīfɛ̃̄/	'white'	MM
	vii)	jikọ́	/dʒīkɔ́/	'heavy'	MH
	viii)	títín	/títĩ́/	'dirty'	HH
	ix)	búrẹ́guà	/búrɛ́gwà/	'ugly'	HHL
	x)	aṣíṣán	/āʃíʃã́/	'empty'	MHH

4.1.2.5 Tone patterns of adverbs

All adverbs in our data are disyllabic or polysyllabic. This can be attributed to the fact that most of these adverbs reduplicate as they copy the phonological make up of the base. It is interesting to note that both the segmental and tonal structure are copied.

Example (4.11)

i)	kọ́kọ́	/kɔ́kɔ́/	'since'	HH
ii)	fẹ́nẹ́fẹ́nẹ́	/fɛ́nɛ́fɛ́nɛ́/	'completely'	HH(HH)
iii)	tètè	/tètè/	'quickly'	LL
iv)	gege	/gēgē/	'immediately'	MM
v)	kokoroko	/kōkōrōkō/	'firmly'	MM(MM)
vi)	sìgọ́sìgọ́	/sìgɔ̀sìgɔ́/	'sluggishly'	LH(LH)
vii)	kìtíkìtí	/kìtíkìtí/	'actually'	LH(LH)
viii)	kpẹ̀lẹ́kpẹ̀lẹ́	/k͡pɛ̀lɛ́k͡pɛ̀lɛ́/	'gently'	LH(LH)
ix)	yòyò	/jòjò/	'hotly'	LL
x)	toyátoyá	/tōjátōjá/	'quickly'	MH(MH)

The adverbs just like the adjectives can combine any of the three tones in the language.

4.1.2.6 Tone patterns of numerals

The numerals 1-10 are the basic forms in Iṣẹkírì because no derivation is invoved. This section examines the tone patterns of the numerals 1-10 and other basic forms such as 20, 30, 40, 60, 80 and 100. The tone patterns of numerals in Iṣẹkírì are dependent on the composition of the initial syllable. Where the initial syllable is a V syllable, the tone is either a mid or low tone with the first two syllables bearing a LL, MM or MH just like disyllabic nouns. Where the initial syllable is a CV syllable, the tone pattern is HM with the exception of the numeral *méjì* 'two' which has the HL pattern.

Example (4.12)

i)	ọ̀kàn/mẹ́ẹ̣nẹ	'one'	LL/HMM
ii)	méjì	'two'	HL
iii)	mẹ́ẹ̣ta	'three'	HMM
iv)	mẹ́ẹ̣rẹn	'four'	HMM
v)	máarú	'five'	HMH
vi)	mẹ́ẹ̣fà	'six'	HML
vii)	mẹ́ẹ̣je	'seven'	HMM
viii)	mẹ́ẹ̣jọ	'eight'	HMM

ix)	mẹ́ẹ̣sán	'nine'	HMH
x)	mẹ́ẹ̣guá	'ten'	HMH
xi)	ogún	'twenty'	MH
xii)	ọ̀gbàn	'thirty'	LL
xiii)	òjì	'forty'	LL
xiv)	ogúnrọ̀ta	'fifty'	MHLM
xv)	ọta	'sixty'	MM
xvi)	ọguádóren	'seventy'	MHHM
xvii)	ọren	'eighty'	MM
xviii)	ọguádórú	'ninety'	MHHH
xix)	ọrú	'one hundred	MH

These tone patterns of V.CV numerals follow the patterns of nominal elements and the numerals whose initial syllable have an onset have a HM tone pattern.

4.2 Tonological operations

This section provides answers to our research question two which dwells on the behaviour of tones in Iṣẹ̀kírì. In order to examine tonal behaviour, tonological operations are described and analyzed. Changes in the surface realization of underlying tones as a result of the concatenation of words in context can be termed as tonological operations. A tonological operation refers to "a case where an input shows some change in tonal structure in the output" (Rolle 2018:17). These operations include tone deletion, spreading, replacement, alternations and so on affected by both phonological and morphological factors. Tonological operations in Iṣẹ̀kírì are examined under two categories in this study; phonologically conditioned tonological operations and syntactically conditioned tonological operations.

4.2.1 Phonologically conditioned tonological operations

Changes in tonal form as a result of identifiable phonological environment or trigger, fall under the category of phonologically conditioned tonological operations in this study. That is, the tonal overlay is characterized by phonological environments. These changes in surface tonal realization is readily observed in some phonological processes like vowel deletion, vowel assimilation, and glide formation. The tonal operations that will be examined here are tone deletion and tone spread. Vowel elision is a productive domain in the Iṣẹkírì phonological system where tonal operations are readily observed.

4.2.1.1 Vowel elision and the morphotonology of Iṣẹkírì

One common strategy of vowel hiatus resolution in many languages is vowel elision. It involves the deletion of one of two vowels in a sequence as a result of the concatenation of morphemes across boundaries. Vowel elision (VE) as a phonological operation has received a lot of attention in the literature (Bamgbose, 1965; Akinlabi, 1986, 2000; Akinlabi and Oyebade, 1987; Egbokhare, 1990; Orie and Pulleyblank, 2002). However, an identification of the vowel in a V + V sequence that gets deleted and an adequate explanation for the selection of the vowel to be deleted is still a matter of interest. Also, there are a number of analytical challenges with VE but the interest of this study as regards vowel elision is in the resultant tonal alternation as a result of VE. The fact remains that VE serves as a fruitful domain of examining tone behaviour, thus relevant environments of elision to examine tone behaviour are our focus. While not overlooking vowel assimilation and glide formation, data on tonal behaviour presented in this section are on VE. This is because these other processes produce the same tonal outcome and also operate in the same environment in terms of tone sequences required for the examination of tone behaviour.

Data on vowel sequences with the H # LL, H # MM, H # MH, M # LL, M # MM and M # MH tone pattern for monosyllabic and disyllabic combinations and MH # LL, MH # MM, MH # MH, MM # LL, MM # MM and MM # MH tone pattern for disyllabic and disyllabic sequences will be used to illustrate vowel elision in Iṣẹkírì. The L # MM, L # MH, LL # MM, and LL # MH patterns are exempted because low toned monosyllabic verbs followed by a complement present tonal outlay that is incongruous with the observed tone behaviour in other tonal inputs. Section 4.2.1.3 examines the L MM, L MH, LL # MM, and LL # MH patterns. These patterns represent all the possible tonal combinations of verb + noun and noun + noun structures in Iṣẹkírì bearing in mind that while the vowel of the verb which is V_1 can bear any of the H, M or L tone, the tone on V_2

which is the initial syllable of the noun structure can only bear the M or L tone following the tonotactic restrictions discussed in Section 4.1.2.1.

A schema of the tonal inputs relevant to the examination of tonal alternation in VE and their outputs is presented in Table 4.9 and illustrated in Examples 4.13 – 4.23.

Table 4.9. Tonal input and output

Input		Output
a) Monosyllabic (Verb) + disyllabic (Noun)		
H	LL	HL
H	MM	HM
H	MH	HH
M	LL	LL
M	MM	MM
M	MH	MH
b) Disyllabic (Noun) + disyllabic (Noun)		
MH	LL	MHL
MH	MM	MHM
MH	MH	MHH
MM	LL	MLL
MM	MH	MMH

Example (4.13)

	H	LL	HL
a)	g͡bá	àlɛ̀	g͡bálɛ̀
	Sweep	ground	‘to sweep’
b)	dʒɛ́	ɛ̀bɛ̀	dʒɛ́bɛ̀
	agree	beg	‘acceptance of begging’
c)	nɛ́	ɔ̀jɔ̀	nɔ́jɔ̀
	have	joy	‘to have joy’
d)	nɛ́	òwȕ	nówȕ
	have	voice	‘to have a voice’
e)	wó	ùɣà	wúɣà
	destroy	compound	‘to destroy acompound’
f)	dʒɛ́	ùk͡pè	dʒúk͡pè
	answer	call	‘to answer a call’
g)	gwɔ́	ɔ̀kɔ̀	gwɔ́kɔ̀
	drag	boat	‘to drag a boat’
h)	nɛ́	ɔ̀ɣɔ̀	nɔ́ɣɔ̀
	have	respect	‘to have honour’
i)	ká	ɔ̀sà	kɔ́sà
	pluck	orange	‘to pluck orange’
j)	nɛ́	èrè	nérè
	have	gain	‘to profit’

Example (4.14)

	H	M M	HM
a)	lá	ēk͡pō	lék͡pō
	lick	oil	‘to lick oil’
b)	ʃɛ́	ēgĩ̄	ʃégĩ̄
	split	wood	‘break wood’

c)	g͡bé	ūlɔ̄	g͡búlɔ̄
	carry	grinding stone	‘to carry a grinding stone’
d)	wā́	ɔ̄mā	wɔ̄́mā
	hit	child	‘hit a child’
e)	sɛ́	āʃɔ̄	sáʃɔ̄
	sew	cloth	‘sew cloth’
f)	nɛ́	ūbō	nɛ́bō/núbō
	have	a place	‘to own a place’
g)	lé	ɔ̄dɛ̄	lɔ́dɛ̄
	pursue	hunter	‘pursue a hunter’
h)	lé	ɔ̄lārɛ̄	lɔ́lārɛ̄
	pursue	elder	‘to pursue an elder’
i)	nɛ́	ɛ̄ɣō	nɛ́ɣō
	have	horn	‘to have a horn’
j)	g͡bɔ́	ūrū̄	g͡bɔ́rū̄
	hear	something	‘to hear something’

Example (4.15)

	H	**M H**	**HH**
a)	nɛ́	ōɣó	nóɣó
	have	money	‘to have money’
b)	lá	ōwó	lówó
	lick	soup	‘to lick owo soup’
c)	g͡bɛ̄́	ēré	g͡bɛ̄́ré
	tear	mat	‘to tear a mat’
d)	dɛ̄́	īk͡pá	dī́k͡pá
	fry	prawn	‘to fry prawn’
e)	nɛ́	ɔ̄sá	nɔ́sá
	have	father	‘to have a father’
f)	ní	ekó	nékó
	PREP	Lagos	‘in Lagos’

g) ʃɛ́ ɔ̄k͡pá ʃɔ́k͡pá

break walking stick ‘to break a walking stick’

h) ʃɛ́ īkṹ ʃíkṹ

break waist ‘to break waist'

i) kó ōɣó kóɣó

pack money ‘to pack money’

j) nɛ́ ōgṹ nógṹ

have inheritance ‘to have or possess an inheritance’

k) ɣɔ́ ɛ̄wɔ́ ɣɛ́wɔ́

sprinkle hand ‘to sprinkle one’s hand’

Example (4.16)

	M	**LL**	**LL**
a)	dʒɛ̄	ɔ̀dʒɛ̀	dʒɔ̀dʒɛ̀
	eat	food	‘to eat food’
b)	k͡pā	òlòlò	k͡pòlòlò
	kill	bottle	‘to break bottle’
c)	sō	ɛ̀k͡pò	sɛ̀k͡pò
	tie	bag	‘to tie a bag’
d)	bɛ̄	ɔ̀sà	bɔ̀sà
	peel	orange	' to peel orange'
e)	rɛ̄	ɛ̀wò	rɛ̀wò
	wet	clay pot	‘to treat a clay pot’
f)	k͡pā	ɛ̀wò	k͡pɛ̀wò
	kill	clay pot	‘to break a clay pot’
g)	ūrū̃	ɔ̀dʒɛ̀	ūrɔ̃̀dʒɛ̀
	something	food	‘ingredient’
h)	rā̃	ɔ̀nà	rɔ̃̀nà
	switch	road	‘to lighten a road’
i)	rō	ìbù	rìbù
	pour	sand	‘to pour sand'

j)	fā̃	ìkùn	fìkù̃
	blow	dirt	‘to blow dirt’

Example (4.17)

	M	**MM**	**MM**
a)	rɔ̄	ōmī	rōmī
	pour	water	‘to pour water’
b)	jā	īrɔ̄̃	jīrɔ̄̃
	comb	hair	‘comb hair ’
c)	ʃē	ūrū̃	ʃūrū̃
	do	something	‘to do something’
d)	k͡pā	ɔ̄mā	k͡pɔ̄̃mā
	beat	child	‘to beat a child'
e)	bā̃	īrɔ̄̃	bī̃rɔ̄̃
	plait	hair	‘plait hair’
f)	lē	ɛ̄dʒā	lɛ̄dʒā
	steam	fish	‘to steam fish’
g)	dʒɛ̄	ūrū̃	dʒɛ̄rū̃/ dʒūrū̃
	eat	something	‘eat something’
h)	bɛ̄	ūrū̃	bɛ̄rū̃
	peel	something	‘to peel something'
i)	jā̃	ɛ̄dʒā	jɛ̄̃dʒā
	smoke	fish	‘to smoke fish’

Example (4.18)

	M	**MH**	**MH**
a)	jā	ējí	jējí
	write	this	‘write this’
b)	k͡pā	ārɔ́	k͡pārɔ́
	kill	story	‘tell a story ’

c)	jɔ̄	īká	jīká
	pull	feather	‘remove feather’
d)	sɔ̄	akṹ	sɔ̄kṹ
	throw	cry	'to cry'
e)	jɔ̄	ēdʒū	jēdʒú
	pull	face	‘to show up briefly’
f)	sō	ɛ̄wɔ́	swɛ̄wɔ́
	tie	hand	‘tying of hands’
g)	jā	īwé	jīwé
	write	book	‘to write a letter’
h)	sɔ̄	īnɔ́	swīnɔ́
	throw	stomach	‘to make incision on the stomach’
i)	ʃē	ūʃɛ́	ʃūʃɛ́
	do	work	‘to work'
j)	fã̄	īmɔ́	fĩ̄mɔ́
	blow	nose	‘to blow your nose’

Example (4.19)

	MH	**LL**	**MHL**
a)	ɔ̄k͡pá	ɔ̀kã̀	ɔ̄k͡pɔ́kã̀
	walking stick	one	‘one walking stick’
b)	ūʃɛ́	èʃù	ūʃéʃù
	work	devil	‘devil’s work’
c)	ōɣó	ɛ̃̀jĩ̀	ōɣɛ̃́jĩ̀
	money	back	‘secret money’
d)	ōɣó	àdʒà	ōɣádʒà
	money	town	‘community fund’
e)	ūdʒó	ɛ̀kũ̀	ūdʒwɛ́kũ̀
	dance	door	‘dance of the shrine’
f)	ɔ̄dɔ̃́	ɔ̀kã̀	ɔ̄dɔ̃́kã̀
	year	one	‘a year’

g)	ūdʒó	àdʒà	ūdʒwádʒà
	dance	town	‘community dance’
h)	ɔ̄gwá	ɛ̀kũ̀	ɔ̄gwɛ́kũ̀
	front	door	‘the front of a door’
i)	ɔ̄wɔ́	èʃù	ɔ̄wéʃù
	hand	devil	‘the hand of the devil'

Example (4.20)

	MH	**MM**	**MHM**
a)	ɔ̄sɔ̃́	ɛ̄rã̄	ɔ̄sɛ̃́rã̄
	flesh	meat/animal	‘beef ’
b)	ōɣó	ɛ̄nɛ̄	ōɣɛ́nɛ̄
	money	we	‘our money’
c)	ūk͡pá	ārũ̄	ūk͡párũ̄
	covering	mouth	‘lips’
d)	ūkó	āɣã̄	ūkáɣã̄
	cup	their	'their cup'
e)	īnɔ́	ɛ̄dʒā	īnɛ́dʒā
	stomach	fish	‘the stomach of a fish’
f)	ōk͡pó	ɛ̄rī	ōk͡pɛ́rī
	empitness	sea	‘sky’
g)	ɛ̄g͡bɛ̃́	ɛ̄tū	ɛ̄g͡bɛ̃́tū
	sore	antelope	‘sore of an antelope’
h)	ōdé	ɛ̄ɣɛ̃̄	ōdɛ́ɣɛ̃̄
	half	egg	‘half of an egg’
i)	uɣɔ́	ɔ̄mā	uɣɔ́mā
	navel	child	‘a child’s navel'
j)	ūdʒó	ōmī	ūdʒómī
	dance	water	‘a type of dance’

Example (4.21)

	MH	**MH**	**MHH**
a)	ūʃɛ́	īwé	ūʃīwé
	work	book	‘book work’
b)	ūʃɛ́	ōɣó	ūʃóɣó
	work	money	‘profitable labour’
c)	ɔ̄dɔ̃́	ɔ̄rú	ɔ̄dɔ̃́rú
	year	hundred	‘hundred years’
d)	īwé	ɛ̄kɔ́	īwɛ́kɔ́
	book	lesson	'textbook'
e)	ūʃɛ́	ɛ̄wɔ́	ūʃɛ́wɔ́
	work	hand	‘handwork’
f)	īk͡pāk͡pá	ɔ̄rú	īk͡pāk͡pɔ́rú
	gun	hundred	‘one hundred guns’
g)	īwé	ɔ̄má	īwɔ́má
	book	Ọmá (name)	‘Ọmá's book’
h)	īmɔ́	ēsé	īmésé
	nose	shark	‘to lighten a road’
i)	ābɛ́	ūʃɛ́	ābúʃɛ́
	under	work	‘well done'
j)	īwé	ējí	īwéjí
	book	this	‘this book’

Example (4.22)

	MM	**LL**	**MLL**
a)	ɔ̄nɛ̄	ìrɛ̀	ɔ̄nìrɛ̀
	person	wisdom	‘a wise person’
b)	āʃɔ̄	ɔ̀kà̃	āʃɔ̀kà̃
	cloth	one	‘one cloth’
c)	ɔ̄mā	ɛ̀dɔ̃̀	ɔ̄mɛ̀dɔ̃̀

	child	heart	‘house help’
d)	ārɔ̄	ɔ̀kȁ	ārɔ̀kȁ
	a cripple	one	' one cripple'
e)	āgā	ɔ̀kȁ	āgɔ̀kȁ
	chair	one	‘one chair’
f)	īrɔ̿	àg͡bȁ	īrȁg͡bȁ
	hair	chin	‘beard’
g)	āʃɔ̄	ùk͡pò	āʃùk͡pò
	cloth	bed	‘bedspread’
h)	ɛ̄dʒā	èg͡bè	ɛ̄dʒèg͡bè
	fish	rotten	‘rotten fish’
i)	ɔ̄mā	ùrò	ɔ̄mùrò
	child	thought	‘responsible child'
j)	īrā	ùdɔ̏	īrùdɔ̏
	time	pain	‘famine’

Example (4.23)

	MM	**MH**	**MMH**
a)	āʃɔ̄	ūʃɛ́	āʃūʃɛ́
	cloth	work	‘work clothes’
b)	ɛ̄ɣɛ̿	īdé	ɛ̄ɣɪ̿dé
	egg	crayfish	‘egg of crayfish’
c)	ɛ̄tū	ɔ̄rú	ɛ̄twɔ̄rú
	antelope	hundred	'one hundred antelopes'
d)	ɛ̄rē	ūʃɛ́	ɛ̄rūʃɛ́
	effort	work	‘well done’
e)	ɔ̄bɛ̄	ōgű	ɔ̄bōgű
	knife	twenty	‘twenty knives’
f)	ūbō	ūʃɛ́	ūbūʃɛ́
	place	work	‘work place’

g)	ōmī	ārá	ōmjārá
	water	salt	'salt water'
h)	ɔ̄mā	ɛ̄wɔ́	ɔ̄mɛ̄wɔ́
	child	hand	'infant'
i)	āʃɔ̄	ōgű	āʃōgű
	cloth	twenty	'twenty clothes'
j)	ūkū̃	ɛ̄jé	ūkwɛ̃̄jé
	friend	world/life	'life's friend'

The data in 4.13-4.23 illustrate tone behaviour in vowel contact situations. In examples (4.13) and (4.19), the H and L tones of the vowels at word boundary positions concatenate. The H-L vowel sequences in these examples show that V_1 is deleted and the H tone of the deleted vowel is retained owing to tone stability. The H tone re-associates to the TBU on its right, while the L tone of V_2 is deleted changing the tonal pattern from H# LL tonal input to HL output in (4.13) and MH# LL tonal input to MHL tonal output in (4.19). In Yoruba, it has been held that the L tone delinked by the H tone is not deleted but rather re-attaches to the H tone on its right to derive a rising tone. Evidence of this is provided in sequences where H + L H → H L H (Akinlabi, 1985)

(a) wa (H) + ẹkọ (LH) → wẹkọ (H L H)
look (for) education look for education
(b) mu (H) + iwe (L H) → muwe (H L H)
take book take a book

Iṣẹkírì data accounts for the deletion of the L tone. A re-attachment of a delinked L tone cannot be affirmed because the H #LH formation across word boundary is absent. The analysis proposed in this study however adequately accounts for both situations.

In 4.14, 4.15, 4.16, 4.20, 4.21, 4.22 and 4.23, the M tone is deleted in vowel contact with both the H and L tones. This is contrary to what is reported in Omamor, (1979) for Iṣẹkírì where the L tone is said to be deleted. Instrumental evidence points to the fact that in M #

LL tonal combination where vowels abut, the mid tone is deleted. Figure 4.20 illustrates this for the Iṣẹkírì phrase *jẹ ọ̀jẹ̀* which becomes *jọ̀jẹ̀* ‘eat food’ after the elision process.

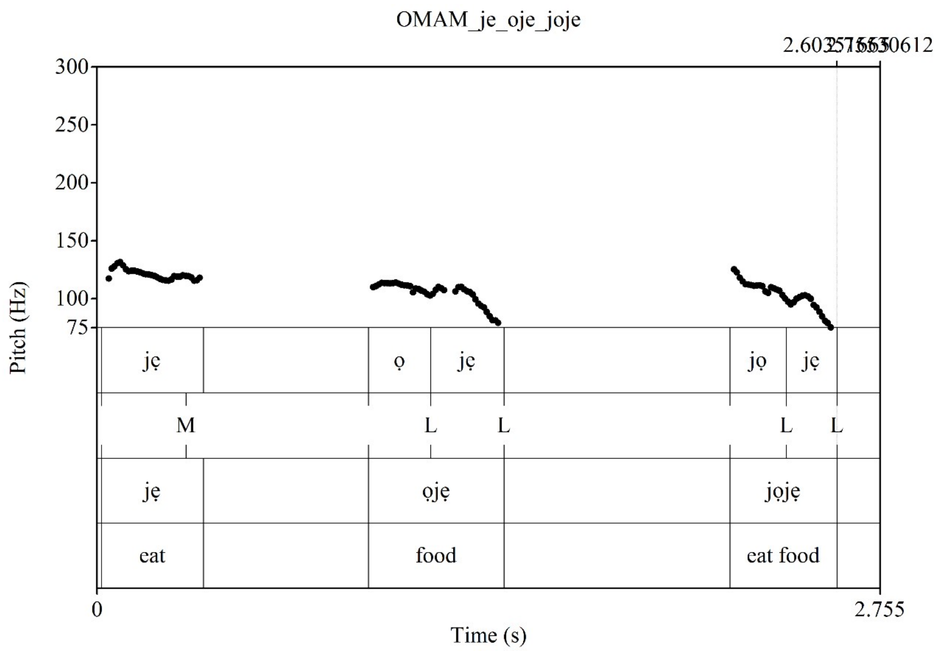


Fig.4.20. Pitch tracks of jẹ, ọ̀jẹ̀ and jọ̀jẹ̀

Table 4.10. F_0 values for *jẹ* 'eat', *ọ̀jẹ̀* 'food' and *jọ̀jẹ̀* 'eat food' for the speaker OMAM

Syllable	F_0 (mean values in Hz)	F_0 (absolute values in Hz)
jẹ	120.88	124.07
ọ	110.19	102.48
jẹ	93.08	79.11
jọ	111.05	99.44
jẹ	93.29	75.22

Perceptionally and acoustically, the tone on *jọ* (which is the resultant syllable after vowel elision) is a low tone. A comparison of the F_0 values of the M tone on *jẹ* and the resultant syllable *jọ* after the deletion of the vowel *ẹ* shows that the tone on *jọ* is a low tone. These values are presented in Table 4.10.

The M tone is the tone deleted in vowel contact situation with the H or L tone. Tonal alternations that result from vowel contact in Iṣẹkírì reveal that the mid tone is most likely to lose out when in contact with the high or low tone. While this asymmetric behaviour of the mid tone has been confirmed in Iṣẹkírì in this study and in the Yoruba literature, there remains the issue of analysis. As mentioned earlier, attempts at analyzing the asymmetric behaviour of tones have been varied and these include accounts in terms of underspecification (Akinlabi, 1985; Pulleyblank, 1986; Odden, 1995; Meyers, 1998), analysis based on the incorporation of tonal markedness into the formulation of faithfulness constraints Pulleyblank (2004), and the fusion analysis Turner (2006). These earlier attempts at analyzing the asymmetric behaviour of tones have engendered disagreements with regard to the underlying status of the M tone described in Akinlabi (2000:8) as "… the modal tone, which represents the absence of L or H". This study suggests that the mid tone is not underlyingly inert. Although it is the most unstable of the three tones (High, Mid and Low tones), it is underlyingly extant. Its malleable nature can be accounted for through its position in a ranking hierarchy.

An examination of the behaviour of mid tones within an Optimality Theory (OT) version that incorporates the grounding conditions in Heiberg (1999) to develop constraints of implicational statements which this study proposes shows that tone asymmetry can be properly and simplistically accounted for by constraint ranking. Pulleyblank (2004) and Long (2013) also identified the explanatory ability of OT in analysing tone asymmetry by constraint ranking, what is different in our analysis however, is the incorporation of constraints of implicational statements as markedness constraints which insightfully reveal why and how the mid tone behaves differently from the high and low tones.

The appeal of the grounding principles to this study is on the tonal outcome expressed as negative implicational statements. That is, "if a then not b" (Heiberg, 1999). The relevance of this is in the possible tonal output after VE in Iṣẹ̀kírì. For example, the presence of a high tone in a VV sequence implies that the mid tone is neutralized, thus the statement can be made that if a high tone then not a mid tone. The interesting contribution of such a statement is that, it handles data from both Iṣẹ̀kírì and Yoruba where the low tone is not deleted. This also resolves the problem associated with the underspecification analysis in a data like *rí ọ̀bẹ* 'see knife', where the attested form after vowel elision is [rɔ́b!ɛ̄]. Ordinarily, going by the underspecification approach, [rɔ́bɛ̀] which is not attested in the language should be the resultant form. Our proposal adequately accounts for such data. Therefore, from the data in 4.13 – 4.16, two ground negative conditions expressed as OT constraints will be sufficient for an analysis of tone behaviour.

4.2.1.2 An OT tone analysis

OT uses constraint ranking to distinguish one candidate from another. Constraints are ranked differently with some constraints ranked higher than others, indicating that they are more important. A violation of these higher ranked constraints are more costly, thus, a candidate who violates a higher-ranking constraint suffers a fatal violation than a candidate who violates a lower-ranking constraint. OT allows a comparison and evaluation of candidates based on the severity of their violations and chooses the best candidate with the least costly violation. Any OT analysis must identify the candidate set to be evaluated from the GEN component, select the constraints for evaluation and most importantly determine the constraint ranking.

4.2.1.2.1 The constraints

Constraints are drawn from the description of the Iṣẹ̀kírì tonal phenomena in sections 4.1.1.1 and 4.1.1.2. A taxonomy of the tones in Iṣẹ̀kírì identified three tones; H, M and L tones. The H tone has been shown to be the least marked in all tonal alternations; in vowel elision, it is the most stable and its tone feature is also the least malleable. This is followed by the L tone and the M tone which is the most unstable. In vowel contact positions, the M tone is deleted in contrast to the H and L tones. The faithfulness constraints relevant in the discussion of tone are the family of MAX constraints and these are:

(1) MAX-IO (T) constraints (Yip, 2002; Long, 2013)

a. MAX[H]: A H tone in the input has an output correspondent.
b. MAX[M]: An M tone in the input has an output correspondent.
c. MAX[L]: An L tone in the input has an output correspondent.

A constraint that determines whether input tones are preserved since not more than one tone is underlyingly allowed on a TBU and which does not permit one to many association is the constraint against multiple tone.

(2) *MULTIPLE (T): No more than one tone is associated to each TBU (Long, 2013).

The tonal outcome after VE are expressed as negative implicational statements as previously explained. The “if a then not b” (Heiberg, 1999) conditons show a co-occurrence restriction on the relation between adjacent tones in output representation. The study in a sense draws on such relations but with emphasis on the disapproval of the co-occurrence of particular tone sequences after deletion. The constraints developed here are based on the possible tonal sequences after VE and are therefore different from *CONTOUR that says one tone is associated to each TBU. The constraints formed are stated below.

(3) Implicational constraints

i) If HT then not MT. The constraints formed are:
a. *H↔M: A high tone- mid tone sequence is prohibited.
b. *M↔H: A mid tone- high tone sequence is not allowed.
c. *L↔H: A low tone- high tone sequence is not permitted.
ii) If LT then not MT. The constraints formed are:
d. *M↔L: A mid tone- low tone sequence is not allowed.

A ranking of all the tonal constraints is given below:

MAX[H]>> *H↔M, *M↔H, *L↔H, *M↔L >> MAX[L] >>*MULTIPLE>> MAX[M]

4.2.1.2.2 Evaluation

Tone asymmetry is observed in our data in section 4.2.1.1. An evaluation of this process is given in tableaux (4.1) – (4.3) for the H# LL, H# MM and M# LL tonal sequences and the set of constraints for our analysis is from the constraint list above. Since the concern of this study is on tonal outcome resulting from vowel elision, the selection of candidates for analysis are tonal candidates. What this implies is that interest is not on the deleted vowel. The set of all tonal output forms are generated from the input form. It is pertinent to point out that all the 17 informants from whom primary data for this study was gathered, produced the same tone pattern which can be attributed to the fact that they are competent native speakers of Iṣẹkiri who were selected for their proficiency in the language.

Emergence of g͡bálɛ̀ ‘to sweep’

Tableau 4.1. Input /g͡bá àlɛ̀/ ⟶ Output [g͡bálɛ̀]

/g͡bá àlɛ̀/ H LL	MAX[H]	* L↔H	MAX[L]	*MULTIPLE
a.[g͡bàlɛ̀]	*!			
☞ b.[g͡bálɛ̀]			*	
c. [g͡bá̀lɛ́]		*!		*
d. [g͡bà́lɛ́]		*!		*
e. [g͡bàlɛ́]	*!	*!		

Constraint ranking: MAX[H] >> *L↔H >> MAX[L] >>*MULTIPLE

Four constraints are involved in the ranking for this analysis and they are MAX[H], *L↔H, MAX[L] and *MULTIPLE. MAX[H] is the topmost ranked constraint and it dominates the other three constraints. There are five output candidates for the input/g͡bá àlɛ̀/, a. [g͡bàlɛ̀], b. [g͡bálɛ̀], c. [g͡bá̀lɛ́], d. [g͡bá́lɛ́] and e. [g͡bàlɛ́]. Candidate (b) [g͡bálɛ̀] emerges as the optimal candidate because it satisfies the highest ranking constraint MAX[H]. Other candidates, (c), and (d) also satisfy the highest-ranked MAX[H] but are knocked out of the competition because they violate another high ranking constraint *L↔H which is relevant to the analysis in Tableau (4.1) and defines the co-occurrence of particular tone sequences after deletion. Therefore, the acceptable form in the language is [g͡bálɛ̀] as this satisfies the relevant constraints and represents a well-formed tonal output in the language.

Emergence of lék͡pō ‘to lick oil’

Tableau 4.2. Input / lá ēk͡pō/ ⟶ Output [lék͡pō]

/lá ēk͡pō/ H MM	MAX[H]	* M↔H	*MULTIPLE	MAX[M]
a.[lēk͡pō]	*!			
b.[lēk͡pó]	*!	*!		
c. [lēk͡pṓ]	*!	*!	*	
☞d. [lék͡pō]				*

Constraint ranking: MAX[H] >> *M↔H >> *MULTIPLE >> MAX[M]

In Tableau (4.2), the tonal output form selected from the candidate forms presented for analysis is (d) [lékpo]. This candidate violates the lower-ranked constraint MAX[M] but is the most harmonic in relation to the constraint ranking and therefore emerges as the optimal form. Three other candidates, a. [lēk͡pō], b. [lēk͡pó] and c. [lēk͡pṓ] violate the top ranking constraint MAX[H] and are therefore disqualified from the competition. This is because a violation of the top ranking constraint MAX[H] by any candidate is regarded as fatal. Therefore, candidate (d) [lékpo] emerges as the optimal candidate.

Emergence of *dʒɔ̀dʒɛ̀* ‘to eat food’

Tableau 4.3. Input /dʒɛ̄ ɔ̀dʒɛ̀ /⟶ Output [dʒɔ̀dʒɛ̀]

/dʒɛ̄ ɔ̀dʒɛ̀/M LL	*M↔L	MAX[L]	*MULTIPLE	MAX[M]
a.[dʒɔ̄dʒɛ̀]	*!	*!		
b.[dʒɔ̄dʒɛ̄]	*!			
☞c. [dʒɔ̀dʒɛ̀]				*
d. [dʒɔ̄ʒɛ̄̀]	*!	*!	*	

Constraint ranking: *M↔L >> MAX[L] >>*MULTIPLE>> MAX[M]

The four constraints involved in the ranking for this analysis are *M↔L, MAX[L], *MULTIPLE and MAX[M]. *M↔L is the highest ranked constraint and it dominates MAX[L], *MULTIPLE and MAX[M]. There are four output candidates for the input /dʒɛ̄ ɔ̀dʒɛ̀/, a. [dʒɔ̄dʒɛ̀], b. [dʒɔ̄dʒɛ̄], c. [dʒɔ̀dʒɛ̀] and d. [dʒɔ̄ʒɛ̀̄]. Candidate (c) [dʒɔ̀dʒɛ̀] emerges as the optimal candidate because it satisfies the highest ranking constraint *M↔L. Other candidates, (a), (b) and (d) violate this constraint which incurs a fatal violation and they lose out of the competition. The optimal and attested form from the analysis in Tableau (4.3) is candidate (c) [dʒɔ̀dʒɛ̀].

The Yoruba data presented earlier to argue for an OT analysis as proposed in this analysis is evaluated in Tableau 4.4 to provide evidence that the theoretical approach recommended and applied in this study can adequately take care of tone asymmetry in any language. This, we hope, will put to rest the challenge of tone asymmetry analysis.

Emergence of *rɔ́b!ɛ̄* 'to see a knife'

Tableau 4.4. Input /rí ɔ̀bɛ̄/ ⟶Output [rɔ́b!ɛ̄]

/ rí ɔ̀bɛ̄ /	MAX[H]	*H↔M	*M↔L	MAX[L]	*MULTIPLE	MAX[M]
a.[rɔ́bɛ̄]		*!		*		
b.[rɔ̀bɛ̄]	*!					
☞c. [rɔ́b!ɛ̄]				*		*
d. [rɔ́bɛ̄́]		*!		*	*	*
e. [rɔ̄bɛ̀]	*!		*!	*		
f. [rɔ̀bɛ́]	*!					*

Constraint ranking: MAX[H]>> *H↔M, *M↔L >> MAX[L] >>*MULTIPLE>> MAX[M]

Six constraints are involved in the analysis of the Yoruba utterance /rí ɔ̀bɛ̄/ and these are MAX[H], *H↔M, *M↔L, MAX[L], *MULTIPLE and MAX[M]. Candidate c. [rɔ́b!ɛ̄] emerges as the optimal candidate because it satisfies the highest-ranked constraint MAX[H]. This candidate violates two constraints but emerges as the optimal form because the two constraints MAX[L] and MAX[M] are lowly-ranked and are therefore not relevant to the the analysis.

The analysis in Tableau 4.4 for Yoruba is to provide evidence that OT can handle any data. This is why as many candidates as possible have been included in the analysis and more candidates can be involved. Although the focus of this study is on Iṣẹ̣kírì, the above tableau is to lend credence to our claim that an OT analysis adequately accounts for tone asymmetry in a sister language like Yoruba. This analysis also demonstrates the fact that the M tone is underlyingly present, its activeness is dependent on the constraint ranking.

4.2.1.3 Verbal L deletion

Data presented in Section 4.2.1.1 excluded tonal combinations where the Low tone occurs on V_1 in a V#V environment. These tonal combinations are; L#MM, L#MH, LL#MH and LL#MM. The behaviour of the M tone in these tonal sequences does not conform to its asymmetric behaviour in other tonal formations. An explanation offered in the literature is that the low tone of a monosyllabic transitive verb is deleted and replaced by the mid tone when its object noun bears a low or mid tone on its initial syllable. Thus the low tone of monosyllabic transitive verbs in citation form is alternated with the mid tone. This is exemplified in Example 4.24.

Example (4.24)

a) sè	'cook'	Mó **se** ọ̀jẹ̀ wé rén.	'I have cooked the food'
b) kpè	'call'	Tósàn **kpe** ọma wé	'Tosan called the child'
c) nẹ̀	'choose'	Olájà **nẹ** irẹ́yé rẹ́n	'The king has chosen someone'
d) lù	'beat (drum)'	Èsànyé **lu** ògùmẹ̀	'Èsànyè beat the drum''
e) rè	'go'	Ọkọ mí **re** ode	'My husband went out'

An observation of the data above shows a replacement of the low tone of the verb with a mid tone. The implication of this is that in a sequence with L #M tonal formation, the M tone is preserved and the L tone is neutralized. This is exactly what happens in VE in the L#MM, L#MH, LL#MH and LL#MM tonal combinations in examples 4.25 -4.28.

Example (4.25)

	L	**MH**	**MH**
a)	g͡bà	ɛ̄wɔ́	g͡bɛ̄wɔ́
	take	hand	‘shake hand’
b)	rè	ūlí	rūlí
	go	house	‘go home’
c)	g͡bà	īwé	g͡bīwé
	take	book	‘take a letter’
d)	fà	ētí̃	fētí̃
	pull	ear	‘to pull the ear’
e)	kà	ōɣó	kōɣó
	count	money	‘to count money’
f)	g͡bà	ūbí	g͡būbí
	take	birth	‘to deliver’
g)	bò	ēdʒú	bwēdʒú
	cover	eye	‘close eye’
h)	g͡bà	ūʃɛ́	g͡būʃɛ́
	take	work	‘to offer a job’

Example (4.26)

	L	**MM**	**MM**
a)	g͡bà	ēgī̃	‘g͡bēgī̃’
	take	wood	‘take wood’
b)	dà	ɛ̄mɔ̄	‘dɛ̄mɔ̄’
	pour	drink	‘pour a drink'
c)	bò	ārū̃	‘bwārū̃’
	cover	mouth	‘close mouth'
d)	g͡bɛ̃̀	ūrū̃	‘g͡bū̃rū̃’
	plant	something	‘plant something’

e)	k͡pɔ̃̀	ɔ̄mā	k͡pɔ̃̄mā
	carry(back)	child	‘carry a child on the back’
f)	rò	ūrũ̄	rōrũ̄
	think	something	‘to think about something’
g)	dà	ōmī	dōmī
	pour	water	‘pour water’
h)	wɔ̀	ūdʒā	wūdʒā
	enter	coven	‘enter into witchcraft'
i)	tà	āʃɔ̄	tāʃɔ̄
	sell	cloth	‘sell clothes’
j)	kɛ̃̀	ēgĩ̄	kẽ̄gĩ̄
	nail	wood	‘nail a wood’

Example (4.27)

	L L	**MH**	**LMH**
a)	ɔ̀kɔ̀	ūʃɛ́	ɔ̀kūʃɛ́
	boat	work	‘labour boat’
b)	ùɣò	ɔ̄dʒɔ́	ùɣɔ̄dʒɔ́
	look	day	‘wrist watch'
c)	ɔ̀kɔ̀	ūná	ɔ̀kūná
	boat	fire	‘steam boat’
d)	èrè	ūʃɛ́	èrūʃɛ́
	gain	work	‘benefits of work’
e)	ùgwà	ālɛ́	ùgwālɛ́
	journey	evening	‘evening journey’
f)	ùrò	ōɣó	ùrōɣó
	thought	money	‘financial worries’
g)	ɔ̀dʒɛ̀	ālɛ́	ɔ̀dʒālɛ́
	food	evening	‘supper’
h)	ùtɔ̀	ɔ̄gwá	ùtɔ̄gwá
	view	front	‘forehead'
i)	ùkò	ɛ̄mí	ùkɛ̄mí
	cool	soul	‘peace of mind’

j)	ùwà	ālɛ́	ùwālɛ́
	wealth	evening	‘lasting wealth’

Example (4.28)

	LL	**MM**	**LMM**
a)	ɔ̀fɔ̀	ōdē	ɔ̀fōdē
	word	outside	‘outside/public talk’
b)	dʒɔ̀lɔ̀	ārā	dʒɔ̀lārā
	repair	body	‘adjust one's self/body'
c)	èg͡bè	ɛ̄dʒā	èg͡bɛ̄dʒā
	rottenness	fish	'rotten fish'
d)	lɛ̀fṹ̀	ōdē	lɛ̀ffdē
	leave	outside	‘come outside’
e)	ɔ̀jɔ̀	ɔ̄mā	ɔ̀jɔ̄mā
	happiness	child	‘the joy of a child’
f)	ɛ̀k͡pò	ōrē	ɛ̀k͡pōrē
	bag	mother	‘mother's bag’
g)	ɔ̀kɔ̀	ōmī	ɔ̀kōmī
	vehicle	water	‘boat’
h)	lèlè	ūkū̃	lèlūkū̃
	follow	friend	‘follow a friend'
i)	ɔ̀fɔ̀	ōrē	ɔ̀fōrē
	word	mother	‘mother's word/advice’
j)	òwũ̀	ɔ̄mā	òwɔ̃̄mā
	voice	child	‘a child's voice’

The behaviour of the M tone in example (4.24) does not conform to its asymmetric behaviour in other tonal formations. It is possible that the data in (4.24) guided the claim in Omamor (1979) that in vowel contact situations the low tone is deleted when it abuts with the high or mid tone. This study has shown in section 4.2.1.1 that this is not the case. The M tone is preserved only in L verbal deletion cases, that is, where the low tone monosyllabic transitive verb is deleted and replaced by the mid tone when its object noun bears a low or mid tone on its initial syllable as earlier stated.

4.2.2 Syntactically conditioned tonological operations

Tonal changes that result from syntactic contexts rather than phonological are referred to as syntactically conditioned tonological operations (SCTO) in this study. SCTO are syntactically conditioned because they apply across syntactic constituents and have the surface effect of changing a lexically specified tone (tone sequence); changing a lexical low tone to a surface high tone for example. We consider two types of syntactically conditioned operations; Leftward high tone spread and Rightward high tone spread.

4.2.2.1 Leftward high tone spread (LHTS)

The occurrence of a V syllable bearing a high tone between the noun phrase and the predicate has been reported in Yoruba. This has been variously termed as the high tone syllable, a clitic, Subject-Predicate Junction marker, Subject Concord marker, Past/Present tense marker, Agreement Marker, a pronoun and validator of actualized predicates (Olumuyiwa, 2009; Oshodi, 2016) in the Yoruba literature. While much has been said on this in Yoruba, its occurrence has not been discussed in Iṣẹ̣kírì. This study discusses the subject- predicate marker in Iṣẹ̣kírì with interest on the tonal changes it produces on the final tone of the noun or noun phrase and for the purpose of our study, we refer to this as Leftward high tone spread and employ a featural analysis to account for the tonal change which we hope will provide a better understanding of its behaviour in Yoruba. The tone of the last syllable of the noun phrase changes to a high tone when the lexically specified tone is a low or mid tone. What this study proposes is that the tonal replacement of the tone of the last vowel of the noun phrase results from the processes of the assimilation of the high tone syllable *é* to the vowel of its immediate left, a leftward spread of the [+Upper] feature of a H tone to a preceding [-Upper] feature of a M tone and a [+Upper] and [+Raised] feature to a [-Upper, -Raised] feature of a L tone and then the deletion of the HTS. This tonal process is illustrated in Fig. 4.21 and the data set in (4.29).

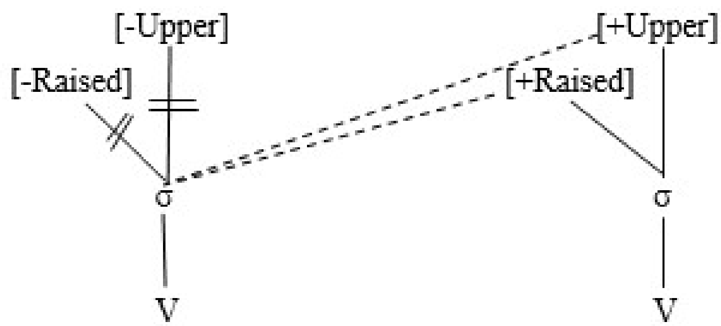


Fig. 4.21a). Leftward high tone spread of the[+Upper], [+Raised] features

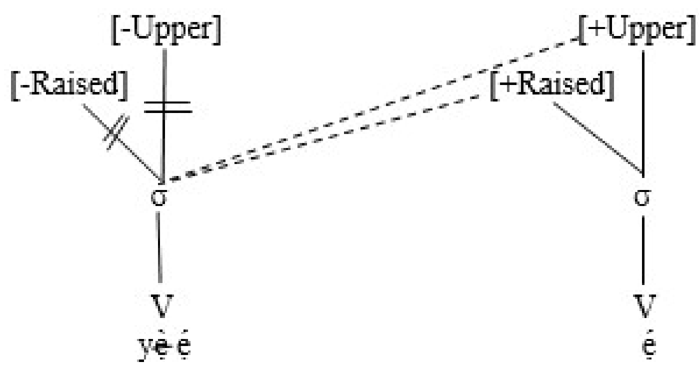


Fig. 4.21b). Leftward high tone spread of the[+Upper], [+Raised] features in Iṣẹkírì

This can be readily captured or explained as a leftward spread of the features of the high tone as shown in Figures (4.21a) and (4.21b). Illustrating with example 4.29a, the low tone on *yẹ̀* which is the final syllable of the noun *Ẹ̀sànyẹ̀* becomes *yẹ́* through a leftward spread of the[+Upper] and [+Raised] features of the high tone on the HTS *ẹ́*

Example (4.29)

a) Ẹ̀sànyẹ̀ ẹ́ lù ògùmẹ̀ ⟶ Ẹ̀sàny**ẹ́** lu ògùmẹ̀.

Ẹ̀sànyẹ̀ beat drum

'Ẹ̀sànyẹ̀ beat the drum'

b) Èdọ̀n ọ́n kpa ẹguálẹ̀ ⟶ Èd**ọ́n** kpa ẹguálẹ̀

Èdọ̀n kill snake

'Èdọ̀n killed a snake'

c) Ùtiẹ̀yìn ín kọ erin ⟶ Ùtiẹ̀yín kọ erin

Ùtiẹ̀yìn sing song

'Ùtiẹ̀yìn sang.'

d) Ìkpọ̀tọ̀r ọ́r guọ́ mi ⟶ Ìkpọ̀tọ́r guọ́ mi

Ìkpọ̀tọ̀r pull PRON

'Ìkpọ̀tọ̀r pulled me'

e) Tòrìṣẹ̀ ẹ́ guẹ̀ ẹsétè ⟶ Tòrìṣẹ́ guẹ̀ ẹsétè

Tòrìṣẹ̀ wash plate

'Tòrìṣẹ̀ washed plates

f) Dede é jẹ eran we ren ⟶ Dedé jẹ eran we ren

Dede eat meat Det ASP

'Dede has eaten the meat'

g) Ọkọ mi í ya iwé wé ní ola ⟶ Ọkọ mí ya iwé wé ní ola.

husband PRON write book Det PREP tomorrow

'My husband wrote the book yesterday'

LHTS of the [+Raised] feature is shown in Figure (4.22a) and illustrated with example (4.29f) in Figure (4.22b) where the [+Raised] feature of é spreads to the vowel of the final syllable *de* of the noun Dede with MM tone to Dedé MH.

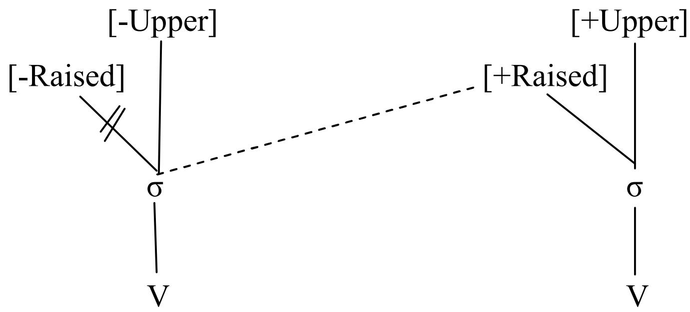


Fig. 4.22a). Leftward high tone spread of the [+Raised] feature

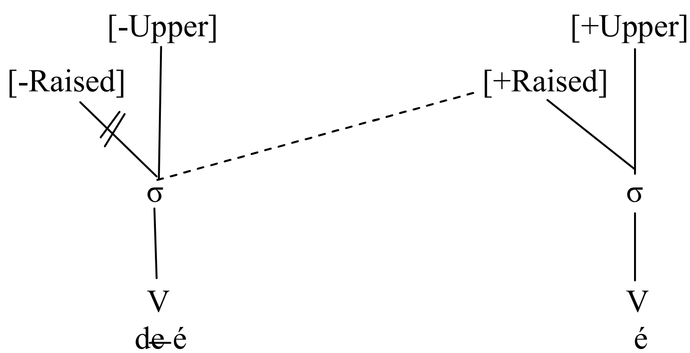


Fig. 4.22b). Leftward high tone spread of the[+Raised] in Iṣẹ̣kírì

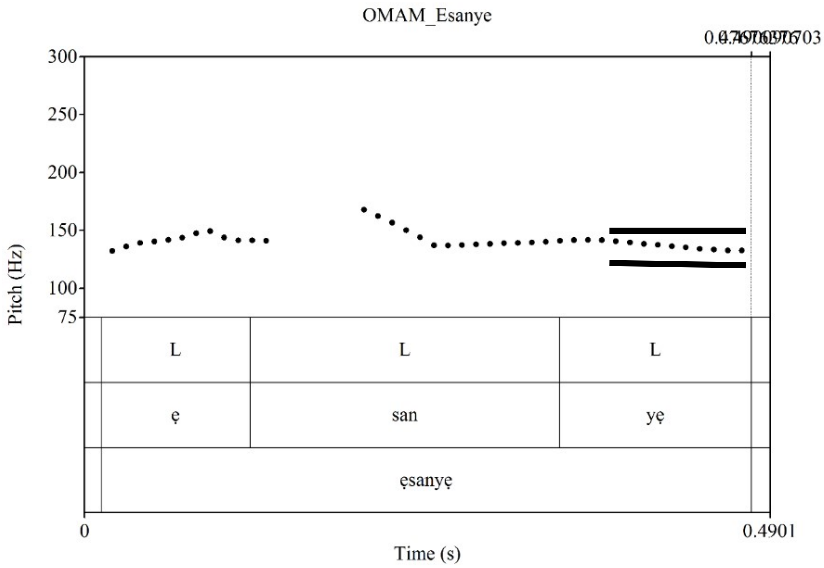


Fig. 4.23a). Pitch track of *Ẹ̀sànyẹ̀*

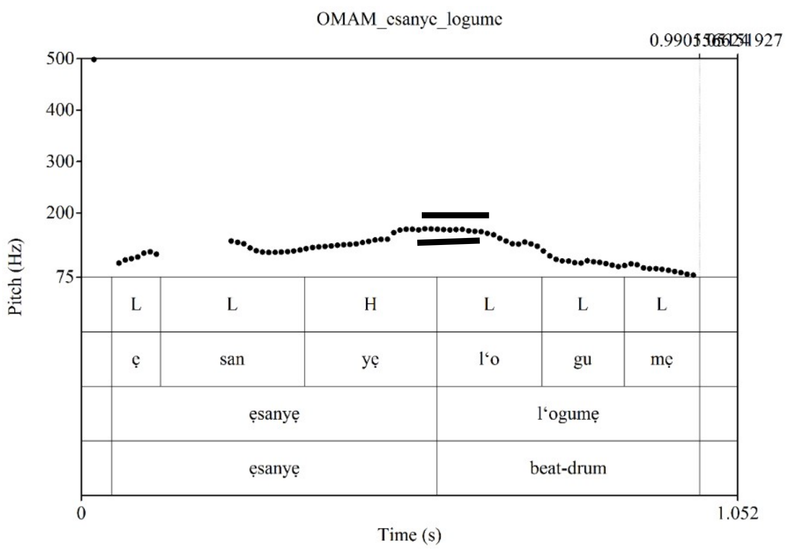


Fig. 4.23b). Pitch track of *Ẹ̀sànyẹ́ lu ògùmẹ̀*

An inspection of the pitch tracks of Figures (4.27a &b) confirms the change in tone from a low to a high tone.

A variation of the tautomorphemic tones preceding the final low or mid tone shows the same tonal output. This is exemplified below:

Example 4.30

a) Ìjẹ̀nẹ́kpò ó fò ṣálẹ̀ → Ìjẹ̀nẹ́**kpó** fò ṣálẹ̀
Tiger jump PREP-ground
'The tiger jumped down.

b) Agbákàrà á jẹ ímìlá → Agbákà**rá** jẹ ímìlá
Crocodile eat cow
'The crocodile ate a cow'

a) Bẹ́sìdọ́nẹ ẹ́ kpe mi → Bẹ́sìdọ́**nẹ́** kpe mi
Call me
'Bẹ́sìdọ́nẹ called me'

b) Ọ̀ghọ̀rìṣẹ̀wárami í kpa eso → Ọ̀ghọ̀rìṣẹ̀wára**mí** kpa eso
kill seed
'Ọ̀ghọ̀rìṣẹ̀wárami cracked the kernel''

e) Ipósì í je eja → Ipó**sí** je eja
cat eat fish
'The cat ate a fish'

4.2.2.2 Rightward high tone spread (RHTS)

The juxtaposition of two words in certain syntactic relations results in changes in surface tonal structure. RHTS refers to "the extension of a high tone from its underlying position to immediately adjacent syllables to the right" Zerbian (2017:396). A high tone on a pre-verbal particle spreads to the verb in Iṣẹ́kírì, that is, the high tone of the word preceding the verb spreads to the first syllable of the verb. An examination of data in the language shows that the rightward spread of the high tone is governed by two constraints; the number of syllables in the verb stem (at least disyllabic), and the tonal melody (a LL or LLL). Data show that this is a robust phenomenon in Iṣẹ́kírì. Thus tonal and syllabic contexts are required for the RHTS to occur. An examination of the following LL patterned verbs in syntactic constructions produce a tonal outcome different from their lexical tonal input. Two data sets are presented for the RHTS. In (4.31a), the spread is from pre-verbal articles and in (4.31b), the spread is from the aspectual marker *gbá.*

The tone of the first syllable of the verb in the Iṣẹ̀kírì data presented changes to a high tone. In like manner with the LHTS, the rightward spread of the [+Upper] and [+Raised] feature of a preceding H tone to a [-Upper, -Raised] feature of a L tone accounts for this as shown in Figure 4.24.

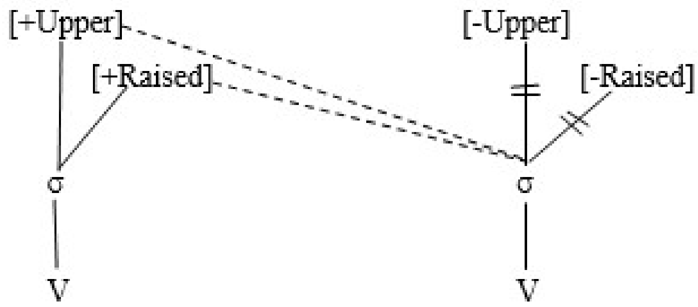


Fig. 4.24a). Rightward high tone spread

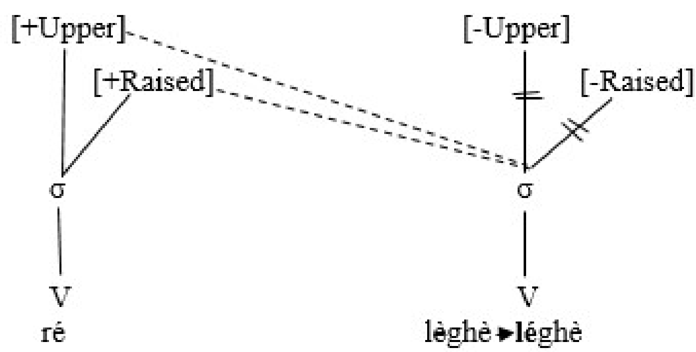


Fig. 4.24b). Rightward high tone spread in Iṣẹ̀kírì

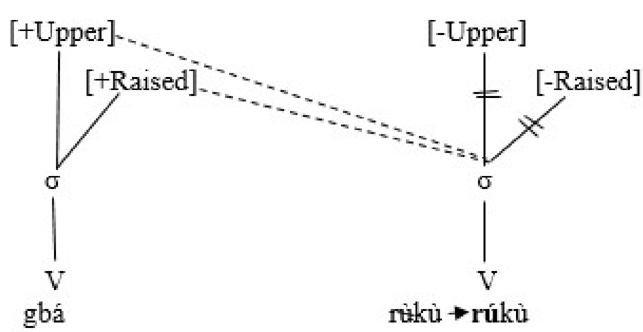


Fig. 4.24c). Rightward high tone spread in Iṣẹ̀kírì

Figures 4.24a, b & c illustrate the spread of the [+Upper, +Raised] features of a high tone to the initial syllable of a LL patterned disyllabic verb. In Figure 4.24b, the spread is from a pre-verbal particle *ré* to the verb lẹ̀ghẹ̀ 'to deceive' to become **lẹ́**ghẹ̀ and in Figure 4.24c, the spread is from the aspectual marker *gbá* to rùkù 'muddy' to become **rú**kù.

Example (4.31a)

i) Nesín ré lẹ̀ghẹ̀ uwọ? ⟶ Nesín ré **lẹ́**ghẹ̀ uwọ?
Who BE deceive PRON 'Who deceived you?'

ii) Ó waá lèlè uwọ. ⟶ Ó waá **lé**lè uwọ.
PRON FUT follow PRON 'He/she will follow you.'

iii) Wo má gbòrò ó, O waá sẹnguà. ⟶ Wo má **gbó**rò ó, O waá sẹnguà.
PRON COMP rub PRON FUT beautiful 'If you paint it, it will be beautiful.'

iv) Jédí ùkpò wé gbègbèrè aralí wé ⟶ Jédí ùkpò wé **gbé**gbèrè aralí wé
Allow bed Det rest wall Det. 'Let the bed lie against the wall'

v) Aṣọ wé kèkè mí ⟶ Aṣọ wé **ké**kè mí
cloth Det tight PRON 'The cloth is closely fitted for me'

Example (4.31b)

i) Ìdìbì gbá rùkù omi wé ⟶ Ìdìbì gbá **rú**kù omi wé
Crab ASP muddy water Det 'The crab started mudding the water'

ii) O wínọ́rọn gbá sọ̀jẹ̀ ⟶ O wínọ́rọn gbá **sọ́**jẹ̀
PRON ASP cook-food 'He/she is cooking'

iii) O wínọ́rọn gbá kpòkpò ọwa ro → O wínọ́rọn gbá **kpó**kpò ọwa ro

PRON ASP trouble father PRON ‘He is troubling his father’

iv) Báwọ̀ wínọ́rọn gbá gbàngbàn orígho ro → Báwọ̀ wínóron gbá **gbán**gbàn orígho ro

Bawọ BE ASP shake head PRON ‘Bawọ is shaking her head’

v) Mo wínọ́rọn gbá jìgìrìn ara mi → Mo wínọ́rọn gbá **jí**gìrìn ara mi

PRON BE ASP shake body PRON ‘I am shaking my body’

A summary of (4.31a) and (4.31b) showing the verb in isolation and in the contexts explained is given in Table 4.11.

Table 4.11. A summary of tonal input and output

Lexical tone LL	Sentence	HL Tonal verbal outcome
lèlè	Ó waá lélè uwọ	lélè
rùkù	Ìdìbì gbá rúkù omi we e	rúkù
lẹ̀ghẹ̀	Nesin ré léghè uwọ?	lẹ́ghẹ̀
sọ̀jẹ̀	O wínóron gbá sọ́jẹ̀	sọ́jẹ̀
kèkè	Aṣọ wé kékè mi	kékè
kpòkpò	O wínóron gbá kpókpò ọwa ro	kpókpò
gbòrò	Wo má gbórò, Ó waá sengua	gbórò
gbàngbàn	Bawọ wínóron gbá gbángbàn orígho ro	gbángbàn
jìgìrìn	Mo wínóron gbá jígìrìn ara mi	jígìrìn
gbègbèrè	Jédí ùkpò wé gbégbèrè aralí wé	gbégbèrè

An examination of our data shows that the constraints earlier mentioned holds, as RHTS is exempted from monosyllabic verbs and any other tonal formation different from the LL sequence. These constraints exempt a spread of the [+ Raised] feature to an M tone as we have it in the LHTS. An extract from story 1 (see appendix ii) clearly shows that the spread of features is blocked for monosyllabic verbs and M tone sequences.

Example (4.32)

(a) Ìdìbì **gbá kpu**jó.
Crab ASP call-dance
'The crab called a dance'

(b) Ìdìbì bírí aghan ti (**wó kpè**) (**gbá bóojó**) (**gbá rè**)
Crab CONJ PRON COMP 3Pl call ASP CONJ- dance ASP go
'The crab and those that he called started dancing and going with him.'

(c) Owun Idibi gbá ṣebinọ **gbá rè**
COMP Crab ASP do-anger ASP go
'Then the crab got angry and left'

(d) Omi wé **kà rùkù**
Water Det become muddy
'The water got muddied'

(e) Ìdìbì **gbá rúkù** omi wé
Crab ASP muddy water Det
'The crab started mudding the water'

The extract above shows the conditions under which RHTS can occur. The highlighted words in (4.32a, b, &c) have pre-verbal elements with a H tone but no tonal change is observed on the following verbs because the verbs are monosyllabic (4.32a, b, &c). In cases where they are not monosyllabic but the tonal sequence is not a LL formation seen in *gbá bojó* with a MH tone in (4.32b), RHTS does not occur. The lexical tonal formation in the verb rùkù (LL) is unaffected by the preceding word with a low tone in (32d) when compared with the same verb with a different tonal outcome in rúkù (HL) in (32e) resulting from the rightward spread of the [+Upper] and [+Raised] feature of a preceding H tone in *gbá*.

A test to ascertain the requirement of the tonal melody was carried out using a frame with an MM tonal formation and a LL tonal formation in the frame (*datú* 'again' verb object pronoun) in (4.33).

Example (4.33)

MM verb

(a) Datú sere é
again pick OP
'Pick it again'

(b) Datú jọnjẹ ẹ́
again press OP
'Press it again'

LL verb

(c) Datú lẹ́ghẹ̀ ẹ́
again deceive OP
'Deceive him again'

(d) Datú gbórò ó
again rub OP
'Rub him again'

The verbs in (4.33a&b) are not affected by the high tone on datú while the low tone on the initial syllable in the verbs in (4.33c&d) are changed to the H tone.

This section has described and analysed the behaviour of Iṣẹkíri tones. Changes in tonal output were examined under two categories; phonologically conditioned tonological operations and syntactically conditioned tonological operations. The changes in the surface tonal realization as a result of VE showed the mid tone is in asymmetry to high and low tones. This was analysed within OT by the constraint hierarchy MAX[H]>>*H↔M, *M↔H, *L↔H, *M↔L >> MAX[L] >>*MULTIPLE>> MAX[M]. Bidirectional tone spread has the surface effect of changing a lexically specified tone (tone sequence); changing a lexical low or mid tone to a surface high tone in the language.

4.3 Phrase level F_0 trends

This section presents our data description and acoustic analysis on the mechanisms Iṣẹ̀kíri employs for the realization of F_0 contours. This seeks to provide answers to our research question three. The consideration of intonation in tone languages has received little attention in comparison with studies on intonation in non- tonal languages. The assumption is that in tone languages, pitch features have already been mobilized for morphosyntactic uses to determine lexical and grammatical tones (Caron, 2015; Cahill, 2016). This has made it difficult to determine the role of pitch in intonation. Some mechanisms by which intonation in tone languages may manifest have however been identified by some scholars (Cruttenden, 1986; Yip, 2002; Ladd, 2008) and these are; the pitch register or pitch level of the whole utterance may be raised or lowered, thus all tones will be higher or lower in pitch than usual (Cruttenden, 1986; Yip, 2002), pitch range may be narrower or wider such that highs or lows either move further apart or closer (Cruttenden, 1986; Yip, 2002; Ladd, 2008), downdrift in the absolute values of tones may apply but this may be suspended in some instances or downdrift may apply within some prosodic domain but may be suspended at domain boundaries and the register resets (Cruttenden, 1986; Yip, 2002), the final tone of the utterance may be modified in different ways (Cruttenden 1986; Yip 2002) and boundary tones may occur at domain edges (Yip, 2002; Ladd, 2008).

Existing literatures on the study of intonation in tone languages have utilized these mechanisms one way or the other in their description and analyses on intonation (Lindau, 1989 for Hausa; Connell and Ladd, 1990; Laniran, 1992 for Yoruba; Genzel, 2013 and Kügler, 2017 for Akan; Cahill, 2017 for Konni; Rose and Piccinini, 2017 for Moro; Zerbian, 2017 for Tswana). The specific downward trend of F_0 as a strategy of expressing intonation explored by scholars for a description and analysis of intonation in both tonal and non tonal languages and the mechanisms commonly considered are declination, downdrift, downstep and final lowering. Intonational boundary tones represented with the diacritic % and often referred to as intonemes (Caron, 2015) or intonational tones (Michaud and Vaissière, 2015) are also feartures used to express intonation.

The goal of this study is to find an answer to the question of how Iṣẹ̀kíri makes use of some or all of these features for expressing intonation. Intonation is used in a restricted sense here to refer to all areas of the linguistic use of fundamental frequency and its physical and perceptual correlates, therefore, pitch is the most salient phonetic means of intonation in our study. This is because while intonation does not have a generally accepted definition, every attempt at a definition of intonation recognizes that pitch plays the most important role (Roach, 2009). Other phonetic means such as duration and intensity will also be considered where necessary. The domains of intonation in Iṣẹ̀kíri have been recognized as the phrase or sentence in this study. Evidence of this is found in our examination of complex structures in Section 4.3.1.2.2 where intonational phrases are identified. While the possibility of a word also being the domain of intonation is not ruled out, our data show the phrase and sentence as the domain, we therefore stick to the term utterance in our discussions. Each figure of our pitch track consists of five tiers namely: the syllable tier, which is made up of a sentence divided into syllables; the tonal tier, showing the lexical tones; the intonational tone tier, referred to here as intoneme tier indicating a boundary tone; the intonational feature or mechanism tier and the gloss tier. It is important to point out that the derived pitch graphs appear more representative of the pitch contours than the pitch tracks as measurements were taken far into the vowel to mitigate segmental effects. Thus in some instances, there might little variations between the pitch track and the pitch graph. The zero boundary tone represented as 0% to indicate the absence of an intonational tone at the right edge of an intonational phrase and the low boundary tone L% are used as intonational tones in this study. L% indicates a fall from the final lexical tone. Figure 4.25 illustrates the tiers in the pitch tracks.

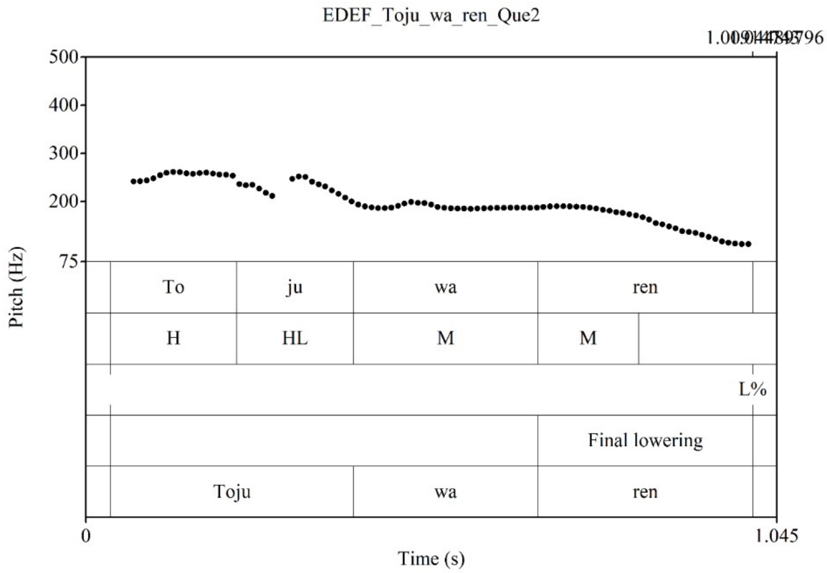


Fig. 4.25. A display of pitch track tiers

4.3.1 Fundamental frequency (F_0) mechanisms in Iṣẹ̣kírì

Different downdrends have been identified as F_0 mechanisms used by both tonal and non tonal languages as features of intonation. F_0 downtrends usually identified in works on tone and intonation are declination, downstep and final lowering (Poser, 1984; Lindau, 1986; Connell and Ladd, 1990; Laniran, 1992; Genzel, 2003; Kugler, 2017; Connell, 2017). The description of intonation in this study shows that declination, downdrift and final lowering operate in Iṣẹ̣kírì in one way or the other and that they in addition to the lexical tones and boundary tones determine the resulting F_0 contour of the different phrasal structures. Each of these downtrend in F_0 is now discussed.

4.3.1.1 Declination in Iṣẹ̣kírì

The gradual lowering of F_0 in time reveals the nature of declination. It is expressed as the gradual lowering of F_0 over an utterance. Declination often times has been equated with downstep in the literature, most especially literature on non tonal languages. This study differentiates declination from other phonologically conditioned pitch lowering following Connell and Ladd, (1990); Laniran, (1992); Genzel, (2003); Kugler, (2017); Connell, (2017). This is referred to as declination in "its pure form" by Genzel, (2003:107). An investigation of like tones shows a consistent pattern of F_0 decline in longer sentences for all three tone sequences. However, data on all-high tones do not necessarily establish the existence of declination in Iṣẹ̣kírì because statistical results show that the amount of declination for the all-high tones is insignificant while all categories of the mid and low tone sequences show significant rate of declination. Statement intonation in utterances of like tone sequences will be investigated in the following sections.

4.3.1.1.1 Declaratives

The most common sentence type in our data, most especially in the oral narratives, are declaratives. This sentence type expresses facts and conveys information. Intonation in Iṣẹ̣kíri declaratives will be considered under the simple and complex declaratives. The intonation pattern of the simple declarative sentences is marked by zero% boundary tones. Lexical tones alone tend to shape the intonational contour as intonational phrase boundary tones are unspecified. The simple declaratives show a downward trend in pitch in mid and low tone sequences and in sentences with unlike tones. To consider the intonation pattern of simple declaratives, data from like tone sequences are examined in sections 4.3.1.1.1.1.

4.3.1.1.1.1 Like tone sequences

Iṣẹkíri has three contrastive tones, high (H), mid (M) and low (L), as shown in Section 4.2. These three tone types are used for the controlled data set of like-tone sentences of varying length meant to examine pitch effects that might be connected to tone type and utterance length.

High tone sentences

Sentences of all high tones considered here range in length from four to fifteen syllables and are categorized into short, medium and long sentences. Three of these sentences consisting of four, eight and thirteen H tones are selected for each category. The sentences and their corresponding pitch tracks for four speakers identified as EDEF, OJEF, AYIM and MORM (section 3.1) are in Examples 4.18- 20 and Figures 4.26, 4.29 and 4.32.

(4.18)

Mímí nóghó
Mímí have-money
'Mímí has money'

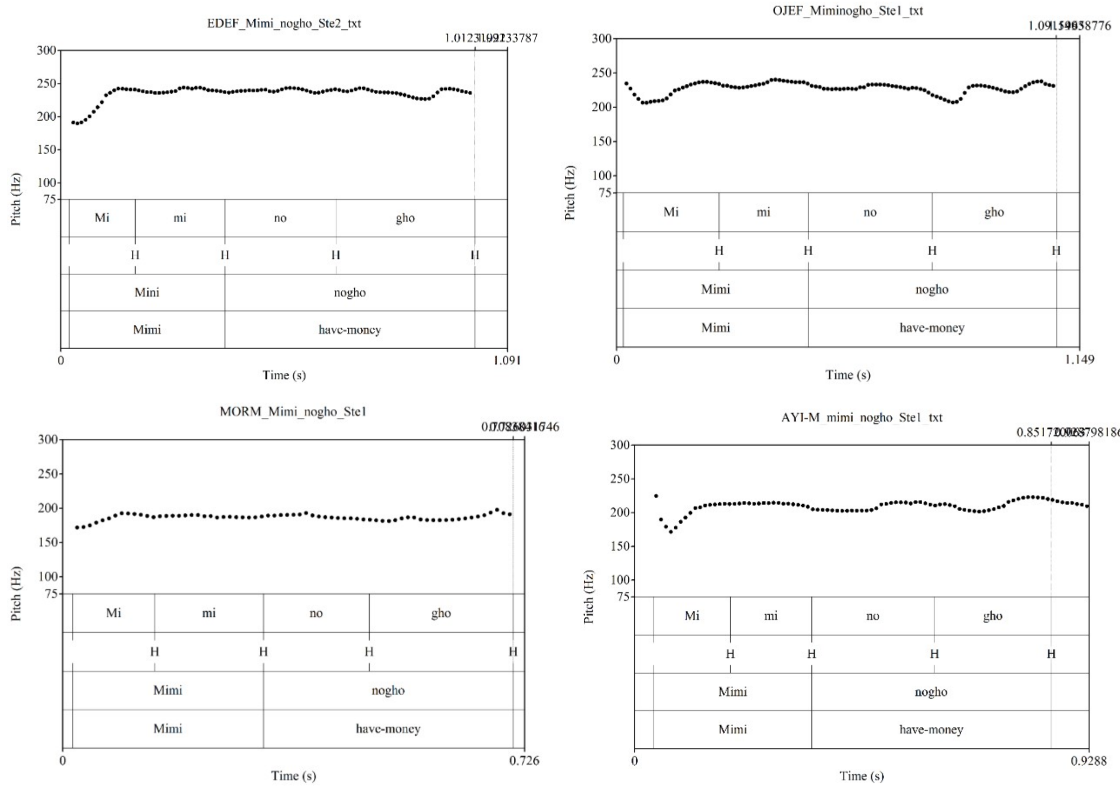


Fig. 4.26. Pitch tracks of the all high toned sentence *Mímí nóghó* 'Mimi has money' for four speakers

Table 4.12. F_0 values and the differences between positions of four speakers for *Mímí nóghó*

SPEAKERS:		EDEF		OJEF		MORM		AYIM	
		F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.
Syllable	**Tone**								
Mi	**H**	242.19		236.82		192.27		233.41	
mi	**H**	243.77	-1.58	240.14	-3.32	189.77	2.5	234.29	-0.88
no	**H**	243.27	0.5	233.13	7.01	192.96	-3.19	227.11	7.18
gho	**H**	242.98	0.29	237.59	-4.46	196.58	-3.62	229.78	-2.67

A cursory inspection of the pitch tracks of the four speakers shows that there is no form of F_0 downdrift. Three speakers have a slightly higher F_0 in the final syllable when compared to the first syllable. Only one speaker AYIM has a lower F_0 difference of 3.63Hz. The average F_0 values obtained from five tokens of the vowel portion of each syllable and the differences between positions are presented in Table 4.12.

One observation on the high tone sentences in Tables 4.12, 4.14 and 4.16 is a rise in the F_0 of the second syllable. This is referred to as a 'start-up' effect in Urua (2001:72) and is described as "the phenomenon in which the High tone target is not reached on the first syllable; usually this is attained in the second or third syllable after which the subsequent High tones stabilize". The 'start-up' effect is noticed at one point or the other for all speakers. This effect tends to affect the following high tone before stability is attained. The F_0 values from Table 4.12 are plotted into a graph in Figure 4.27 for all four speakers for easy comparison.

The graph provides a quick evaluation of the four speakers and shows that while there is a downward trend for OJEF and AYIM between the second and the third syllables, there is a general trend of a slight increase in F_0 in the final syllable. What this means is that there is no phrasal downward trend in this utterance.

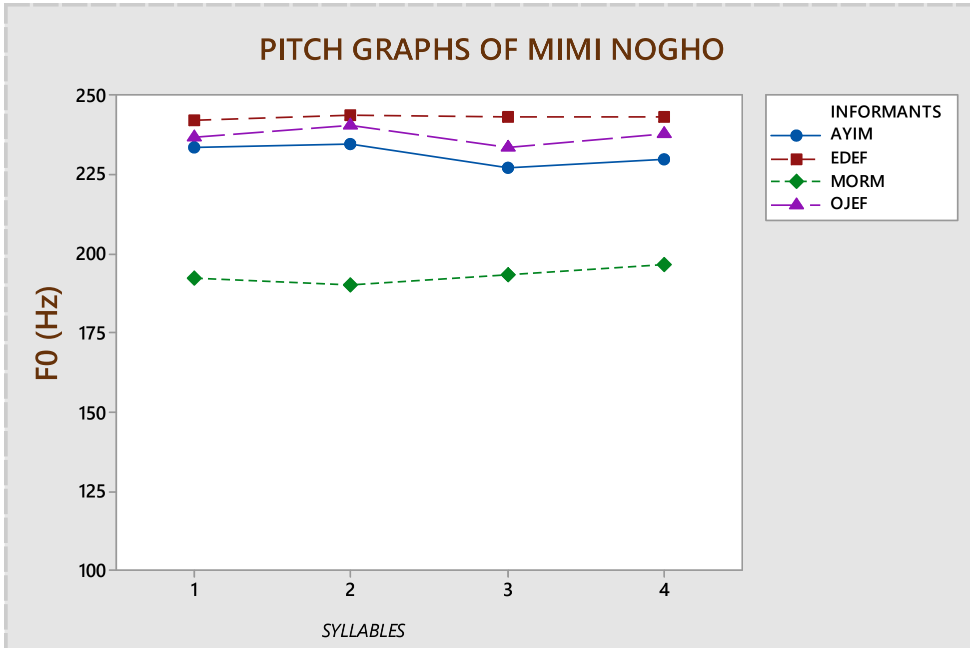


Fig. 4.27. Pitch graph of *Mímí nóghó* ‘Mimi has money’

A statistical analysis is carried out to test for statistical significance of F_0 downtrend in utterances of the different tone types of varying length. The outcome of the regression analysis of the four syllable utterance in Example 4.18 is shown in Figure 4.28. The blue dots are the F_0 values and the red line is the regression line. The alpha level is set at 0.05 in all analysis in this research.

A positive slope is observed for two speakers with the coefficient in the regression equation as +0.196 and +1.4 for EDEF and MORM. This implies an absence of declination in this utterance. The slope of the regression line for OJEF is - 0.051 which is not significantly different from zero. F_0 is lowered by less than 1Hz on the average. The speaker AYIM however shows some form of downward trend of an average of F_0 lowering of about 2Hz. The regression summary is presented in Table: 4.13.

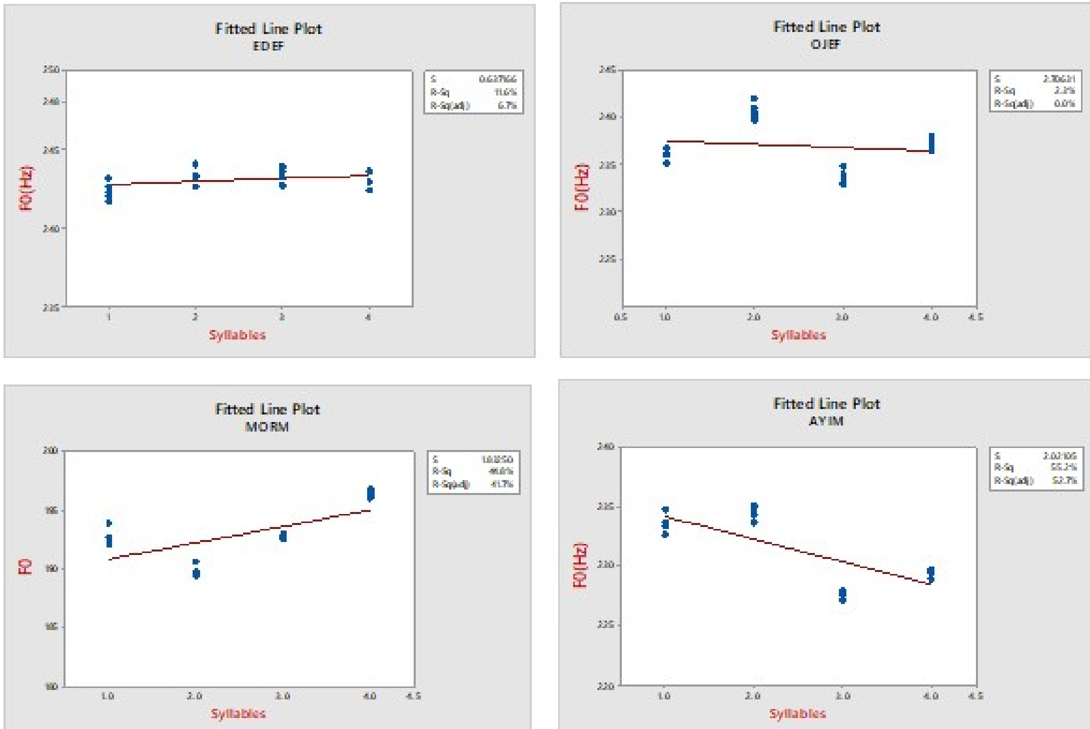


Fig. 4.28. Fitted line plot for *Mímí nóghó* ‘Mimi has money

Table: 4.13. Regression summary for *Mímí nóghó* ‘Mimi has money’

Coefficients:

	EDEF		OJEF		MORM		AYIM	
Terms:	equation	p-value	equation	p-value	equation	p-value	equation	p-value
Constant	242.6	0.000	237.9	0.000	189.4	0.000	236.1	0.000
Y	+ 0.196	**0.142**	- 0.051	**0.525**	+ 1.400	**0.122**	- 1.904	**0.062**

We now consider the seven syllable utterance in Example (4.19) with the corresponding pitch tracks in Figure 4.29 for four speakers.

(4.19)

Tuọ́kpẹ́ wúlí gbá rúwé

Tuọ́kpẹ́ PREP-house ASP read-book

'Tuọ́kpẹ́ is reading at home.'

An examination of the pitch tracks in Figure 4.29 reveals that there is no clear form of declination for all the speakers. Differences in F_0 values between the initial and final syllables are a little higher in the final syllables when compared to the first syllables. The F_0 values and pitch graph for Example (4.19) are presented in Table 4.14 and Figure 4.30.

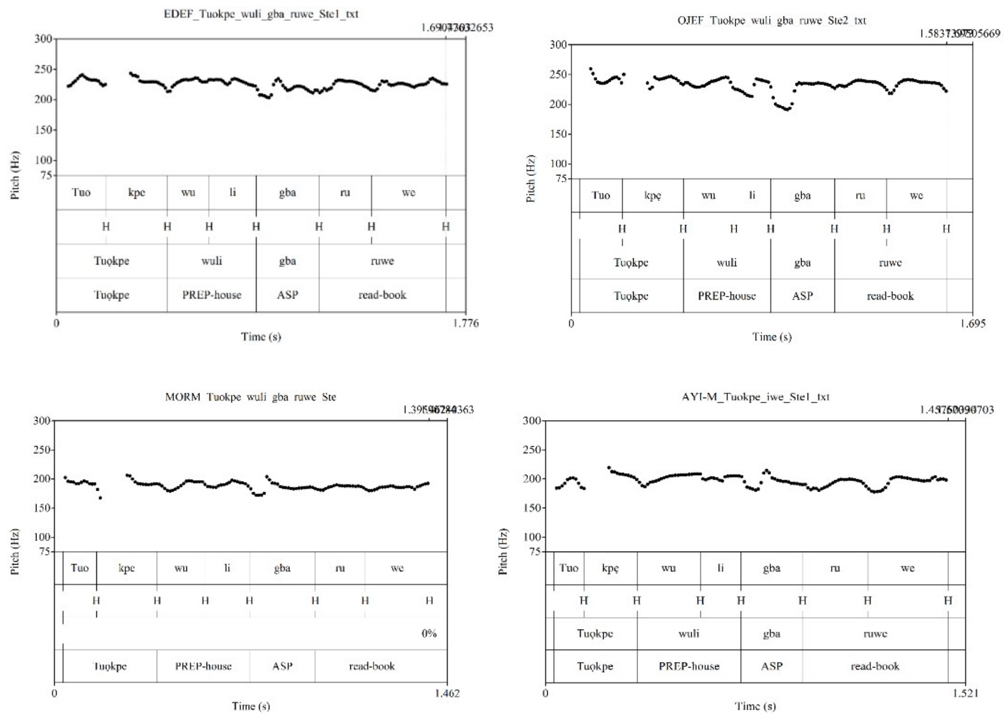


Fig.4.29. Pitch tracks of the all high toned sentence *Tuọ́kpẹ́ wúlí gbá rúwé* ‘Tuọ́kpẹ́ is reading at home’ for four speakers

Table 4.14. F_0 values and the differences between positions of four speakers for *Tuọ́kpẹ́ wúlí gbá rúwé*

SPEAKERS:		EDEF		OJEF		MORM		AYIM	
		F_0 (Hz)	**Diff.**	**F_0 (Hz)**	**Diff.**	**F_0 (Hz)**	**Diff.**	**F_0 (Hz)**	**Diff.**
Syllable	**Tone**								
Tuọ	**H**	240.60		241.1		196.28		201.57	
kpẹ	**H**	248.25	-7.65	240.9	0.2	205.98	-9.7	210.01	-9.01
wu	**H**	245.39	2.86	245.43	1.27	196.83	9.15	208.35	1.66
li	**H**	244.39	1	242.1	3.33	197.81	-0.98	205.37	2.98
gba	**H**	243.70	0.69	235.78	6.32	201.11	-3.3	214.25	-8.88
ru	**H**	241.83	1.87	240.36	-4.58	196.51	6.6	209.88	4.37
we	**H**	244.42	-2.59	241.72	-1.36	195	- 0.49	203.59	-3.71

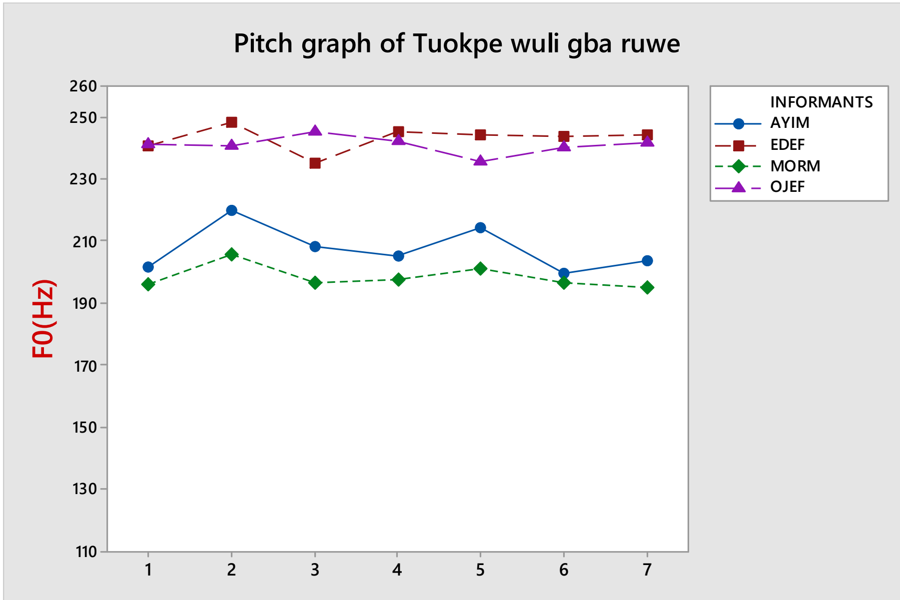


Fig.4.30. Pitch graph of *Tuọ́kpẹ́ wúlí gbá rúwé* ‘Tuọ́kpẹ́ is reading at home.’

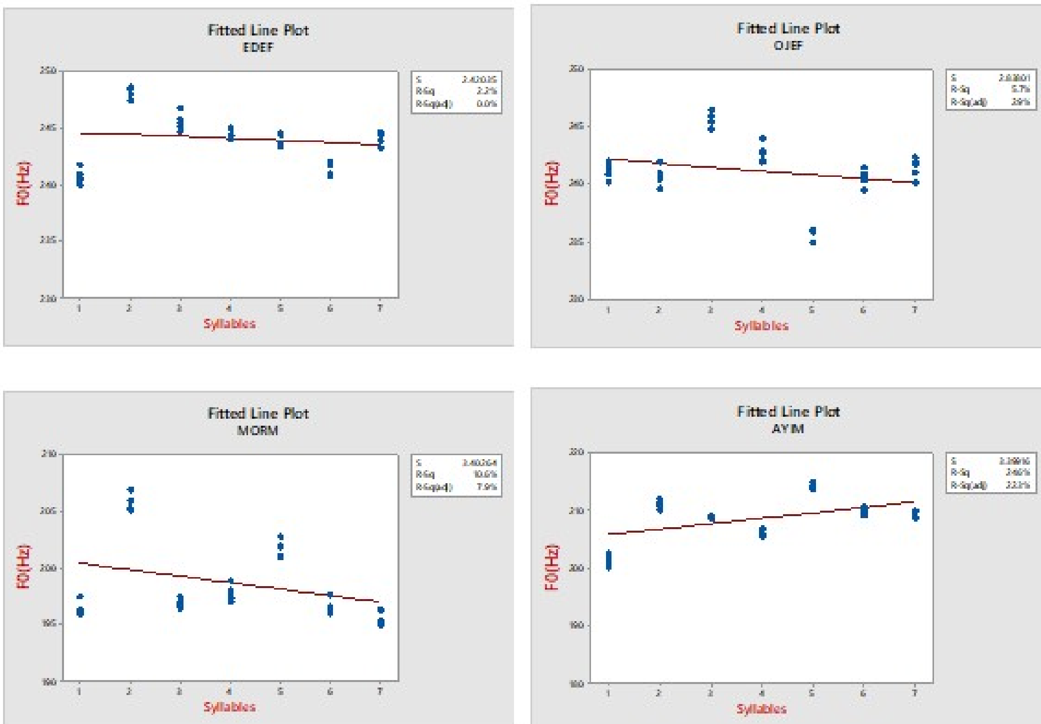


Fig. 4.31. Fitted line plot for *Tuọ́kpẹ́ wúlí gbá rúwé* ‘Tuọ́kpẹ́ is reading at home.’

Table 4.15. Regression summary for *Tuọ́kpẹ́ wúlí gbá rúwé* 'Tuọ́kpẹ́ is reading at home'

Coefficients:

	EDEF		OJEF		MORM		AYIM	
Terms:	equation	p-value	equation	p-value	equation	p-value	equation	p-value
Constant	244.8	0.000	242.5	0.000	201.0	0.000	205.2	0.000
Y	- 0.176	**0.397**	- 0.34	**0.166**	- 0.569	**0.056**	+ 0.466	**0.170**

The regression analysis which shows the fitted line plot and regression summary are as presented in Figure 4.31 and Table 4.15.

The coefficients in the regression equation for three speakers indicate a negative slope but this is not distinctly different from 0 at - 0.176 for the speaker EDEF, - 0.34 for OJEF and - 0.569 for MORM which show that for these three speakers, F_0 lowers at less than 1Hz. It is interesting to note that the slope of the regression line for the speaker AYIM is + 0.466 which shows an absence of a downward trend.

An utterance with thirteen syllables is considered in (4.20).

(4.20)

Bíbí	bírí	Méyíwá	némí	wá	néjúmá
Bíbí	CONJ	Méyíwá	can	come	PREP-tomorrow

'Bíbí and Méyíwá can come tomorrow.'

Fig.4.32 shows the pitch tracks of the all high toned sentence in example (4.20).

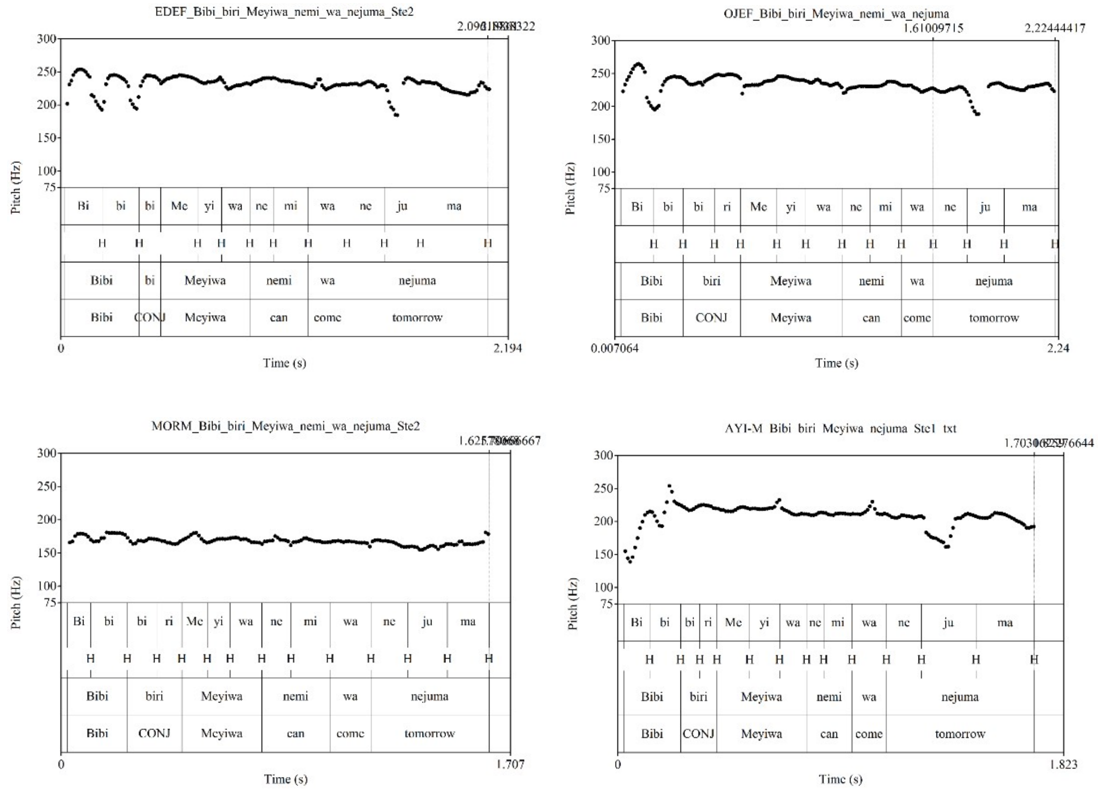


Fig.4.32. Pitch tracks of *Bíbí bírí Méyíwá némí wsá néjúmá* ‘Bíbí and Méyíwá can come tomorrow’

A gradual decline is noticed for all speakers and there is a difference between the F_0 of the initial H tone and that of the final H tone for all speakers. This slight F_0 decline can be ascribed to sentence length. Empirical facts drawn from our statistical analysis for H tones reveal that the amount of declination noticed is not significant in Iṣẹ̣kírì. The regression analysis shows that the slope is not significant (p= 0.135). Laniran, (2002) and Fajobi, (2005) report that sentences with H tones show some amount of declination for Yoruba, which varies with sentence length. While this study confirms a correlation between the amount of declination and sentence length, all facts (pitch tracks, graphs and p-value) show that H tones in Iṣẹ̣kírì do not have a significant amount of F_0 decline that can be attributed to declination.

Table 4.16. F_0 values and the differences between positions of four speakers for *Bíbí bírí Méyíwá némí wá néjúmá* 'Bíbí and Méyíwá can come tomorrow'

SPEAKERS:		EDEF		OJEF		MORM		AYIM	
		F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.
Syllable	Tone								
bi	H	252.36		254.49		179.04		215.13	
bi	H	248.17	4.19	249.53	18.96	180.47	-1.43	229.11	-13.98
bi	H	247.43	0.74	251.41	3.12	171.1	9.37	224.81	4.3
ri	H	-		248.86	-6.45	167.76	3.34	224.89	-0.08
me	H	247.86	-0.43	242.43	9.43	180.39	-12.63	221.83	3.06
yi	H	240.48	7.38	245.61	-6.18	171.18	-9.21	221.74	0.09
wa	H	241.99	-1.51	240.81	4.8	173.10	-1.92	217.31	4.43
ne	H	244.67	-2.68	239.63	10.18	175.04	-1.94	213.01	4.3
mi	H	242.87	1.8	240.86	-7.23	172.78	2.26	212.44	0.57
wa	H	242.02	0.85	236.09	5.77	168.19	4.59	212.17	0.27
ne	H	240.15	1.87	235.7	2.39	169.50	-1.31	209.34	2.83
ju	H	244.87	-4.72	240.66	-5.96	164.93	4.57	211.58	-2.24
ma	H	243.02	1.85	242.93	0.73	169.8	-4.87	206.44	5.14

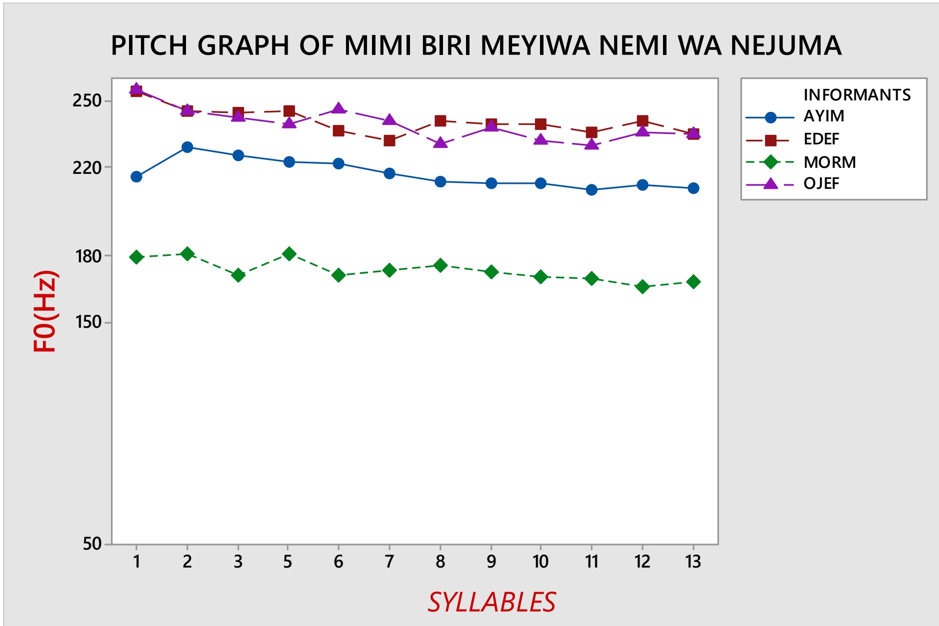


Fig.4.33. Pitch graph of *Bíbí bírí Méyíwá némí wá néjúmá* 'Bíbí and Méyíwá can come tomorrow'

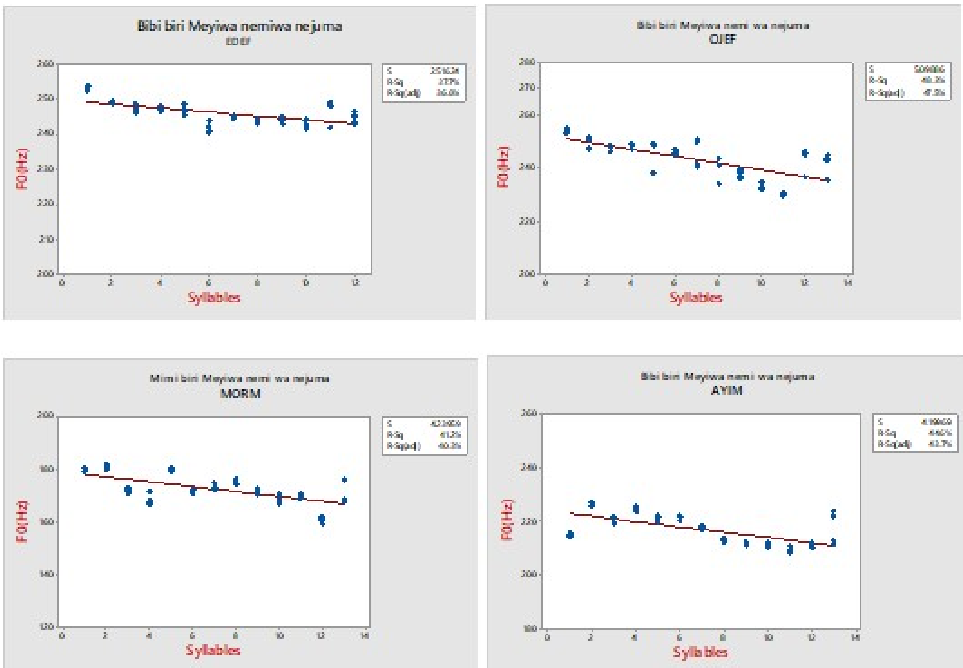


Fig.4.34. Fitted line plot for *Bíbí bírí Méyíwá némí wá néjúmá* 'Bíbí and Méyíwá can come tomorrow'

Table 4.17. Regression summary for *Bíbí bírí Méyíwá némí wá néjúmá* 'Bíbí and Méyíwá can come tomorrow'
Coefficients:

	EDEF		OJEF		MORM		AYIM	
Terms:	equation	p-value	equation	p-value	equation	p-value	equation	p-value
Constant	249.6	0.000	252.5	0.000	179.1	0.000	223.8	0.000
Y	- 0.5572	**0.057**	- 1.062	**0.063**	- 0.9347	**0.051**	0.9907	**0.003**

In all, sentences with H tones in Iṣẹ̀kírì cannot be said to utilize declination as a mechanism although there are slight downward drifts in longer utterances. An analysis of all the speakers taken together present a better fit regression model (R2 = 0.9) with a -0.6776 regression line slope (Appendix 3: Figure 3).

Mid tone sentences

Three sentences consisting of five, nine and fifteen M tones are selected for short, medium and long sentences. The sentences and their corresponding pitch tracks for four speakers are in examples 4.21-4.23 and Figures 4.35, 4.38 and 4.41.

(4.21)
Ọkọ mi rẹja
husband PRON buy-fish
'My husband bought fish'

The pitch tracks for Example (4.21) do not show a consistent trend. There is a gradual lowering of F_0 for the speaker MORM throughout the utterance but the other three speakers display a kind of fluctuation; an uptrend in the second and third syllables for EDEF and TORM. This fluctuation is not significant enough to affect the F_0 decline. The regression analysis for all speakers shows a downward slope.

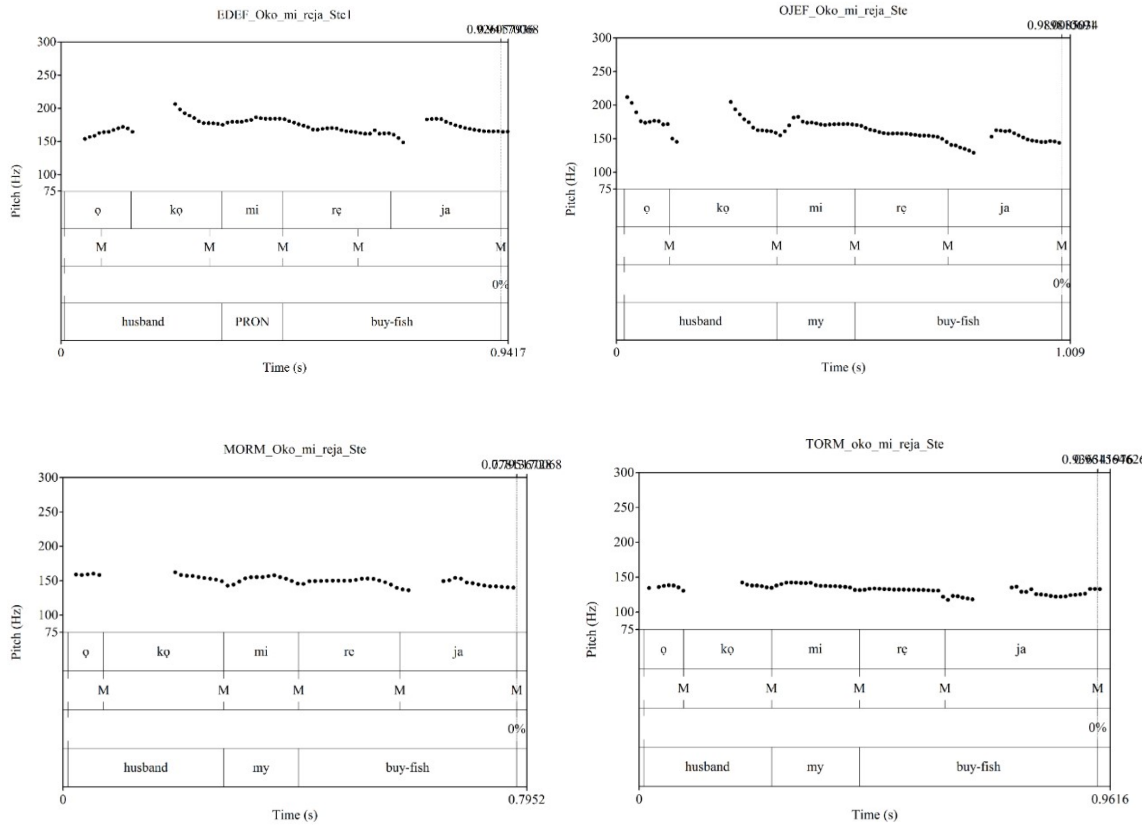


Fig.4.35. Pitch tracks of the all mid toned sentence *Ọkọ mi rẹja* ‘My husband bought fish’ for four speakers

Table 4.18. F_0 values and the differences between positions of four speakers for *Ọkọ mi rẹja* 'My husband bought fish'

SPEAKERS:		**EDEF**		**OJEF**		**MORM**		**TORM**	
		F_0 (Hz)	**Diff.**	**F_0 (Hz)**	**Diff.**	**F_0 (Hz)**	**Diff.**	**F_0 (Hz)**	**Diff.**
Syllable	**Tone**								
ọ	**M**	169.84		176.83		158.88		136.12	
kọ	**M**	177.16	-7.32	183.3	-6.47	155.24	3.64	137.61	-1.49
mi	**M**	180.03	-2.87	180.6	2.7	151.82	3.42	138.35	-0.74
re	**M**	166.57	13.46	170.06	10.54	149.01	2.81	131.57	6.84
ja	**M**	167.46	-0.89	162.67	7.39	144.41	4.6	125.64	5.93

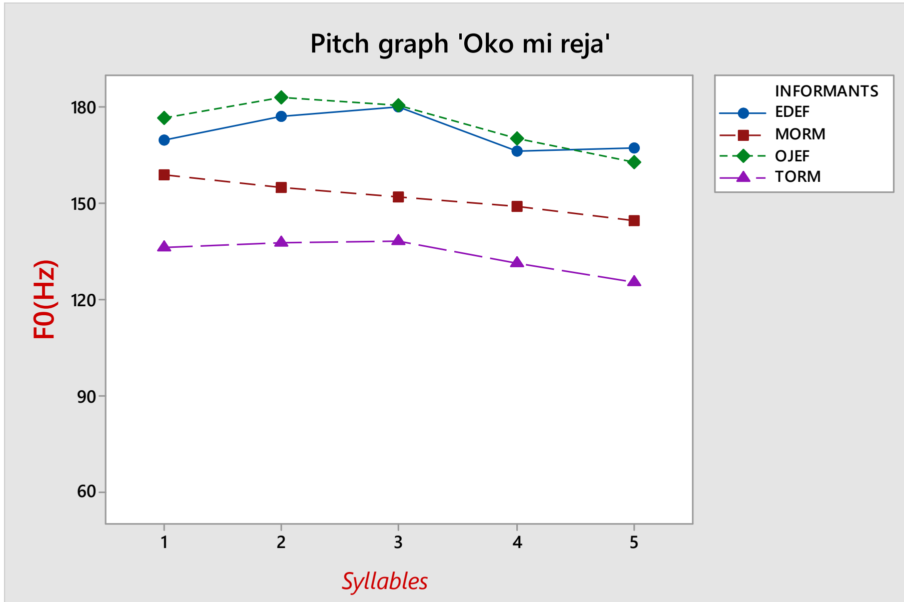


Fig. 4.36. Pitch graph of *Ọkọ mi rẹja* ‘My husband bought fish’

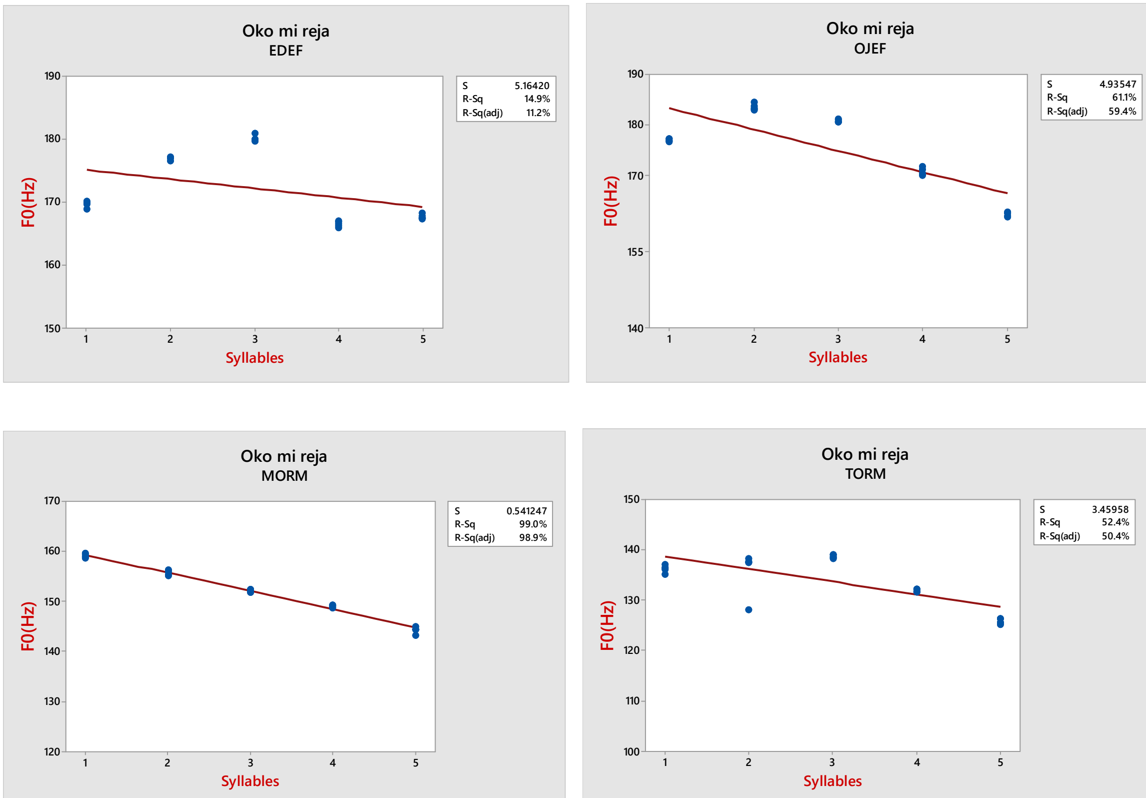


Fig. 4.37. Fitted line plot of *Ọkọ mi rẹja* ‘My husband bought fish’

Table 4.19. Regression summary for *Ọkọ mi rẹja* ‘My husband bought fish’

Coefficients:

	EDEF		OJEF		MORM		AYIM	
Terms:	equation	p-value	equation	p-value	equation	p-value	equation	p-value
Constant	176.6	0.000	187.5	0.000	163.0	0.000	141.1	0.000
Y	- 1.468	**0.056**	- 4.199	**0.001**	- 3.640	**0.001**	- 2.463	**0.003**

A negative slope is observed for all the speakers as F_0 is lowered by an average of 2Hz to as much as 4Hz. This indicates the presence of declination in this utterance.

Example (4.22) is a nine syllable sentence and its corresponding pitch tracks for four speakers are shown in Figure (4.38). F_0 values are presented in Table 4.20 and the derived graph and fitted line plots are in Figures (4.39) and (4.40).

(4.22)
Ọmọnọkẹrẹn tẹrẹ rẹja
Child-male Poss buy-fish
'Your son bought fish'

The pitch tracks for Example (4.22) show a consistent trend. There is a gradual lowering of F_0 for all the speakers but this is more noticeable for the speakers OJEF and MORM. The pitch tracks for EDEF and TORM show a slight F_0 decline. The pitch graph just like the pitch tracks show a lowering of F_0 for all the speakers and as earlier observed, for the speakers OJEF and MORM, this more evident.

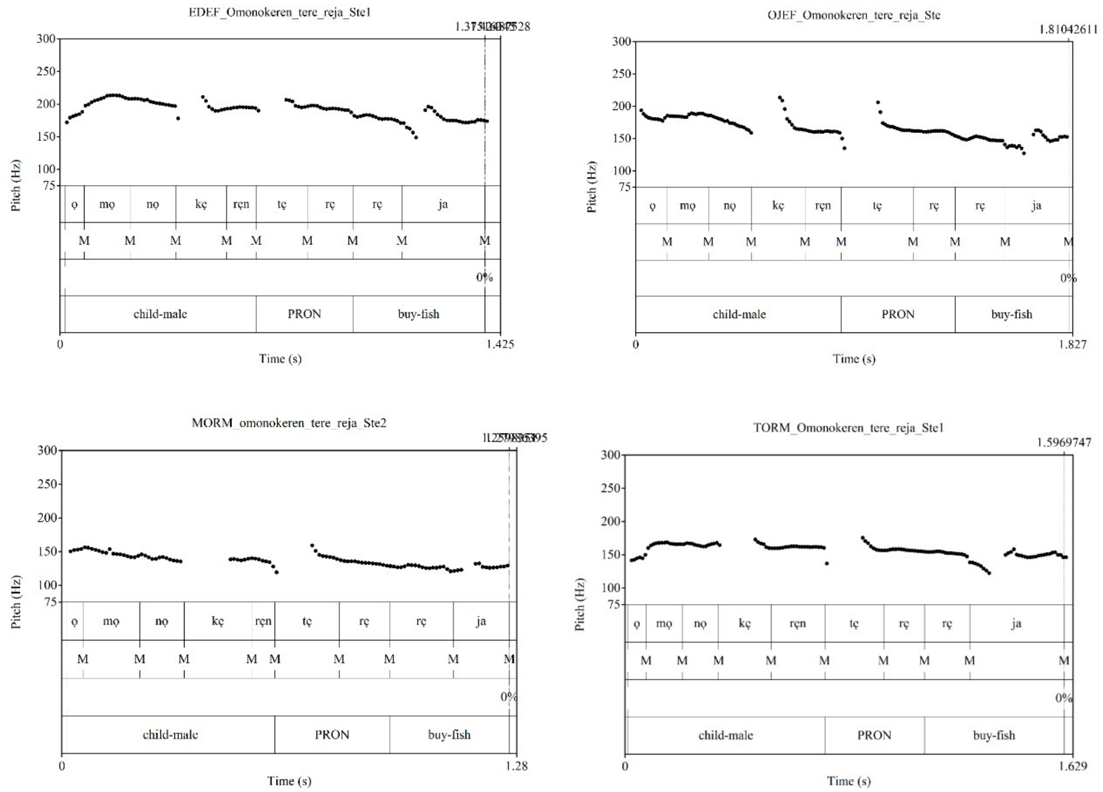


Fig.4.38. Pitch tracks of the all mid toned sentence *Ọmọnọkẹrẹn tẹrẹ rẹja* 'Your son bought fish'

Table 4.20. F_0 values and the differences between positions of four speakers for *Ọmọnọkẹrẹn tẹrẹ rẹja* ‘Your son buy fish’

SPEAKERS:		EDEF		OJEF		MORM		TORM	
		F_0 (Hz)	**Diff.**	**F_0 (Hz)**	**Diff.**	**F_0 (Hz)**	**Diff.**	**F_0 (Hz)**	**Diff.**
Syllable	**Tone**								
Ọ	**M**	181.73		182.78		152.38		144.78	
mọ	**M**	208.24	-26.51	186.02	-3.24	148.42	3.96	165.25	-20.47
nọ	**M**	203.14	5.1	174.46	11.56	139.92	8.5	165.32	-0.07
kẹ	**M**	193.92	9.22	163.61	10.85	138.34	1.58	161.29	4.07
rẹn	**M**	194.4	-0.48	160.68	2.93	135.51	2.83	161.40	-0.11
tẹ	**M**	196.4	-2	162.71	-2.03	139.7	-4.19	157.56	3.84
rẹ	**M**	192.32	4.08	160.6	2.11	133.38	6.32	156.83	0.73
rẹ	**M**	178.9	13.42	149.55	11.05	126.86	6.52	152.27	4.56
ja	**M**	174.87	4.03	147.19	2.36	126.8	0.06	145.31	6.96

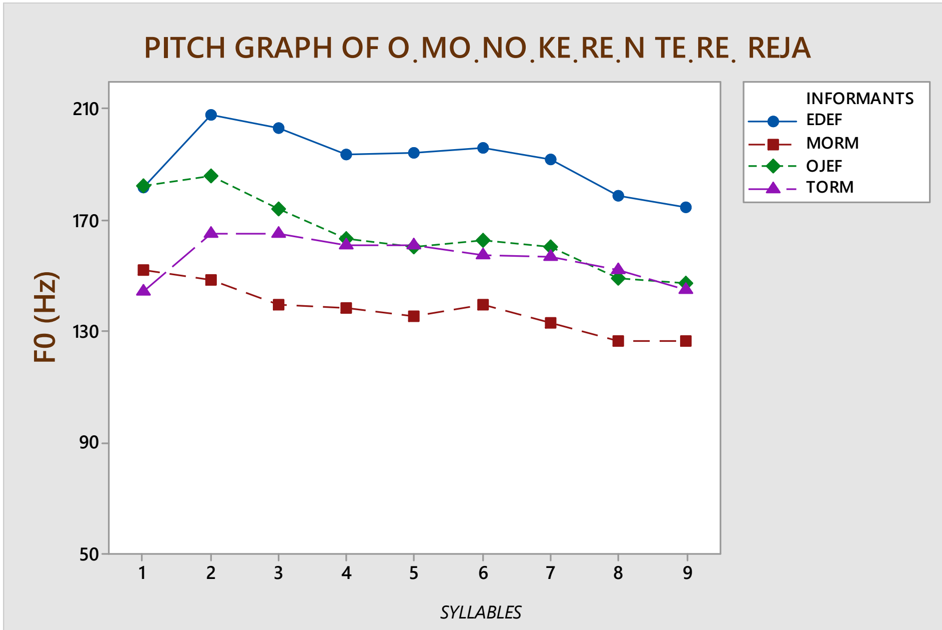


Fig. 4.39. Pitch graph *Ọmọnọkẹrẹn tẹrẹ rẹja* ‘Your son buy fish’

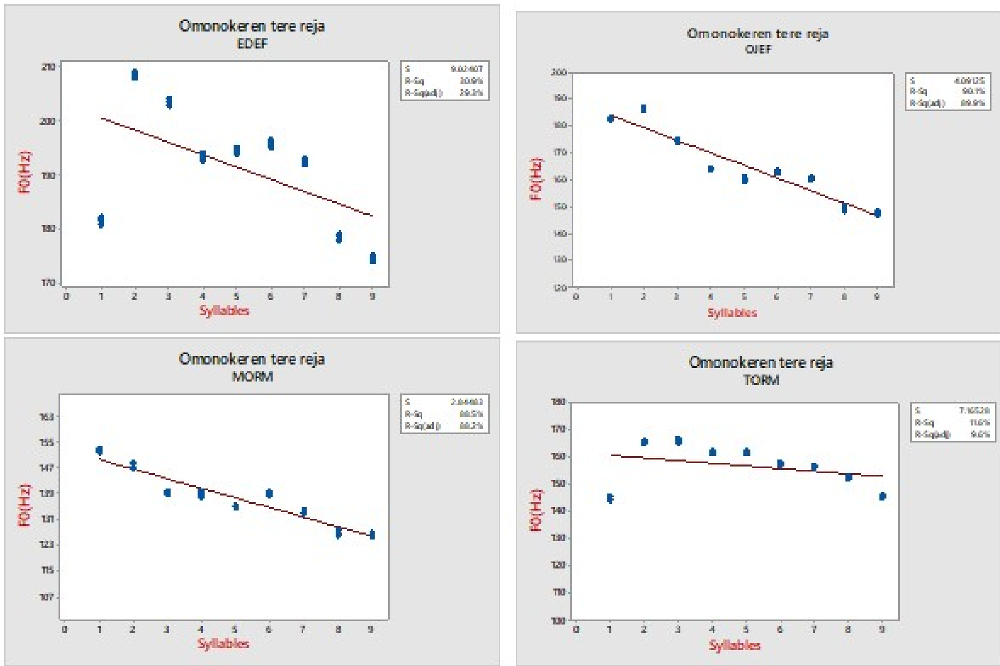


Fig. 4.40. Fitted line plot of *Ọmọnọkẹrẹn tẹrẹ rẹja* ‘Your son bought fish’

Table 4.21. Regression summary for *Ọmọnọkẹrẹn tẹrẹ rẹja* 'Your son bought fish'

Coefficients:

	EDEF		OJEF		MORM		TORM	
Terms:	equation	p-value	equation	p-value	equation	p-value	equation	p-value
Constant	202.9	0.000	188.8	0.000	152.6	0.000	161.7	0.000
Y	-2.283	**0.001**	-4.682	**0.000**	-2.983	**0.001**	-0.9848	**0.022**

The pitch tracks in Figure 4.38, the derived graph, F_0 values in Table 4.20 and fitted line plots all show a downward trend. The slope of the regression line for this utterance is negative as seen in the regression summary in Table 4.21.

(4.23)

Ọmọnọkẹrẹn ọmonobirẹn tẹrẹ sereja

Child-male child-female POSS pick-fish

'Your daughter's son picked fish.'

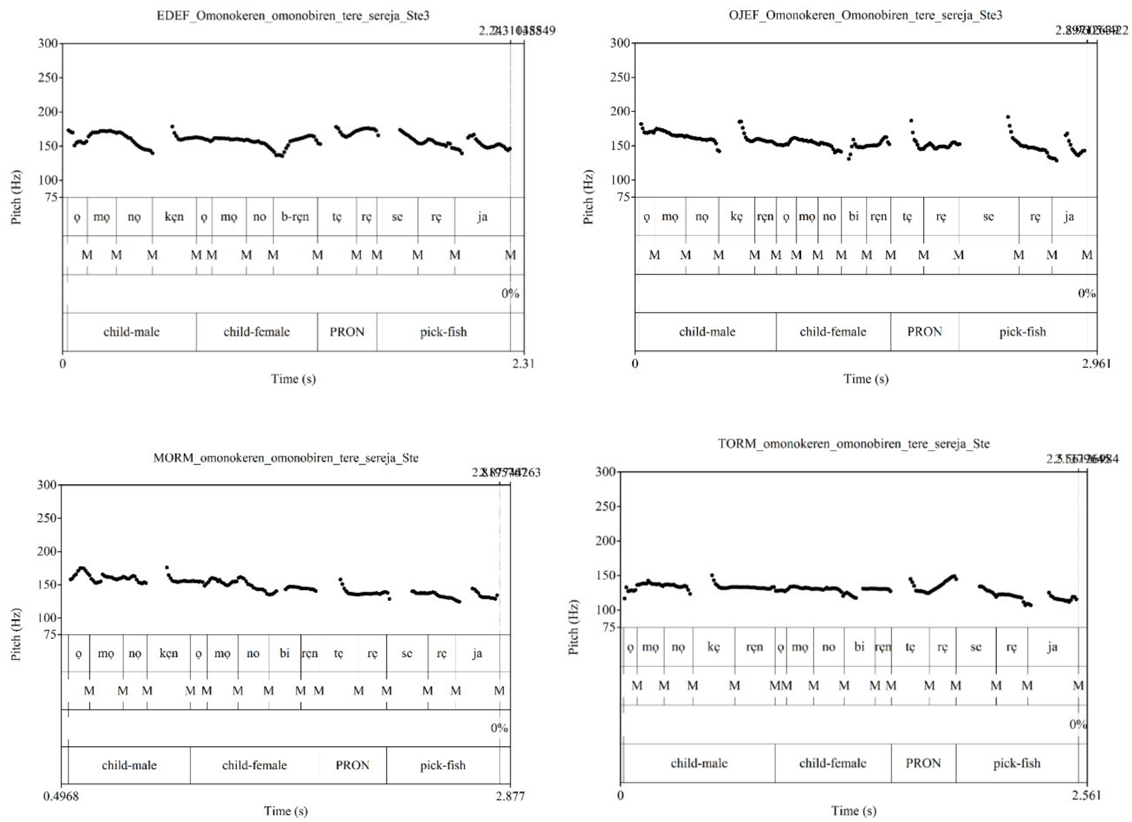


Fig.4.41. Pitch tracks of the all mid toned sentence *Ọmọnọkẹrẹn ọmonobirẹn tẹrẹ serẹja* 'Your daughter's son picked fish'

Table 4.22. F_0 values and the differences between positions of four speakers for *Ọmọnọkẹrẹn ọmonobirẹn tẹrẹ serẹja* 'Your daughter's son picked fish'

SPEAKERS:		EDEF		OJEF		MORM		TORM	
		F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.
Syllable	**Tone**								
Ọ	**M**	159.94		171.54		167.9		127.71	
mọ	**M**	170.03	-10.09	168.4	3.14	158.97	8.93	137.81	-10.1
nọ	**M**	155.84	14.19	159.05	9.35	157.66	1.31	134.08	3.73
kẹ	**M**	159.13	-3.29	157.94	1.11	157.81	-0.15	131.94	2.14
rẹn	**M**	161.37	-2.24	156.67	1.27	157.79	0.02	132.29	-0.45
ọ	**M**	160.34	1.03	154.42	2.25	153.94	3.85	128.1	4.29
mọ	**M**	160.25	0.09	157.02	-2.6	154.66	-0.72	132.28	-4.18
no	**M**	154.5	5.75	148.45	8.57	148.48	6.18	129.81	2.47
bi	**M**	156.03	-1.53	147.02	1.43	142.88	5.6	126.21	3.6
rẹn	**M**	158.63	-2.6	153.67	-6.65	143.43	-0.55	130.1	-3.89
tẹ	**M**	159.7	-1.07	147.64	6.03	140.96	2.47	127.23	2.87
rẹ	**M**	159.89	-0.19	148.97	-1.33	136.78	4.18	126.29	0.64
se	**M**	159.13	0.76	154.7	5.73	137.05	-0.27	126.84	-0.25
rẹ	**M**	153.92	5.21	144.9	9.8	133.06	3.99	119.28	7.55
ja	**M**	151.57	2.35	143.35	1.55	132.74	0.32	115.38	3.91

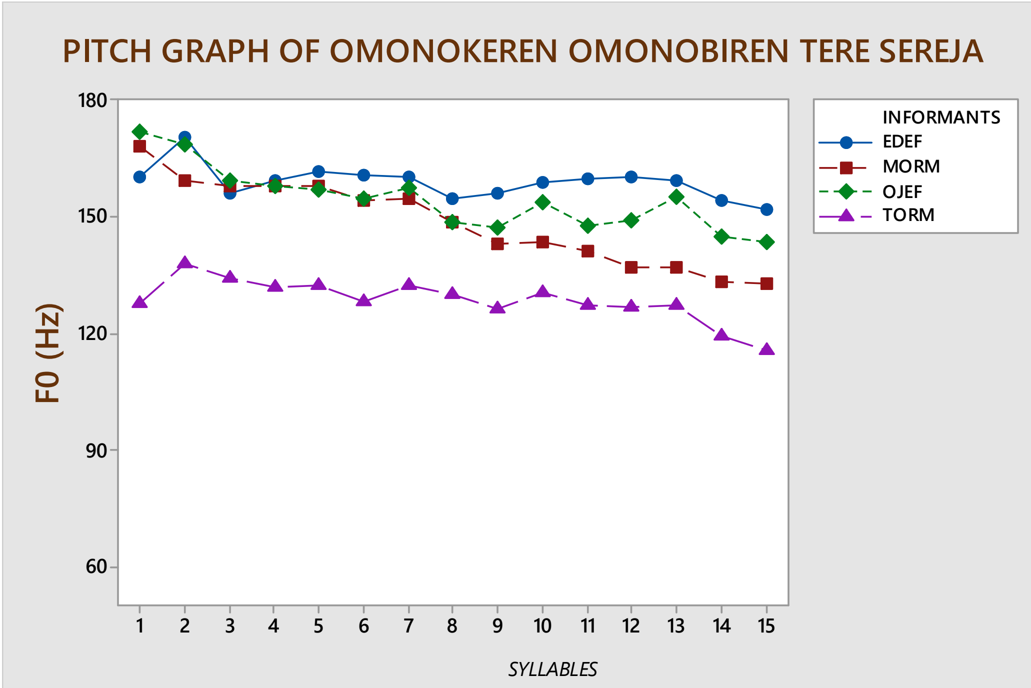


Fig. 4.42. Pitch graph of *Ọmọnọkẹrẹn ọmonobirẹn tẹrẹ serẹja* ‘Your daughter’s son picked fish’

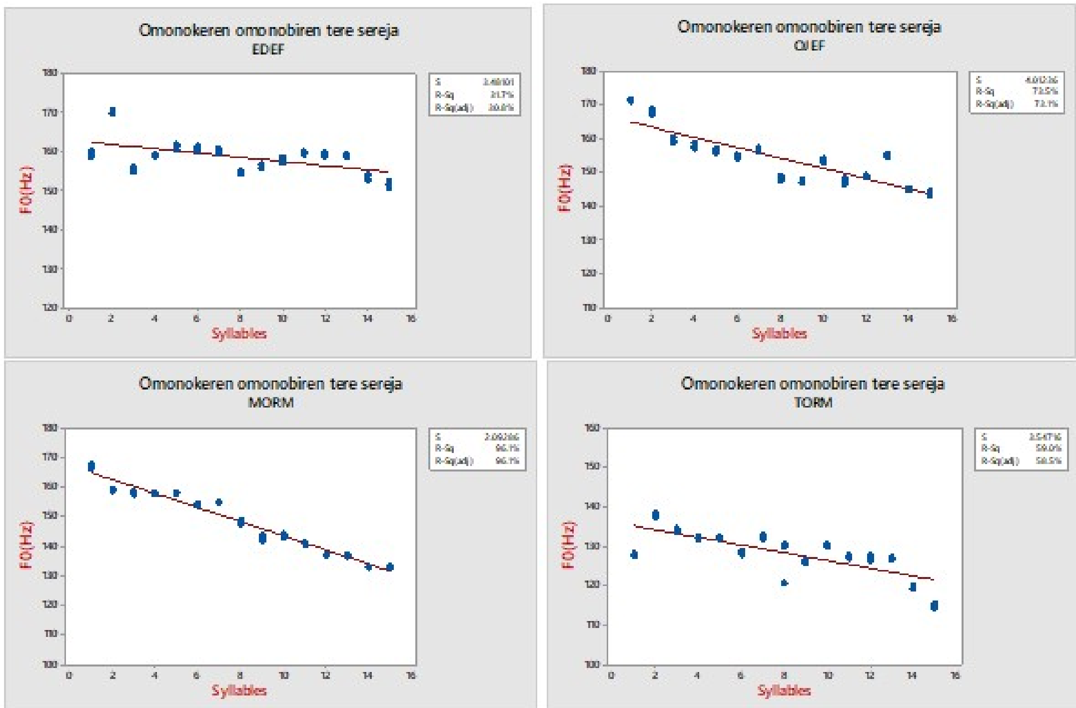


Fig. 4.43. Fitted line plot of *Ọmọnọkẹrẹn ọmonobirẹn tẹrẹ serẹja* ‘Your daughter’s son picked fish’

Table 4.23. Regression summary for *Ọmọnọkẹrẹn ọmonobirẹn tẹrẹ serẹja* 'Your daughter's son picked fish'

Coefficients:

	EDEF		OJEF		MORM		TORM	
Terms:	equation	p-value	equation	p-value	equation	p-value	equation	p-value
Constant	163.0	0.000	166.4	0.000	167.3	0.000	136.1	0.000
Y	-1.542	**0.001**	-3.526	**0.001**	-3.383	**0.000**	-2.9721	**0.000**

The pitch graph and outcome of the regression analysis reveal that the downward F_0 trend and the negative slope of the regression line is significant with a p-value of > 0.05 for all speakers. There is a remarkable difference between the F_0 of the initial M tone and the F_0 of the final M tone for all speakers. This is particularly noticeable for OJEF with a difference of 28.19Hz and as much as 35.16Hz for MORM. Declination is evidently identified as an F_0 mechanism that is utilized in this utterance.

The results from the analysis of M tones demonstrate that declination varies with sentence length. The F_0 mechanism at work for the downward trend of the pitch contour of sentences with a mid tone formation is declination.

Low tone sentences

Low tones have been shown to feature final lowering in Iṣẹkírì (Section 4.3.) and as a result, there is the possibility of the final lowering effect manifesting at the utterance level. It therefore becomes necessary to determine whether observed downtrends are evidence of declination or final lowering. To achieve this, we follow a previous attempt to separate a potential effect of final lowering from that of declination for Mambilla in Connell, (2017), where a regression analysis was conducted on the main part of an utterance and on the last one to two syllables of the same utterance. The sentences considered in this section range from six syllables to seventeen syllables in Examples (4.24), (4.25) and (4.26). Example (4.24) is illustrated in the graphs and tables in the following pages; Figures 4.44, 4.45 and 4.46a are representations of the pitch tracks, pitch graph and fitted line plot respectively while Tables 4. 24 and 4.25 show F_0 values and the differences between positions of the speakers, and the regression summary. The fitted line plots of the main part of Example (4.24) and the last syllable, are in Figures (4.46b &c) while the regression summaries are in Tables 4. 26 and 4.27.

(4.24)

Tòrìsẹ̀ gbàkpèrè.

Tòrìsẹ̀ take-basket

'Tòrìsẹ̀ take a basket'

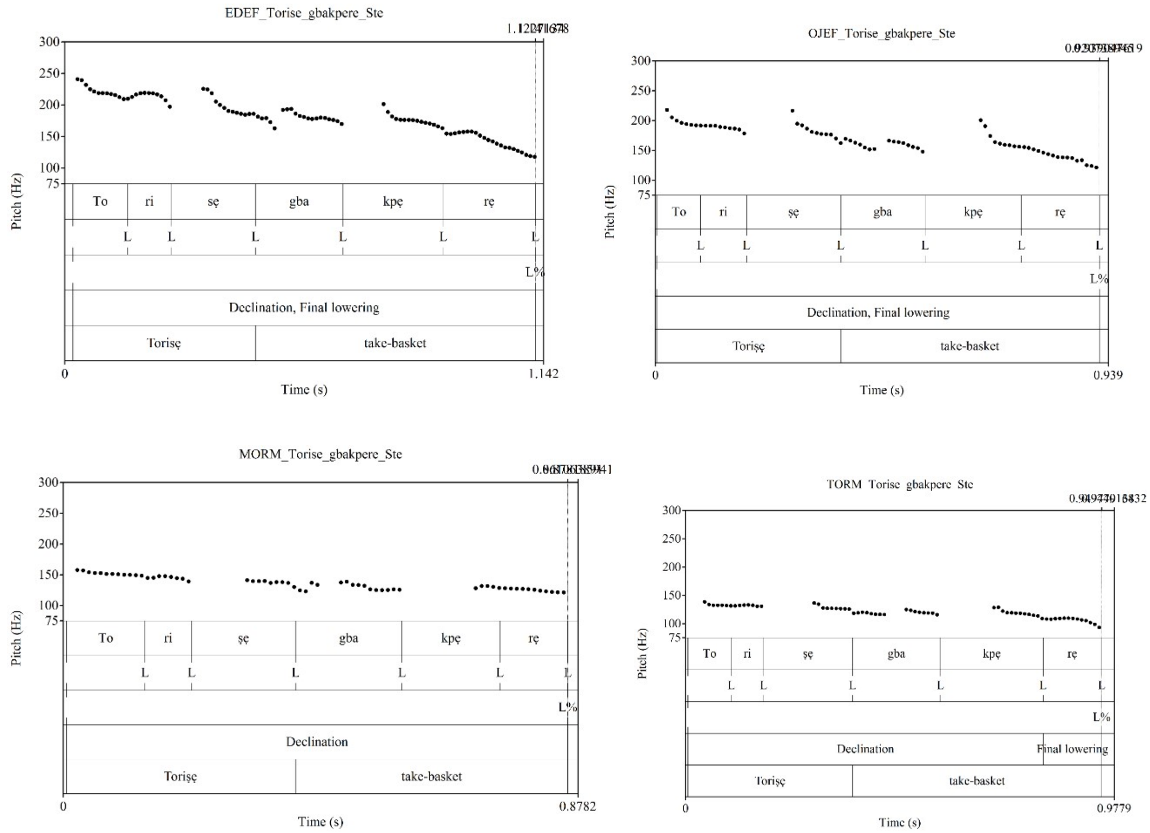


Fig.4.44. Pitch track of the all low toned sentence *Tòrìsẹ̀ gbàkpèrè* ‘Tòrìsẹ̀ take basket’

Table 4.24. F_0 values and the differences between positions of four speakers for *Tòrìsẹ̀ gbàkpèrè* 'Tòrìsẹ̀ take a basket'

SPEAKERS:		EDEF		OJEF		MORM		TORM	
		F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.
Syllable	**Tone**								
To	**L**	208.73		191.48		146.31		131.29	
ri	**L**	197.17	11.54	178.29	13.19	138.92	7.33	130.27	1.02
ṣẹ	**L**	183.94	13.23	162.55	15.74	128.68	10.24	120.25	10.02
gba	**L**	172.67	11.27	147.77	14.78	121.64	7.04	115.52	4.73
kpe	**L**	160.92	11.75	147.77	0	121.49	0.15	105.73	9.79
rẹ	**L**	117.51	43.41	121.32	26.45	110.18	10.31	92.98	12.79

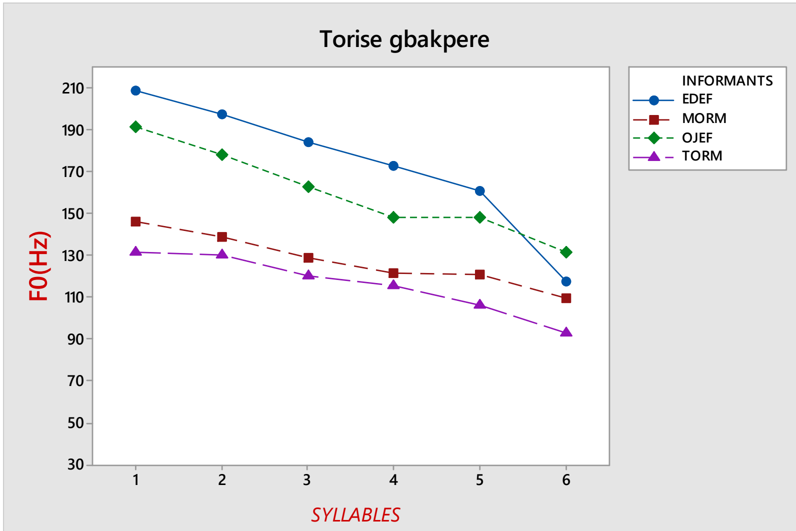


Fig.4.45. Pitch graph of the all low toned sentence *Tòrìsẹ̀ gbàkpèrè* ‘Tòrìsẹ̀ take a basket’

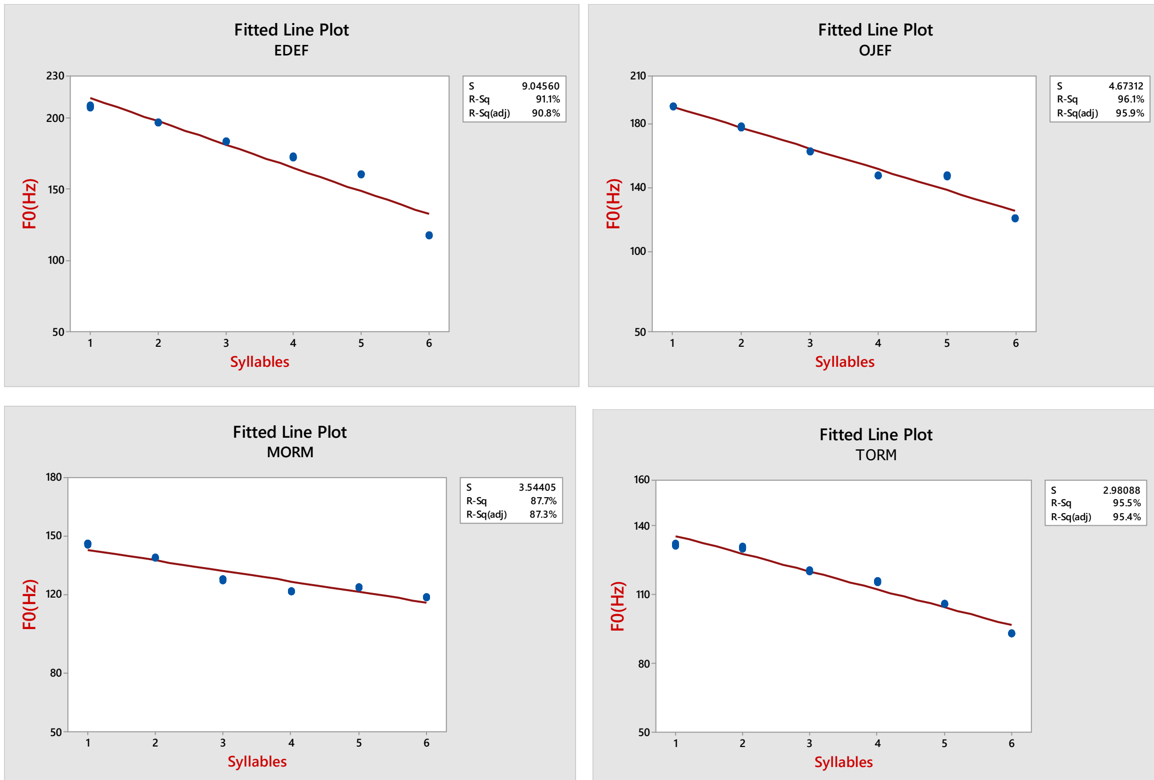


Fig.4.46a). Fitted line plot for *Tòrìsẹ̀ gbàkpèrè* ‘Tòrìsẹ̀ take a basket’

Table 4.25. Regression summary for *Tòrìṣẹ̀ gbàkpẹ̀rẹ̀* 'Tòrìṣẹ̀ take a basket'

Coefficients:

	EDEF		OJEF		MORM		TORM	
Terms:	equation	p-value	equation	p-value	equation	p-value	equation	p-value
Constant	231.0	0.000	203.8	0.000	148.4	0.000	143.5	0.000
Y	- 10.39	**0.000**	- 7.06	**0.000**	- 5.365	**0.003**	- 5.796	**0.000**

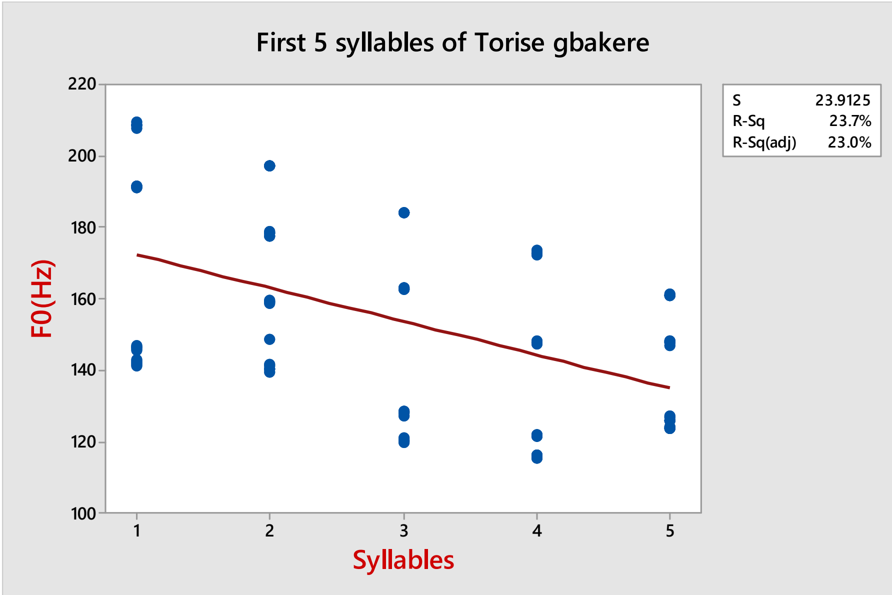


Fig.4.46b). Fitted line plot for the first part of *Tòrìsẹ̀ gbàkpèrè* 'Tòrìsẹ̀ take a basket'

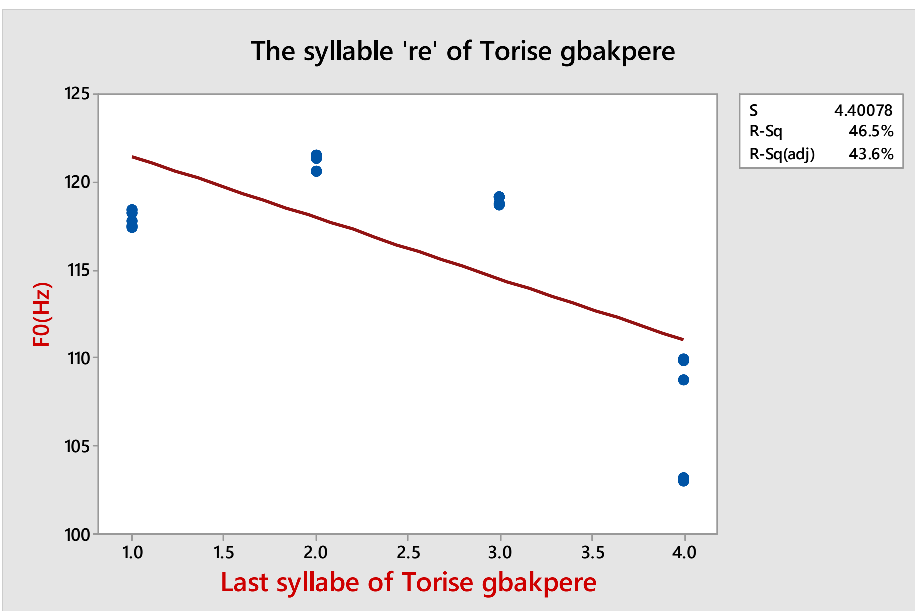


Fig.4.46c). Fitted line plot for the last syllable of *Tòrìsẹ̀ gbàkpèrè* 'Tòrìsẹ̀ take a basket'

Table 4.26. Regression summary for the first five syllables of *Tòrìṣẹ̀ gbàkpẹ̀rẹ̀* ‘Tòrìṣẹ̀ take a basket’

Coefficients:

Terms:	value	SE	T-value	p-value
(Intercept)	178.2	14.4	12.34	0.000
Y	-9.17	4.35	-2.11	**0.010**

Table 4.27. Regression summary for the last syllable of *Tòrìṣẹ̀ gbàkpẹ̀rẹ̀* ‘Tòrìṣẹ̀ take a basket’

Coefficients:

Terms:	value	SE	T-value	p-value
(Intercept)	125.0	2.41	51.84	0.000
Y	-3.485	0.880	-3.96	**0.001**

The pitch tracks of Figure 4.44 show a steady decline of pitch. This is true for all the speakers. The abrupt drop in the last syllable in the other speakers is not noticeable for MORM. Results of a regression analysis on the whole utterance, the first five syllables and the final syllable also comfirm a consistent drop in pitch. The slope for the whole utterance is significant with a p-value of >0.05. Also, the slope of the main part and final syllable of the utterance is significant with 0.010 and 0.001 p-values respectively. This shows that although the final lowering mechanism results in a steeper slope for the utterance, declination is also present.

The same procedure is carried out for the medium and long sentences in (4.25) and (4.26) with similar results showing that for the low toned sentences declination and final lowering feature irrespective of sentence length. The pitch tracks, graphs and regression analysis for (4.25) and (4.26) are illustrated in Appendix 4.

(4.25)

Tòrìsè gbàkpèrè bȍbò ròbọ̀n.
Tòrìsè take-basket some go-market
‘Tòrìsẹ̀ take some baskets to the market’

(4.26)

Tòrìsẹ̀ gbàkpèrè òkàn nọ̀kàn ròbòdò.
Tòrìsẹ̀ take-basket one only go-Obodo
‘Tòrìsẹ̀ take only one basket to Obodo’

The like tone sequences examined show the absence of declination in H tone sentences in both the short, medium and long sentences. In the long sentence, there appears to be a decline in F_0 which statistical analysis show is not significant. One cannot rule out the possible effect of segmental interference although the study tried to mitigate this as much as possible. Evidence for declination is most evident in the Low tone sentences and in the all-Mid tone sentences. A summary of the investigation of declination is given in Table 4.28.

Table 4.28. Declination in H, M and L tones utterances

Mechanism:	**DECLINATION**		
Sentence length:	**Short**	**Medium**	**Long**
Tone			
H	x	x	x
M	√	√	√
L	√	√	√

Different treatments appear to be given to the different tone types and this is not perculiar to the language of study. Connell (2017) reports for Mambilla, a four-tone language that the high tone, which is Tone 1, is subject to little in the way of downtrends, while tone 4, the low tone, consistently shows some form of downtrend. The same is reported for Yoruba, a three tone language (Connell and Ladd, 1990; Laniran, 1992; Fajobi, 2005). The explanation offered in Connell (2017:146-147) is that the low tones have more tendency of declination "presumably because there is no lower tone whose space it would be violating" while the High tones do not show down- trends consistently "because they would risk impinging on the space of the lower tone(s)". While this explanation seems plausible, when the rate of declination for each tone type is considered; very slight amount of F_0 declination in H tone sequences, which is negligible, some form of a decline in F_0 which is reasonably significant in M tone sequence, as though not wanting to invade the tonal space of L tones and considerable declination in L tone sequences. There however is the need for an alternative explanation because the L tone sentences of some languages have been reported to show no form of declination (Egbokhare, 1990 for Emai). This alternative explanation would follow the view in Hyman, (1975) that the more lexical tones in the tonal space of a language, the less likely would be the effect of declination. One fact the results from this study has revealed is that declination is controlled by linguistic variables and is asynchrounous with time as longer sentences show more F_0 declination.

4.3.1.2 Downdrift and downstep in Iṣẹkírì

A distinction is often made in the literature between downdrift, also called automatic downstep, which is caused by a specific surface phonological tone and downstep or non automatic downstep; a lowering caused by a floating tone. In this study, we stick to the terms downdrift and downstep. Downdrift is a phonetic lowering triggered by a surface L tone such that in a sequence of H tones with intervening L tones, the H tone following the low tone is lower than the preceding High tone (Connell & Ladd, 1990; Egbokhare, 1990; Omozuwa, 2010; Yip, 2002; Laniran, 2002; Laniran and Clements, 2003; Gussenhoven, 2004). The lowering is predictable from the context. Downstep is lowering that is triggered by a floating or delinked tone. To consider downdrift and downstep as possible

F_0 mechanisms in the realization of F_0 contours, data from unlike tone sequences are examined in section 4.3.1.2.1.

4.3.1.2.1 Unlike tone sequences in simple declaratives

Mixed tone sentences are considered in this section to examine the realization of F_0 contours of simple sentences. Most of the sentences considered here are extracts from narratives. This makes it difficult to have particular tone sequences. Possible F_0 mechanisms such as downdrift is examined here. Illustrative examples are in (4.27) – (4.29).

(4.27)

ɔ̀kã̀nɔ̀kã̀   ww   mú rùljɛ́kɔ́
one-one   PRON take go-PREP-school
‘He took only one to school’

(4.28)

ēdʒí rɔ̀   nónúwé
rain soft   PREP-today
‘It rained today’

(4.29)

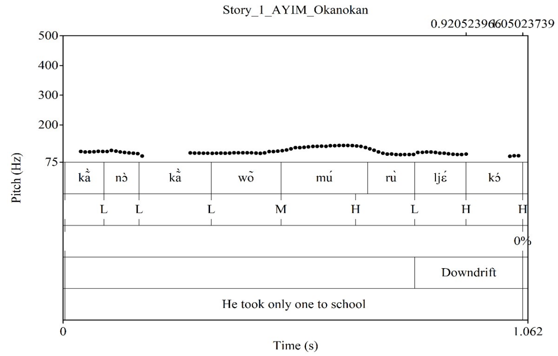
ɛ̄dɛ́mā wé   dĩ̄   ʃúwɛ̀
Man   DET deaf DET-place
‘The man kept quiet there’

The pitch contour in Figure (4.47) shows downdrift on the H tone of the penultimate syllable *ljɛ́.* The F_0 value of the first H toned syllable is 131.09 Hz on *mu* and that on the second H toned syllable is 108.69 Hz revealing an F_0 decline conditioned by a preceding L tone. The effect of downdrift on H2 tone sets a ceiling for the following H tone which is the final syllable *kɔ́*. This is also noticed in Figure (4.48) where downdrift on the third H tone is conditioned by a preceding L tone and the effect of downdrift on third H tone sets a ceiling for the following H tones revealing a global effect.

The pitch contours in Figures (4.47) and (4.48) show that the interaction of tones determines pitch contours in declaratives. The examples taken thus far exemplifies sequences of H and L tones such that the effect of downdrift can be seen on the H tone in both transitive and intransitive sentences. It is noteworthy to mention that, there is an absence of M and L tone sequences in our data. That is, sequences M and L tones abutting in utterances, for us to determine if the L tone downdrifts M tones were not found. This is not surprising considering the limited tone patterns identified in the language. This was also noticed in Iṣẹ̣kírì lexical items as mentioned in section 4.1.1.1.2. In order to determine if M tones downdrifts, sequences of M and L were purposely put together as exemplified in Example 4.30 and Figure 4.49.

Example 4.30

Omaja mi yan
Child-town PRON suck
'The child of my town suck'



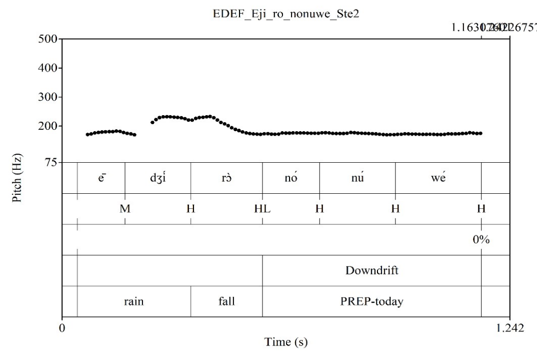


Fig. 4.47. Pitch track of *Òkànòkàn won mú rùliékọ́* 'He took only one to school' **Fig. 4.48.** Pitch track of Ejí rr nónúwé 'It rained today' for EDEF

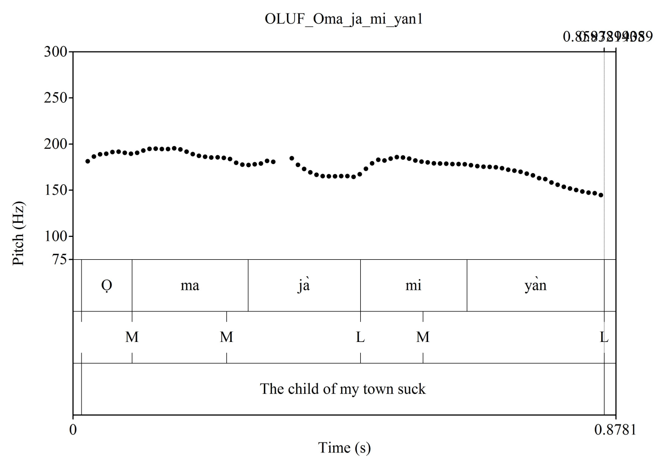


Fig. 4.49. Pitch track of *Omaja mi yan* 'The child of my town suck'

The pitch track of this utterance shows that the intervening L tone between the second and the third M tones does not downdrift the third M tone. The M tones are realized on the same pitch register with the mean F_0 values of 188.52Hz, 188.71Hz and 184.5Hz respectively. The F_0 contours of simple sentences with mixed tones, from our examples and acoustic diagrams, show that they are marked with the zero boundary tone. Downdrift operates depending on the sequences of tones.

4.3.1.2.2 Unlike tone sequences in complex declaratives

Complex structures in this study consist of matrix clauses with embedded structures connected by complementizers or conjunctions. The complementizer sentences in (4.31) and (4.32) are illustrated in Figures (4.50) and (4.51) for two male speakers. Sentences in the examples here are presented in two forms; the way they appear in slow speech and the way they are said in the stories from which they were extracted (after phonological processes like deletion and assimilation).

(4.31)

Ó kà dá íra ti ó gbá a mú orígho gbẹ́ aghan ọ̀kàn ọ̀kàn
Ó kà díra tó gbá mórígho gbághan ọ̀kọ̀nkàn
3SG now set-time that BE give head PREP PRON one-one
‘He set a time that he will give a head to each of them.’

(4.32)

O gbá dẹ̀ gín gbẹ́ ẹ̀ keé gí gín ugbá wé tuwo gbé gbá rè wé máà ṣí won
O gbá dẹ̀ gín gbẹ́ ké gí gín ugbá wé two gbé gbá
3SG now say PREP.PRON that calabash DET COMP.PRON carry ASP
rè wé mâ ṣí won
go DET PRON.NEG open PRON.EPH
'He told him that he should not open the calabash he was carrying.'

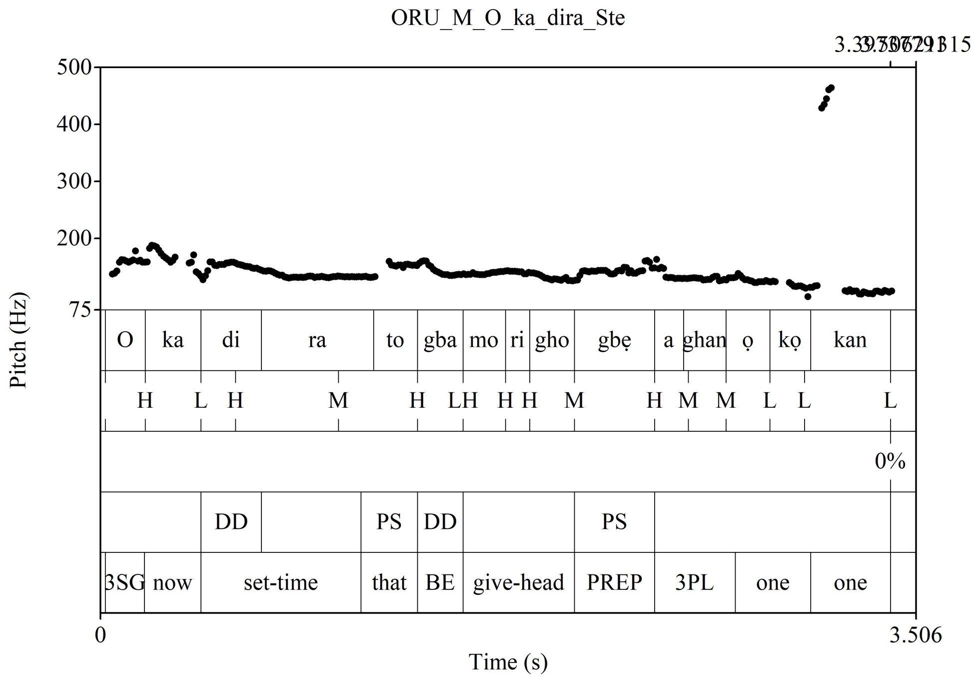


Fig.4.50. Pitch track of Ó kà díra tó gbá mórígho gbẹ́ aghan ọ̀kọ̀nkàn 'He set a time that he will give a head to each of them.'

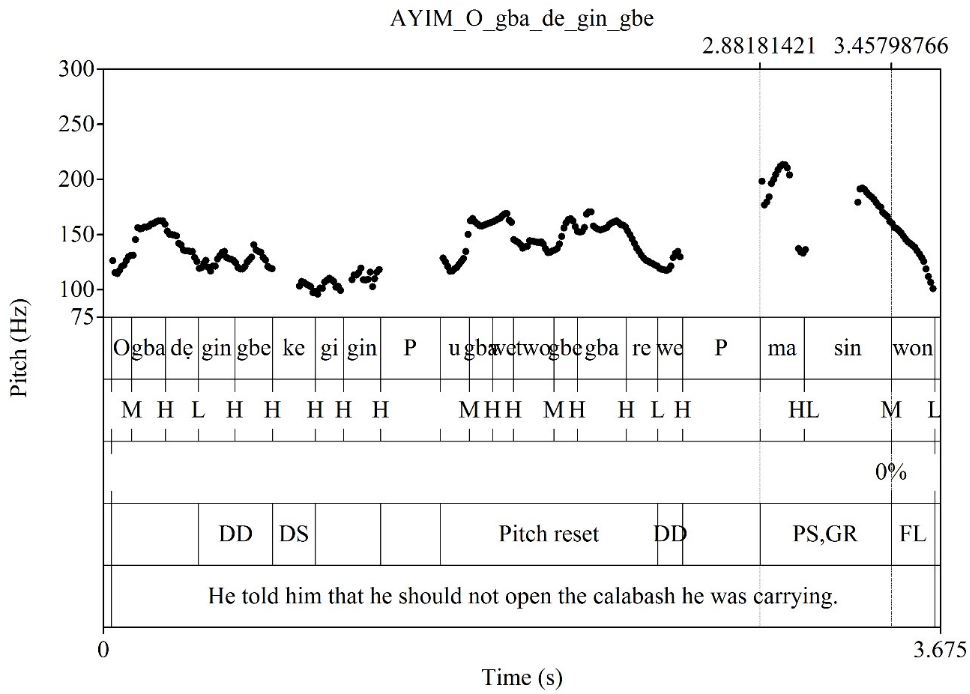


Fig.4.51. Pitch track of *O gbá dẹ gín gbẹ́ ké gígín ugbá wé two gbé gbá rè wé mâ ṣí won* 'He told him that he should not open the calabash he was carrying.'

Figure 4.50 shows downdrift on the second H tone, this is followed by pitch reset seen in the F_0 of the third H tone which increases from 150.64Hz of the second H toned syllable to 160.23Hz. The presence of a L tone before H4 downdrifts this tone and a ceiling is maintained on to the sixth H tone. Pitch reset is again observed on H7 which starts at a higher F_0. Pitch resets at boundary junctions. Pitch reset signals phrasing as "…resetting of the baseline can be simulated between two phrases, even in the absence of a pause. The resetting is used as a boundary marker, and the degree of resetting indicates the importance of the boundary" (Vaissière, 1983:57).

In Figure 4.51, there is a pause after the complimentizer *gin* 'that', which is followed by pitch reset seen in the F_0 of the first H tone in the embedded clause which rises from 119.73Hz of the last H tone of the matrix clause to 164.29Hz. The embedded clause for both speakers in Figs. 4.50 and 4.51 begin at a higher F_0 than the last H tone of the matrix clause. Pauses are universal cues of prosodic phrasing which occur at major syntactic boundaries (Genzel, 2013). The reset value for the H tone at the boundary in Figure 4.51 is higher than that of the preceding H tone, but not as high as that of the initial H in the sentence which has a value of 184.74Hz. The same process of downdrift and pitch reset observed in Figure 4.50 is also noticed in Figure 4.51. An additional phonetic effect of Global Raising referred to as GR in the annotation is noticed for AYIM. Global Raising is when the tones are raised above the level at which they would appear (Egbokhare, 1990; Inkelas and Leben, 1990). The pause, pitch resets and Global Raising observed suggest the effects of phrasing. The complex structure can be said to have more than one intonational phrase all marked by a zero boundary tone just like the simple statement. Note however the final lowering in the last syllable for AYIM which is as a result of the emphasis on the pronoun *won*. It is interesting to observe that these effects are seen even when the embedded structure comes before the matrix illustrated in Figure 4.52.

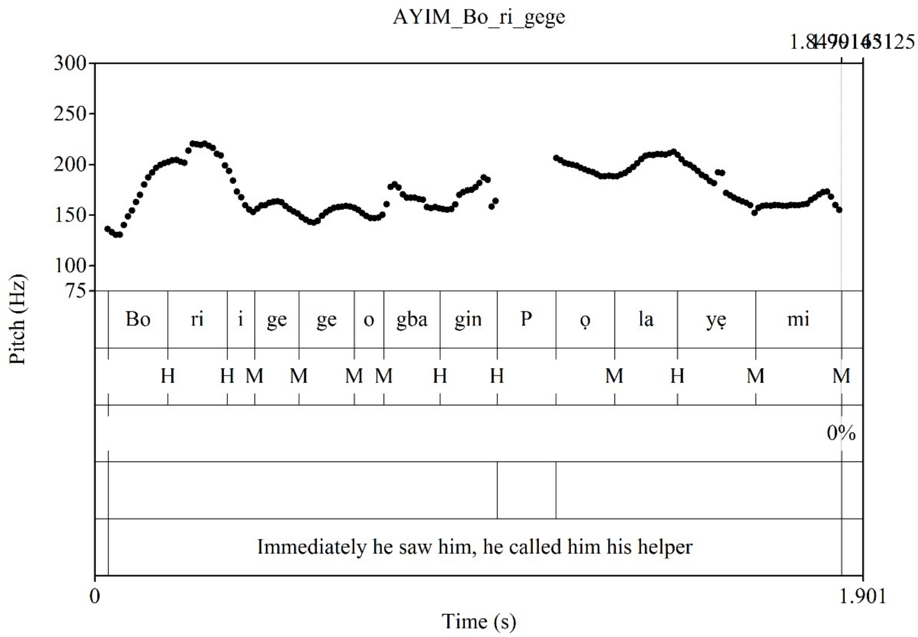


Fig.4.52. Pitch track of Bó rí i gege O gbá gín, ọláyẹmi 'Immediately he saw him, he called him his helper'

(4.33)

Bí o rí i gege O gbá gín, ọláyẹmi
Bó rí i gege O gbá gín, ọláyẹmi
PRON see PRON ADV PRON ASP say PRON help
'Immediately he saw him, he called him his helper'

The embedded clause comes before the matrix clause in Example 4.33 and Fig.4.52. The same effects of a pause after the complimentizer *gin* which is followed by pitch reset is observed. Inkelas and Leben (1990) offer evidence of intonational phrases in Hausa on the basis of a number of phonological and phonetic effects which are prosodic constituents that appear to be constrained by the syntax of the language. The syntax-based prosodic constituent account pursued in Inkelas and Leben (1990) and Kugler (2017) following Selkirk's proposal appear applicable for Iṣẹkírì. The language is an SVO language with the basic syntactic structure as illustrated in (4.34).

(4.34)

a) Ẹdẹ́ma wé jẹ ọ̀jẹ̀
man the eat.PRS food
'The man eats food'

a) [$_{\text{IP}}$ Ẹdẹ́ma wé [$_{\text{VP}}$jẹ ọ̀jẹ̀]]

The syntactic structure for (4.31) is given in (4.35)

(4.35)

[$_{\text{IP}}$O ka dira [$_{\text{CP}}$to gba morigho [$_{\text{PP}}$gbẹ aghan ọkanokan]]]

The syntactic structure in (4.35) tends to correspond with the prosodic structure as each syntactic category can be equated with an intonational phrase. The first intonational phrase corresponds to the matrix sentence *O ka dira* 'He set a time' which ends before the pitch reset. The second phrase marked by the pitch reset before the complementizer *to* corresponds to the CP *to gba morigho* 'that he will give a head', and the third intonational phrase marked by a pitch reset corresponds to the PP *gbẹ aghan ọkanokan* 'to each of them.'

We now consider the data in Example (4.32) reproduced below where both downdrift and downstep manifest.

Example (4.36)

O gbá dẹ̀ gín gbẹ́ ẹ̀ keé gí gín ugbá wé tuwo gbé gbá rè wé máà ṣí won

ō g͡bá dɛ́ gĩ́ g͡bɛ́ !ké gí gĩ́ ūg͡bá wé twō g͡bé g͡bá

3SG now say PREP.PRON that calabash DET COMP.PRON carry ASP

rè wé mâ ʃĩ́ wɔ̃̄

go DET PRON.NEG open PRON.EPH

'He told him that he should not open the calabash he was carrying.'

Downdrift and downstep manifest in this utterance. An examination of all high tones in the following table, show that the decline in F_0 value in the second and last H tones is the effect of a surface L tone in the utterance. This is not the case concerning the fourth H tone !ke where there is no specific surface phonological tone triggering the downstepped high tone. The downstepped H tone in !ke can be traced to a deleted low toned vowel ɛ̀.

Table 4.29. F_0 values of syllables with H tones

Syllable	F_0 values of H tones in (Hz)
g͡ba	162.66
gĩ	134.89
g͡bɛ	140.79
!ke	118.76
gi	110.07
gĩ	119.73
g͡ba	164.29
we	169.42
g͡bɛ	164.15
g͡ba	162.3
we	134.74

Vowel elision leads to the deletion of a low toned vowel and its effect is observed in the derivation of downstep in Iṣẹkírì. The degree of lowering of downdrift and downstep are quite close as the lowering intervals between the downstepped H and the effect of downdrift on the Hs are approximately 32Hz in this example. Downstep can therefore be traced to a deleted low tone while downdrift results from a surface phonological low tone.

4.3.1.3 Final lowering, L%, and Question intonation

A sudden drop in F_0 is referred to as final lowering. It is an abrupt lowering at the end of an utterance. Final lowering is evident as both a lexical and post lexical phenomenon in Iṣẹkírì. The abrupt drop in syllable final low tones points to this as seen the illustration in section 4.2.1.3. At the phrasal level, it is a principal F_0 mechanism that accounts for the pitch contour of interrogatives, most especially the YNQs. An examination of the pitch tracks of all the speakers under investigation manifests this mechanism which points to the fact that it is an active mechanism employed by the language for a determination of F_0 question contour.

The intonation of question has cross-linguistically been said to be characterized by a rising intonation (Bolinger,1978). While many African languages manifest this feature which is referred to as high- pitched markers in Rialland, (2007), the contrary is seen in some African languages (Konni in Cahill, 2017; Akan, Genzel, 2013, Kugler, 2017; Bemba, Kula and Hamann, 2017). Question intonation, most especially the Yes/no question, in Iṣẹkírì has some interesting features of a consistent effect of pitch raising and a final fall in pitch which is contrary to cross-linguistic expectations. The two main question types examined in this study are the Yes/no question and the Wh or constituent questions.

4.3.1.3.1 Yes/no question

Yes/no questions (YNQ) consist of interrogative compositions where the expected response is limited to either a ‘yes’ or a ‘no’. Yes/no questions can be categorized into Yes/no questions with particles and Yes/no questions without particles. YNQ with particles usually have a question word with an expected 'yes' or a 'no' answer. Yes/no questions without particles have the syntactic structure of a statement and are also referred to as polar or declarative questions. YNQ in a language may be marked morphologically, syntactically, intonationally, or by combining these mechanisms (Byrd, 1992). The question status of the Yes/no expression in Iṣẹkíri is usually conveyed by prosodic cues. Yes/no questions with particles is identified with the particle *di* 'should'. The features of YNQs in Iṣẹkíri are determined through a quantitative experimental investigation in this section. In Iṣẹkíri, polar questions do not differ from their declarative counterparts in their morphology or word order. An instrumental investigation of YNQs in Iṣẹkírì readily reveals both local and global effects on F_0 pattern of sentences. The data set in (4.37), (4.38) and (4.40) presents YNQ utterances and their corresponding declaratives (in some instances) for an investigation of the intonation mechanisms at work in Yes/No question.

(4.37)

a. Tuọ́kpẹ́ wúlí gbá rúwé.
Tuọ́kpẹ́ PREP-house ASP read-book
'Tuọ́kpẹ́ is reading at home.'

b. Tuọ́kpẹ́ wúlí gbá rúwé?
Tuọ́kpẹ́ PREP-house ASP readbook
'Is Tuọ́kpẹ́ reading at home?'

Figure 4.53 presents the pitch tracks of both YNQ and statement intonation for the speaker EDEF to highlight the differences between the pitch track of YNQ and its corresponding declarative. An inspection of the pitch tracks shows that the high-toned YNQ utterance is marked by several cues. These cues include, an initial pitch raising, a lengthening of the final syllable and a final fall. Each of these will be examined in the following paragraphs.

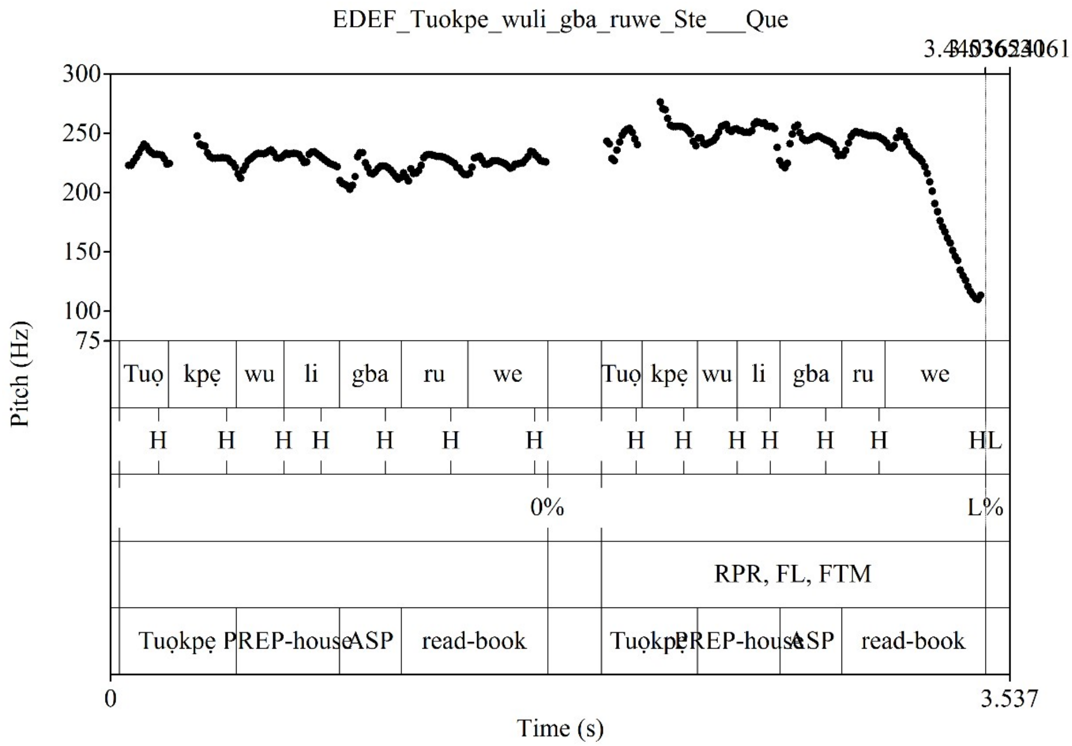


Fig. 4.53. Pitch graph of high-toned utterance of a declarative and YNQ for EDEF

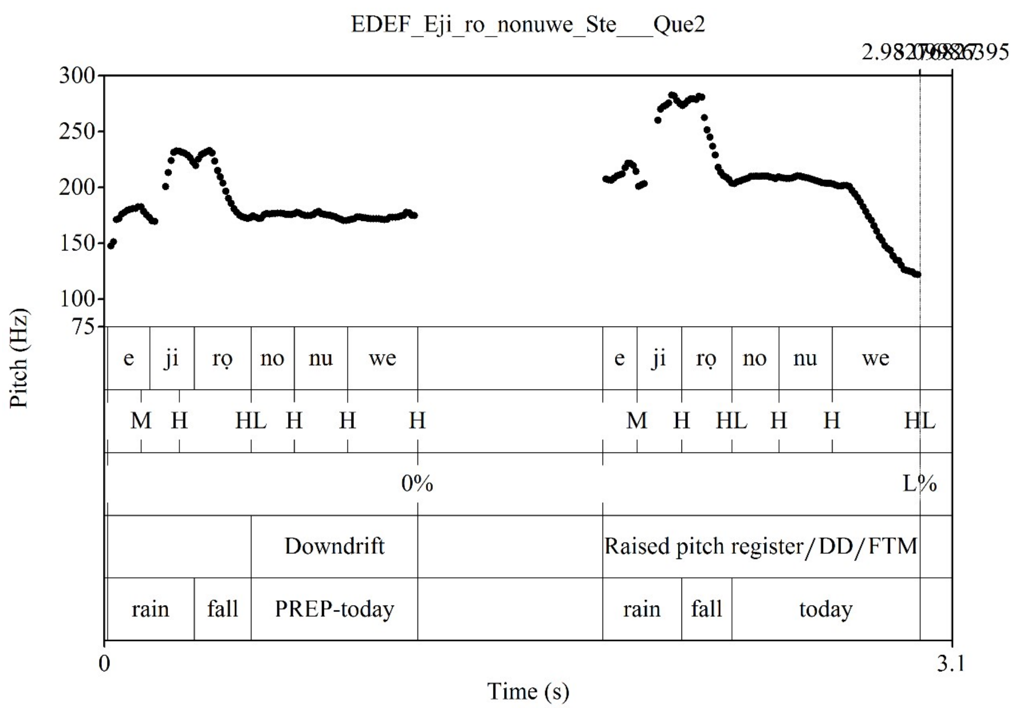


Fig. 4.54. Pitch graph of mixed-tone utterance of a declarative and YNQ for EDEF

In Figure 4.53, it is clear that the differences in the tonal contours of the declarative and the YNQ are due to intonation. The initial F_0 is higher for YNQ than the statement. This is observed for all the speakers. We can therefore say that F_0 patterns differentiates sentence types in Iṣẹkírì.

Further illustrative example of YNQs with other tonal formation is in Figures 4.54.

(4.38)

(a) Ejí	rò	nónúwé	(b) Ejí	rò	nónúwé?
rain	soft	PREP-today	rain	soft	PREP-today
'It rained today'			'Did it rain today'		

An examination of the pitch contour in Figure 4.54 shows that downdrift is not suspended in YNQs in Iṣẹkírì. The partial or total suspension of downdrift differentiates the statement and question intonation in many languages. This is not the case in Iṣẹkírì, the downdrift mechanism operates irrespective of the intonation pattern. In spite of the raised pitch register, there is a modification of the tone of the final syllable which is attributable to the final lowering effect. The H tone on the final syllable in our example forms a HL final contour (Figure 4.53 and 4.54). A low tone modifies the existing final H tone at the end of the intonational phrase. We obtain the same outcome for the mid tone. This study analyzes final lowering as involving a right edge boundary L% following Kula and Hamman (2017) for Bemba. Utterance final H tones show a sharply falling pitch movement which is a major distinguishing feature between declaratives and Yes/No questions. Genzel (2013) reports same for Akan where this is said to be the disambiguating factor between declaratives and Yes/No questions. Figure 4.55 shows that the prosodic cues identified hold true for all speakers investigated.

The pitch tracks of all speakers show a regular pattern of a raised pitch register. This is obvious in the F_0 values of the initial syllable of the polar questions and the statement counterpart in Table 4.30.

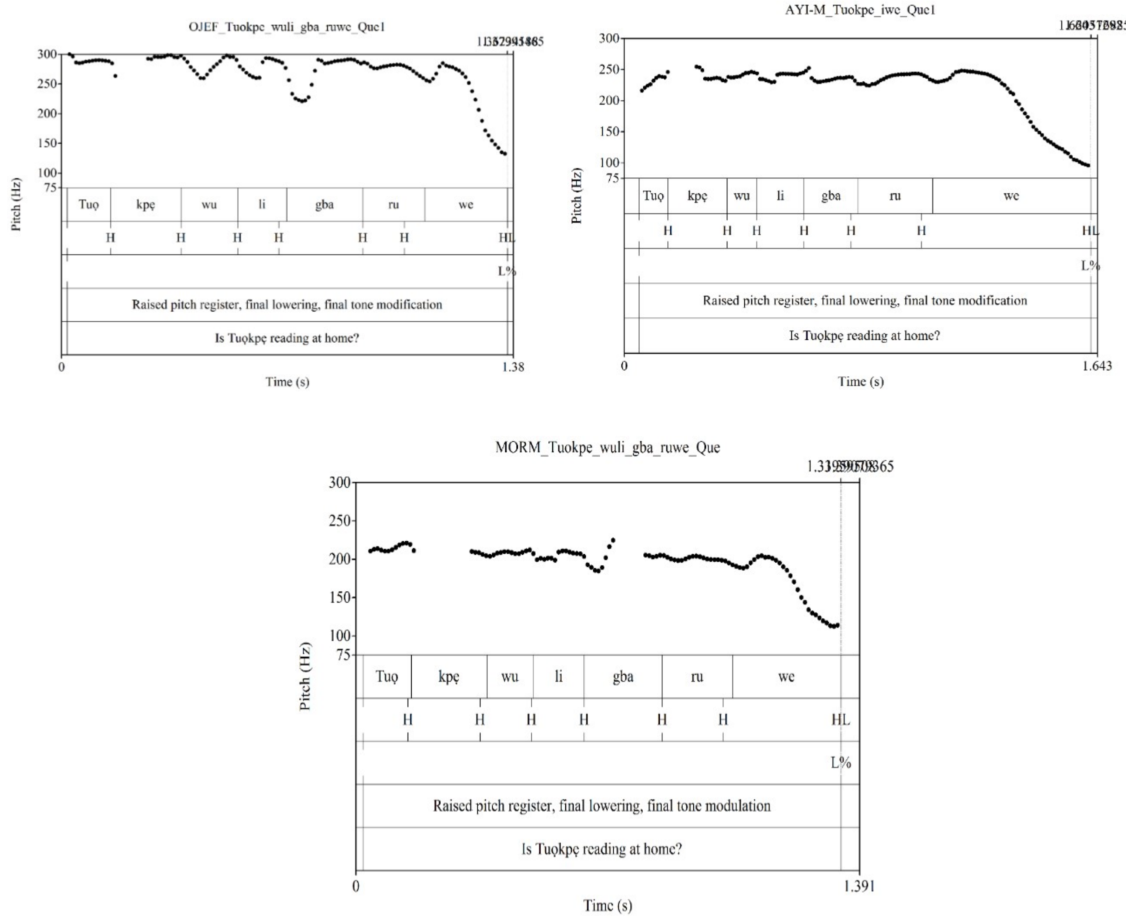


Fig. 4.55). Pitch tracks of high-toned utterance for a YNQ for OJEF, AYIM and MORM

Table 4.30. F_0 of initial syllable of *Tuọ́kpẹ́ wúlí gbá rúwé* 'Tuọ́kpẹ́ is reading at home'

SPEAKERS:	EDEF	OJEF	MORM	AYIM
	F_0 (Hz)	**F_0 (Hz)**	**F_0 (Hz)**	**F_0 (Hz)**
Statement	240.6	242.2	196.28	201.57
YNQ	254.17	290.13	220.94	245.76

The initial F_0 is higher for YNQ than its associated declarative. Lindau (1986) reports that the initial F_0 for both YNQ and statement revolves around the same point on the grids thus Hausa YNQs are not marked by a raised register but by the global suspension of the statement downward slope in favor of zero slope. The opposite is the case in Iṣẹkírì as raised pitch register is a robust intonation mechanism of YNQs irrespective of tonal configuration. Bryd, (1992) suggests that pitch range expansion rather than overall register shift is at work where the raising of highs is more than the mids and the lows are not raised in the question phrase. The Iṣẹkírì data presents a case of raised pitch register as the raising of all tones is observed for all the speakers except MORM where the low tone is not significantly raised.

Final syllable lengthening is another phonetic characteristic of YNQs in Iṣẹkírì. This is exemplified in Figure 4.56 which shows the duration of the final syllable of the statement and YNQ. Duration values in milliseconds for the final syllables of the YNQ and its corresponding declarative are presented in the histogram in Figure 4.56. Duration values for the last syllable of YNQ are significantly higher than for the statement for all four speakers. Increased intensity is also observed in the final syllable of YNQs when compared to a corresponding statement in our acoustic analysis. This is shown in Figures 4.57a) and 4.57b).

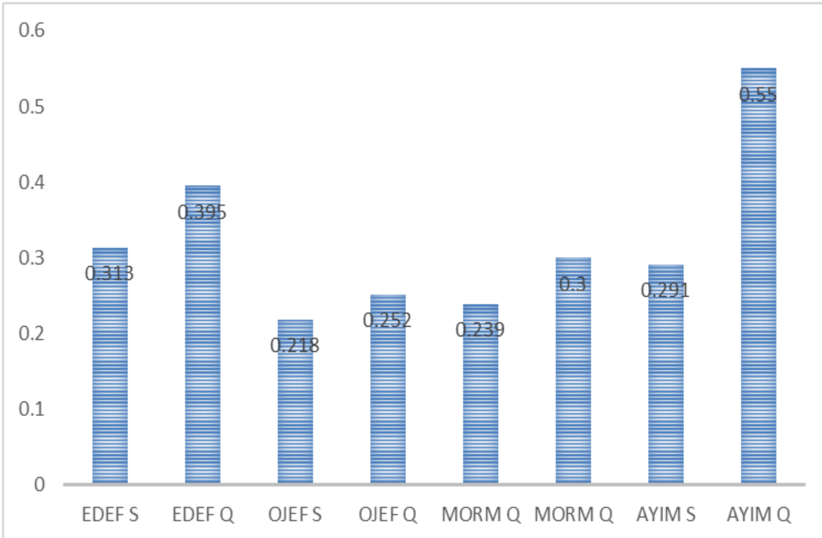


Fig.4.56. The duration of the final syllable of the statement and YNQ

Statement Question

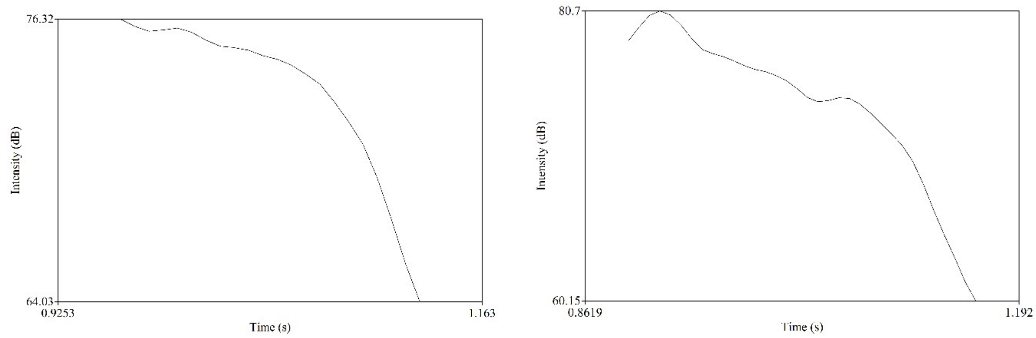


Fig. 4.57a). Intensity contour for the final syllable of YNQ and a declarative

Statement Question

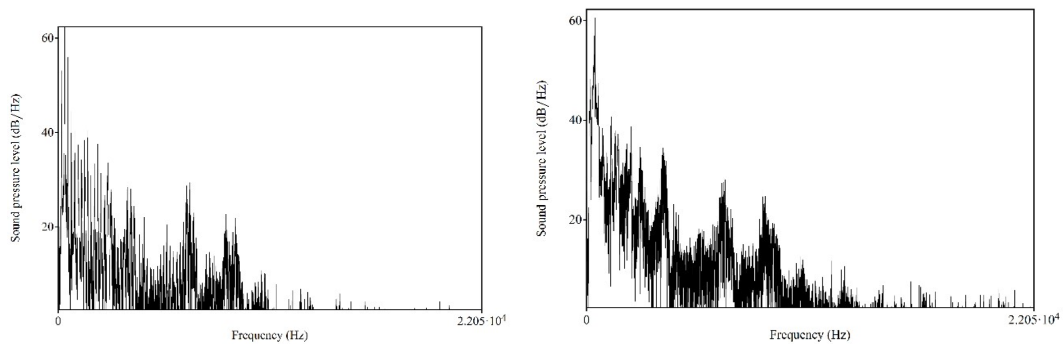


Fig. 4.57b). Spectral slides of the final syllable of YNQ and a declarative

Polar questions offer very interesting features as they are prosodically characterized by a raised register, final lowering, final syllable lengthening, and higher intensity.

4.3.1.3.2 Wh question

Wh questions are questions expected to produce specific information. These are also known as content questions. These questions in Iṣẹ̣kírì are coded through the use of particular question markers which are listed in Table 4.31.

Table 4.31. Wh question words in Iṣẹkírì

Wh question marker	gloss
nesí	who
nikọ́	what
nikọ́	why
bokọ́	where
ira bokọ́	when
ti bokọ́	which (one)
bokọ́	how

These questions in Iṣẹ̣kíri more often than not syntactically appear ex-situ in sentence initial positions. The question words have a MH tonal melody. Wh questions present similar F_0 patterns with YNQs but Final lowering is limited in Wh questions because it is not as abrupt as we have it in YNQs. Examples of Wh questions in Iṣẹ̣kíri are in (4.39) - (4.41)

(4.39)

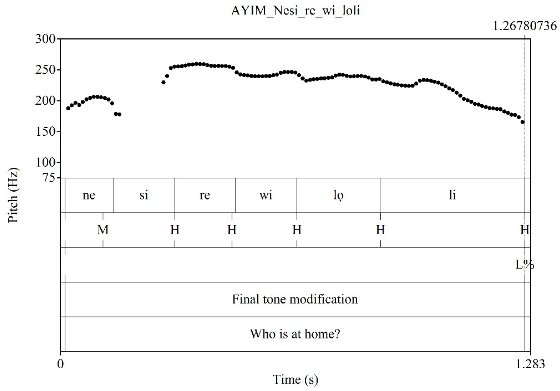
Nesí ré wiloli?
Who BE PREP-house
'Who is at home?'

(4.40)

Bokọ́ wó rè nọ́la?
Where PRON go PREP-yesterday
'Where did you go to yesterday?'

(4.41)

Bokọ́ wó wínó gbá rè?
Where PRON ASP go
'Where are you going to?'



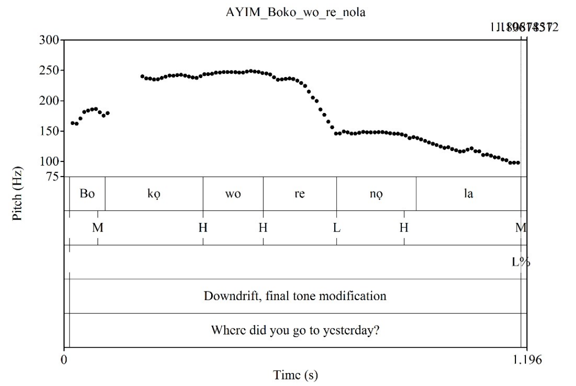


Fig.4.58. Pitch track of *Nesín ré wílólí?* 'Who is at home' **Fig.4.59**. Pitch track of *Bokọ́ wó rè nọ́la?* 'Where did you go to yesterday'

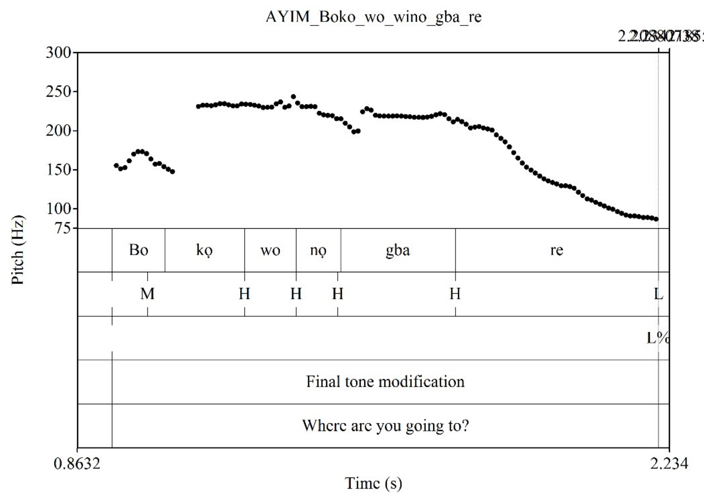


Fig.4.60. Pitch track of *Bokọ́ wó wínó gbá rè?* 'Where are you going to'

The final fall on the last syllable spreads across the whole syllable in the Wh questions and varies with the tone of the final syllable. It is noticed in Figure 4.58 that the fall does not get to the speaker's lowest range but in Figures 4.59 and 4.60, the fall gets to the speaker's lowest range. This is possibly because of the final H tone of the final syllable in the first instance, and the M and L tones of the final syllables in the second instance. The last syllable of Figure 4.59 is believed to have been influenced by downdrifting effect of the preceding syllable. The difference between the Wh question intonation and YNQ intonation appears to be in the nature of the final fall. While it is abrupt and reaches the speaker's lowest range irrespective of tone type for the YNQs, the fall for the Wh question is on the whole syllable and depends on the final tone. Other phonetic cues like duration and intensity could not be tested for Wh questions with declaratives because controlled data were not elicited for the Wh sentences. Rather, all the sentences were drawn from oral narratives and questions asked concerning different linguistic situations.

Same nouns and verbs are used in Example (4.42) to further examine and determine if intonation is responsible for F_0 differences. The sentences in this example all have the verb *je* 'eat' and the noun phrase *erósò nínóní* 'rice in the house'.

Example (4.42)

a) Mímí jerósò nínóní.
   Mímí eat-rice PREP-house
   'Mímí ate rice in the house.'

b) Nesín ré jerósò nínóní?
   Who FOC eat-rice PREP-house
   'Who ate rice in the house?'

c) Ubo nikó owun Mímí kélè jerósò?
   place where Mímí can eat-rice
   'Where did Mimi eat rice?'

d) Nikó ré se ti Mímí gbá jerósò nínóní?
   Why FOC do that Mimi ASP eat-rice PREP-house
   'Why did Mimi eat rice in the house?'

e) Nikó owun Mímí je nínóní?

What FOC Mimi eat PREP-house

‘What did Mimi eat in the house?’

f) Mímí jerósò nínóní?

‘Mímí eat-rice PREP-house’

Did Mímí eat rice in the house?

g) Bokó Mímí te ṣe gba jerósò nínóní?

How Mimi do ASP eat-rice PREP-house

‘How did Mímí eat rice in the house?’

h) Dí Mímí jerósò nínóní?

Should Mímí eat-rice PREP-house

‘Should Mímí eat rice in the house?’

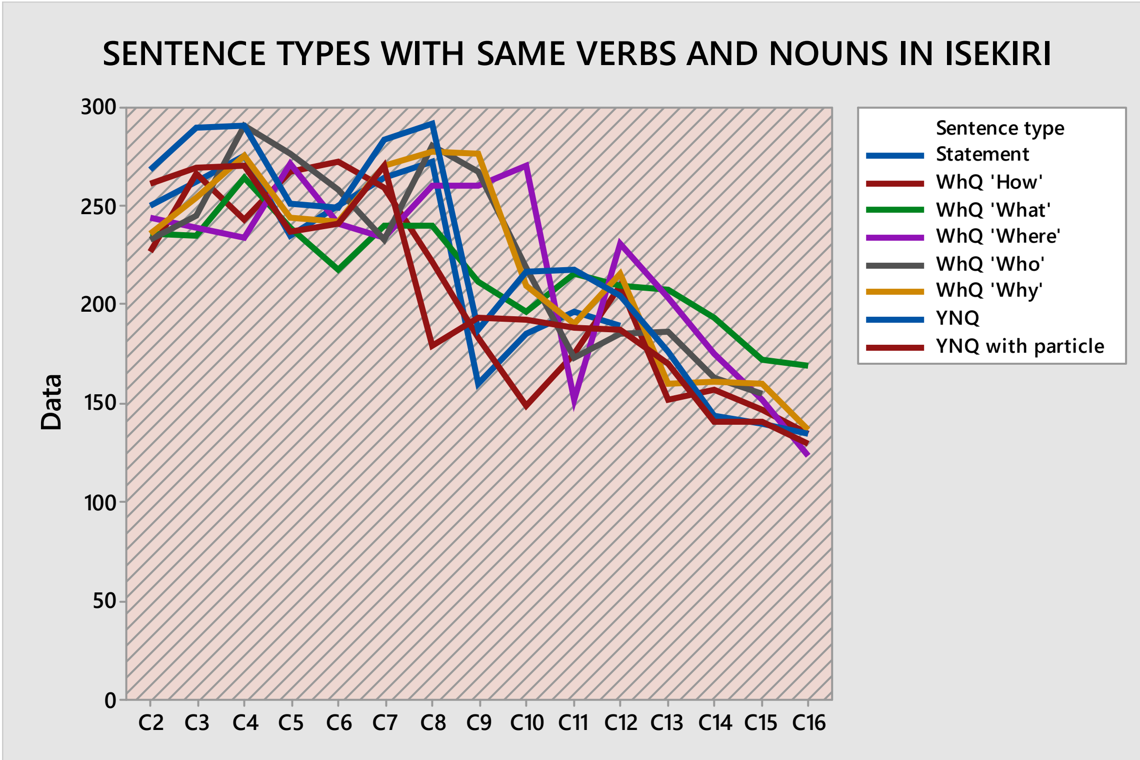


Fig.4.61. Pitch graph of same nouns and verbs of the verb *je* ‘eat’ and the noun phrase *erósò nínóní* ‘rice in the house’

The pitch graph of the question sentences reveals a falling intonation pattern for all question types. One may be tempted to attribute the falling intonation pattern to just the effects of downdrends identified in this study, but it is of interest to note that even in the sentence *Nikó owun Mímí je nínóní?* 'What did Mimi eat in the house?’where there is an obvious absence of downstep and downdrift, a falling intonation pattern is also manifest. What this points to is that while the downtrends are mechanisms utilized in Iṣẹkírì, the language is characacterized by a falling intonation pattern evident in the its questions. The pitch track of *Nikó owun Mímí je nínóní?* 'What did Mimi eat in the house?"’in Figure 4.62 has been isolated for clarity.

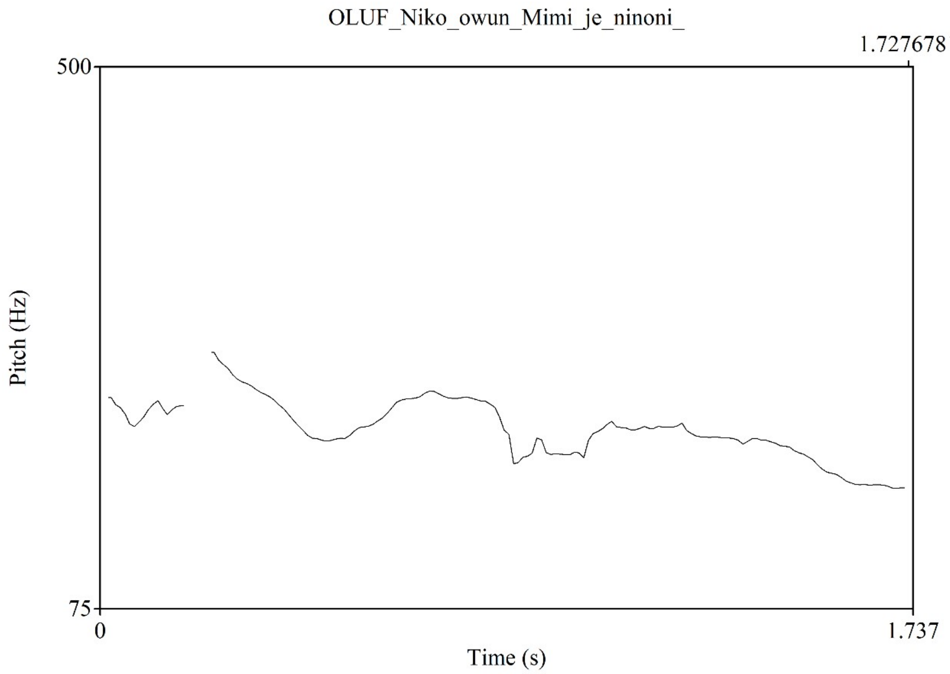


Fig.4.62. Pitch track of *Nikó owun Mímí je nínóní?* 'What did Mimi eat in the house?'

In the pitch track of *Nikó owun Mímí je nínóní?* 'What did Mimi eat in the house?'' in Figure 4.62 above, there is a clear lack of downstep and downdrift but a falling intonation pattern is seen.

4.4 Iṣẹ̣kírì intonation patterns

This section provides an analysis of the intonation patterns that Iṣẹ̣kírì manifest. This provides answer to our research question four.

4.4.1 An OT analysis

The intonational structures described in section 4.3 drive the choice of constraints necessary for a formal analysis of Iṣẹ̣kírì intonation within the OT framework. The constraints considered in the OT analysis in this section differ from those of the lexical tonal analysis because "intonational structure displays features that are not obviously found in segmental structures or even in lexical tonal structures, it is worth while to bring intonational data to bear on OT" (Gussenhoven, 2004:143). The first set of constraints relevant to the description of Iṣẹ̣kírì intonation are the alignment constraints. The alignment constraints are meant to determine the location of intonational tones in our data relative to the edge of the intonational phrase. The two intonational tones identified are 0%, that serves as a declarative boundary tone and L%, as an interrogative boundary tone. Two constraints are formulated to account for the placement of these intonational tones to the edge of the utterance and they are:

(1) Alignment constraints

a. Align 0%(Rt, ip): The right edge of the 0% must be aligned with an intonational phrase.
b. Align L%(Rt, ip): The right edge of the L% must be aligned with an intonational phrase.

Alignment constraints that refer to the position of intonational phrases in relation to syntactic boundaries identified in complex structures and those to account for association of every tone to a syllable are formed as follows:

c. Align R(Tσ): The right edge of every tone must coincide with the right edge of a syllable.
d. Align (CP, L, ip, R): The left edge of a CP coincides with the right edge of an ip.

Phonetic cues other than pitch features that indicate different intonation patterns in our description are lengthening and increased intensity. These two phonetic features inform the formulation of the following constraints:

(2) Acoustic constraints

a. *Finσ-length: Assign a violation mark if the duration of the final syllable in the output is equivalent to the length specification in the input.

b. *Finσ-Intensity: Assign a violation mark for final syllables with equivalent intensity specification with input.

A Dep constraint is also revelant as lexical tones contribute in a great extent to shape the intonational contour, the constraint that forbids the insertion of tones is therefore formed as follows:

(3) Dependence constraint

a. Dep(T): All output tones have correspondents in the input

A list of the constraints for the analysis of data on intonation is:

a. Align 0%(Rt, ip): The right edge of the 0% must be aligned with an intonational phrase (Gussenhoven, 2004:150).
b. Align L%(Rt, ip): The right edge of the L% must be aligned with an intonational phrase (Gussenhoven, 2004:150).
c. Align R(Tσ): The right edge of every tone must coincide with the right edge of a syllable (Gussenhoven, (2004:150; Yip, 2002:80).
d. Align (CP, L, ip, R): The left edge of an CP coincides with the right edge of an ip (Gussenhoven, 2004:150).
e. *Finσ-length: Assign a violation mark if the duration of the final syllable in the output is equivalent to the length specification in the input.
f. *Finσ-Intensity: Assign a violation mark for final syllables with equivalent intensity specification with input.
g. Dep(T): All output tones have correspondent in the input (Yip, 2002:79)

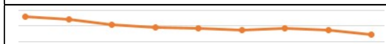
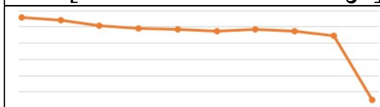
The constraint hierarchy is given below:

Align L%(Rt, ip)>> Align 0%(Rt, ip)>> *Finσ-L>> *Finσ-I >>Dep T >> Align (CP, L, ip, R)>> Align R(Tσ)

Analysis is presented for a YNQ, statement with like tones, statement with mixed tones, complex structure and Wh question in Tableaux (4.5), (4.6), (4.7), (4.8) and (4.9) respectively. The sketching on the candidate output forms shows the pitch contours.

of *ɔ̄mɔ̄nɔ̄kɛ̄rɛ̃̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā* ‘Your son picked fish’

Tableau 4.5. Input /ɔ̄mɔ̄nɔ̄kɛ̄rɛ̃̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā/ ⟶Output [ɔ̄mɔ̄nɔ̄kɛ̄rɛ̃̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā0%]

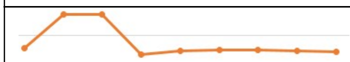
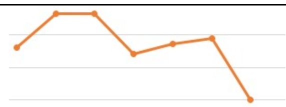
/ ɔ̄mɔ̄nɔ̄kɛ̄rɛ̃̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā / MMMMMMMMMM	Align 0% (Rt, ip)	Dep T	Align (CP, L, ip, R)	Align R(Tσ)
 ☞a.[ɔ̄mɔ̄nɔ̄kɛ̄rɛ̃̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā]			*	
 b.[ɔ̄mɔ̄nɔ̄kɛ̄rɛ̃̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā̀]	*!	*!		*
 c. [ɔ̄mɔ̄nɔ̄kɛ̄rɛ̃̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā̀]	*!	*!	*	
 d. [ɔ̄mɔ̄nɔ̄kɛ́rɛ̃́ tɛrɛ sɛ̄rɛ̄dʒā]		*!	*	*
 e. [ɔ̄mɔ̄nɔ̄kɛ̄rɛ̃̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒá]	*!	*!		*

Constraint ranking: Align 0%(Rt, ip) >> Dep T >> Align (CP, L, ip, R) >> Align R(Tσ)

In Tableau 4.5, four constraints are involved in the ranking for this analysis and they are Align 0%(Rt, ip), Dep T, Align (CP, L, ip, R) and Align R(Tσ). Align 0%(Rt, ip), the highest-ranked constraint dominates the other three constraints. There are five output candidates for the input /ɔ̄mɔ̄nɔ̄kɛ̄rɛ̄̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā/ and these are, a. [ɔ̄mɔ̄nɔ̄kɛ̄rɛ̄̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā], b. [ɔ̄mɔ̄nɔ̄kɛ̄rɛ̄̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā̀], c. [ɔ̄mɔ̄nɔ̄kɛ̄rɛ̄̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒà̄], d. [ɔ̄mɔ̄nɔ̄kɛ́rɛ̄́ tɛ̄rɛ sɛ̄rɛ̄dʒā] and e. [ɔ̄mɔ̄nɔ̄kɛ̄rɛ̄̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒá]. Candidates (a) and (d) satisfy the topmost ranked constraint Align 0%(Rt, ip) but Candidate (a) is selected over Candidate (d) by the grammar of the language as Candidate (d) violates the faithfulness constraint Dep T which ranks high for statements. Although Candidate (a) ɔ̄mɔ̄nɔ̄kɛ̄rɛ̄̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā0% violates Align (CP, L, ip, R), it emerges as the optimal candidate because constraint Align (CP, L, ip, R) is of less importance to the analysis. The intonation contour in Candidate (d) does not therefore describe the input structure which the faithfulness constraint demands. This candidate also has a final tone that is not associated to a syllable. Candidate (a) [ɔ̄mɔ̄nɔ̄kɛ̄rɛ̄̄ tɛ̄rɛ̄ sɛ̄rɛ̄dʒā] satisfies the highest ranking constraints Align 0%(Rt, ip) and Dep T and emerges as the optimal candidate. Candidates (b), (c) and (e) lose out of the competition to emerge as the optimal form because they violate the alignment constraint Align 0%(Rt, ip) which defines the simple statement intonation.

Emergence of ēdʒí rɔ̀ nónúwé ‘It rained today’

Tableau 4.6. Input /ēdʒí rɔ̀ nónúwé/ ⟶ Output [ēdʒí rɔ̀ nónúwé]

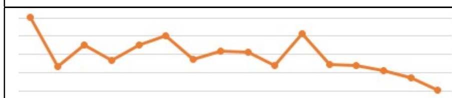
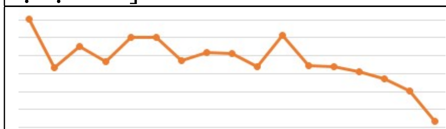
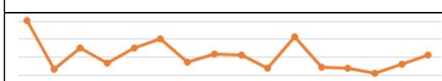
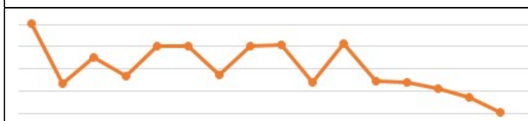
/ēdʒí rɔ̀ nónúwé/ MHHLHHH	Align 0% (Rt, ip)	Dep T	Align (CP, L, ip,R)	Align R(Tσ)
 a.[ēdʒí rɔ̀ nónúwéé]		*!	*	
 b.[ēdʒí rɔ̀ nónúwé́]	*!			*
 c. [ēdʒí rɔ̀ nónúwê]	*!	*!		*
 ☞d. [ēdʒí rɔ̀ nónúwé]			*	

Constraint ranking: Align 0%(Rt, ip) >> Dep T>> Align (CP, L, ip, R)>> Align R(Tσ)

Four constraints are involved in the ranking for this analysis and they are Align 0%(Rt, ip), Dep T, Align (CP, L, ip, R) and Align R(Tσ). The input form /ēdʒí rɔ̀ nónúwé/ has four output candidates viz a. [ēdʒí rɔ̀ nónúwéé], b. [ēdʒí rɔ̀ nónúwé́], c. [ēdʒí rɔ̀ nónúwê] and d. [ēdʒí rɔ̀ nónúwé]. The output form selected from the candidate forms presented for analysis is (d). This candidate violates the lowly ranked constraint Align (CP, L, ip, R) but is the most harmonic in relation to the constraint ranking and therefore emerges as the optimal form. Candidate (a) satisfies the highest ranking constraint Align 0%(Rt, ip) but violates Dep T. Other candidates, (b) and (c) violate the top ranking constraint Align 0%(Rt, ip and therefore lose out of the competition.

Emergence of *Ó kà díra tó gbá mórígho gbẹ́ aghan ọ̀kọ̀nkàn* 'He set a time that he will give a head to each of them'

Tableau 4.7. Input /ó kà díra tó gbá mórígho gbẹ́ aghan ọ̀kọ̀nkàn/ ⟶ Output [Ó kà díra tó gbá mórígho gbẹ́ aghan ọ̀kọ̀nkàn]

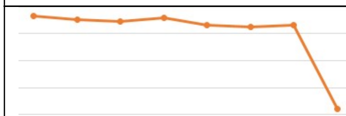
/ O ka dira to gba morigho gbẹ aghan ọkọnkan/ HLHMHHHHMHMMLLL	Align 0% (Rt, ip)	Dep T	Align (CP, L, ip, R)	Align R(Tσ)
 a.[o ka dira to g͡ba morigho gbẹ aghan ọkọnkan]		*!	*	
 ☞ b.[O ka dira to gba morigho gbẹ aghan ọkọnkan]				*
 c. [O ka dira to gba morigho gbẹ aghan ọkọnkan]	*!	*!		*
 d. [O ka dira to gba morigho gbẹ aghan ọkọnkan]	*!	*!		*
 e. [O ka dira to gba morigho gbẹ aghan ọkọnkan]	*!	*!		*
 f. [O ka dira to gba morigho gbẹ aghan ọkọnkan]	*!	*!	*	

Align 0%(Rt, ip) >> Dep T>> Align (CP, L, ip, R)>> Align R(Tσ)

The constraint hierarchy relevant for an analysis of the statement intonation given for Tableaux (4.5) and (4.6) is expanded because the complex structure considered for analysis in Tableau (4.7) contains more than one intonational phrase. Four constraints are involved in the analysis for Tableau (4.5). The constraints are; Align 0%(Rt, ip), Dep T, Align (CP, L, ip, R) and Align R(Tσ). The pitch contours of Candidates (a) and (b) appear the same but the complementizer phrase in Candidate (a) does not align with the right edge of the intonational phrase which results in a violation of Dep T and Align (CP, L, ip, R). Candidates (c), (d), (e) and (f) all violate the highest ranking constraint Align 0%(Rt, ip).

Emergence of *Tuọkpẹ wuli gba ruwe?* ‘Is Tuọkpe reading at home?’

Tableau 4.8. Input / Tuọkpẹ wuli gba ruwe?/⟶ Output [Tuọkpẹ wuli gba ruwe?]

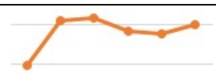
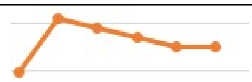
/Tuọkpẹ wuli gba ruwe?/ HHHHHHH	Align L% (Rt, ip)	*Finσ-L	*Finσ-I	Dep T
 a.[Tuọ́kpẹ́ wúlí gbá rúwé]	*!	*!	*	
 ☞ b.[Tuọ́kpẹ́ wúlí gbá rúwé]				*
 c. [Tuọ́kpẹ́ wúlí gbá rúwéé]	*!			*
 d. [Tuọ́kpẹ́ wúlí gbá rúwé́]	*!		*	*

Align L%(Rt, ip) >> *Finσ-L >>*Finσ-I>> Dep T

Align L%(Rt, ip), *Finσ-L, *Finσ-I and Dep T are the four constraints involved in the ranking for this analysis. Align L%(Rt, ip) is the topmost ranked constraint and it dominates the other three constraints. Four candidates were generated for the input /Tuọkpẹ wuli gba ruwe/. These are a. [Tuọ́kpẹ́ wúlí gbá rúwé], b. [Tuọ́kpẹ́ wúlí gbá rúwéè], c. [Tuọ́kpẹ́ wúlí gbá rúwéé] and d. [Tuọ́kpẹ́ wúlí gbá rúwé̋]. Candidate (b) emerges as the optimal form from the analysis in Tableau (4.8) because it satisfies the top ranking constraints, Align L%(Rt, ip) and *Finσ-L. Although it violates the Dep T constraint, this is irrelevant because Dep T was lowered to satisfy *Finσ-L which was ranked higher than Dep T because final syllable length is a relevant feature of YNQs in Iṣẹkírì. The other candidates (a), (c) and (d) violate the highest ranking constraint that defines the F_0 contour of a YNQ in Iṣẹkírì. The F_0 contour on candidate (b) represents the YNQ intonation pattern in Iṣẹkírì.

Emergence of *Nesín ré wílólí?* 'Your son picked fish'

Tableau 4.9. Input /Nesín ré wílólí/⟶ Output [Nesín ré wílólí?]

/ Nesin re wiloli/ MHHHHH	Align L% (Rt, ip)	*Finσ-L	*Finσ-I	Dep T
 a. Nesin re wiloli	*!	*!		
 ☞ b. Nesin re wiloli				*
 c. Nesin re wiloli	*!	*!	*	
 d. Nesin re wiloli	*!	*!		*

Align L%(Rt, ip) >> *Finσ-L >>*Finσ-I>> Dep T

The analysis in Tableau (4.9) chooses candidate (b) Nesín ré wílólíì as the optimal interrogative form. Four constraints are required in this analysis and they are Align L%(Rt, ip), *Finσ-L, *Finσ-I and Dep T. This candidate violates the lowly ranked faithfulness constraint Dep T but is the most harmonic in relation to the constraint ranking and therefore emerges as the optimal form. All other candidates a. Nesín ré wílólíì, c. Nesín ré wílólíì and d. Nesín ré wílólíì, violate the top ranking constraint Align L%(Rt, ip) and are therefore disqualified from the competition because a violation of the top ranking constraint Align L%(Rt, ip) by any candidate in this analysis is regarded as fatal. These candidates do not satisfy the constraints Align L%(Rt, ip), *Finσ-L, and *Finσ-I that describe interrogative intonation in Iṣẹkírì. Pitch patterns identified in this study are summarized in Figure 4.63.

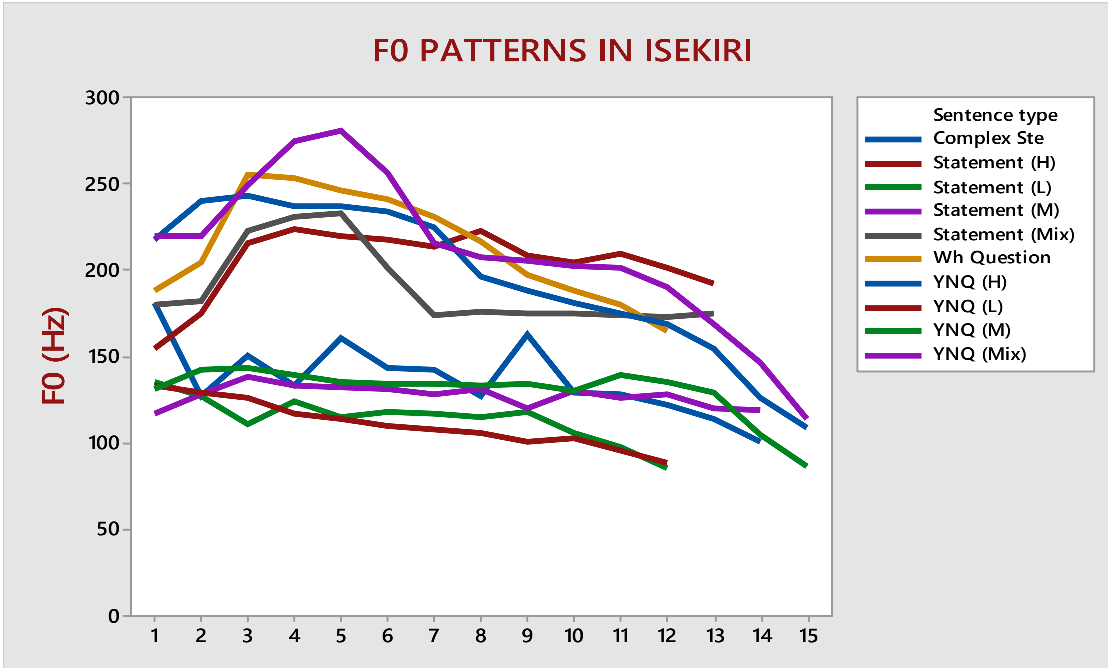


Fig. 4.63. F_0 patterns in Iṣẹ̀kírì

Interrogatives are distinguished by the falling pattern for all tone types revealing a falling intonation that can be attributed to final lowering as an F_0 mechanism in addition to a L%. Declaratives on the otherhand manifest a slightly falling pattern that is marked by final 0% and controlled by tone type and tonal interactions. The conclusion that can be drawn from Iṣẹkírì utterances is that pitch features and other phonetic cues make a distinction between declaratives and interrogatives.

4.5 Tone - intonation interaction in Iṣẹkírì

In this section, we will be examining the relation between lexical tone and phrasal pitch features in Iṣẹkírì with a view to identifying the strategies the language uses to interpret the interaction between the two in answer to our research question five. The occurrence of intonational and lexical tones has posed a challenge to many scholars most especially in languages where the lexical tones have taken up most of the tonal space with a high number of lexical tones. Hyman and Monaka, (2011:268) observed that "Word-level tones show three degrees of hospitality (or hostility) towards F0 intrusions at the phrase- or utterance level". They propose three kinds of interactions between tone and intonation which are accommodation, submission and avoidance. These strategies are adopted in this study in the examination of tone – intonation interaction in Iṣẹkírì. Accommodation or what Hyman and Monaka, (2011) also refer to as "peaceful co-existence" is when lexical and intonational tones interact minimally. The minimal interaction from instantiations given in Hyman and Monaka, (2011) show a restriction of intonational tones to one syllable as seen in certain Otopamean languages of Mexico, where intonational contrasts are reserved for word-final syllables and lexical tone contrasts are restricted to pre-final syllables. The results and discussion on intonation in this study demomstrate that accommodation is not a tone-intonation strategy in Iṣẹkírì. The illustration on minimal interaction in Hyman and Monaka, (2011) shows that lexical tones are confined to particular syllables different from intonational tones. Data examined here show that while intonational tones are restricted to the final syllable, they occur with lexical tones (Section 4.2).

The second type of interaction between lexical tones and intonation is submission or "surrender". This is when intonational tones override lexical tones and in languages that manifest this type of interaction, lexical tones merge with intonational tones. Data on question intonation suggest partial submission for Iṣẹ̀kírì. The pitch track in Figure 4.64 is reproduced from Fig. 4.31 to illustrates this. The HL outcome of the final syllable in the illustrative figure shows partial and not total submission. This is because the intonational tone does not totally override the lexical tone. Rather, both occur on the final syllable.

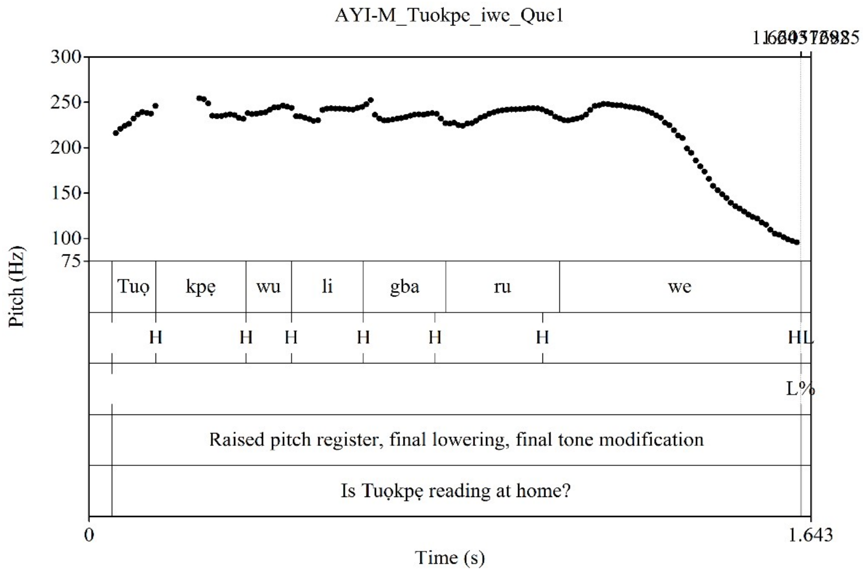


Fig. 4.64. Pitch graph of high-toned utterance for a YNQ for AYIM

Partial submission is thus posited for question intonation as lexical tones tend to merge with an intonatinal L% as observed above. The lexical tone does not surrender to the intonational tone but rather occurs with it.

Avoidance, which is a third interaction strategy, is when intonation is minimized. In a complete sense, this is where the tone system does not allow any intonational tone. Tone-intonation interaction of statements in Iṣẹkírì features this type of interaction. Statement intonation examined in Section 4.3.1 show that lexical tones tend to shape the intonational contour as intonational phrase boundary tones are unspecified. The Iṣẹkírì tone system does not to allow any intonational tone for decaratives.

In all, tone-intonation interaction in Iṣẹkírì feature partial submission for question intonation and avoidance for statement intonation. The tone-intonation interaction strategy employed in the language is based on specific intonation patterns.

4.6 Conclusion

Findings on pitch features at the word and phrasal levels were presented and discussed in this chapter. Tonemic analyses were subjected to acoustic investigation and the phonological and syntactic environments that condition the behaviour of tones were perceptually and instrumentally considered and analyzed within OT. Post lexical pitch features revealed the tonal contours of the intonation patterns in Iṣẹkírì and this was evaluated within an OT framework. Finally, the accomodation, submission and avoidance strategies were used to discuss the tone-intonation relationship.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study examined the role of pitch at word and phrasal levels in Iṣẹkírì. A consideration of the objectives, research questions, significance, scope of the study and an overview of Iṣẹkírì segmental phonology, provided an introduction to the investigation of the research. A review of previous studies in Iṣẹkírì, relevant concepts, related studies and theories were undertaken. This provided insight into some of the concerns of this study. The theoretical inclinations that evaluated the data were also examined. Methodological issues that described the selection of informants, nature of data, data collection and method of analysis employed for a successful research were addressed.

Lexical tones and their interactions in lexical items and grammatical constructions were examined. Lexical tones were categorized into three; H, M and L tones based on tonemic contrast. Tone patterns in Isẹkírì were shown. Tonological operations in the language were categorized into phonologically conditioned tonological operations and syntactically conditioned tonological operations. Different grammatical constructions were used to show deletion in different environments and the corresponding behaviour of the mid tone observed. The study also considered the mechanisms involved in the realisation of pitch contours and discussed the interaction of pitch properties at the lexical and post lexical levels.

5.2 Findings

This study has been on how pitch is systematically used in Iṣẹkírì phonological system from an experimental approach. Data analyzed showed some findings guided by our research objectives.

The tonal system of Iṣẹkírì

In line with our first objective which centres on the nature of the tonal system in Iṣẹkírì, the following observations were made as presented.

- Iṣẹkírì uses tone contrastively and demonstrate a three-way phonological tonal distinction. Acoustic measurements confirmed that there are three distinct tonal categories; with mean F_0 values approximately at 183Hz for High tones, 140Hz for Mid tones and 107Hz for Low tones.
- There are two phonetic gliding tones; the rising and falling tones which are derived from two of the three level tones; the high and low tones. Iṣẹkírì data therefore showed the composite nature of contour tones. A pitch graph of the phonetic tones in the language was presented in Figure 4.19.
- Tone patterns on disyllabic nominal elements showed only three possibilities, which are LL, MM and MH patterns while non-nominal elements can assume any tonal sequence of the H, M and L tones on monosyllabic verbs and adjectives. Disyllabic verbs bear any of the LL, LM, LH, ML, MM, MH, HH, HM, HL tonal pattern with some of these patterns derived from the morphological process of compounding and the phonological process of vowel elision. The tone pattern of numerals is dependent on syllable composition. When the syllable is made up of V.CV structure, numerals behave like nominal elements and manifest the LL, MM or MH pattern. Where the initial syllable is a CV syllable, the tone pattern is a HM pattern with the exception of the numeral *meji* ‘two’ which has a HL pattern.

The behaviour of the mid tone in Iṣẹkírì

Our second objective provided the basis for the investigation of the behaviour of the mid tone in Iṣẹkírì. It was imperative that our investigation determine the way, manner and reason this tone behaves differently from the other tones in the language by accounting fully for the tonological operations prevalent in the language. One of the primary motivations for the present study was to employ a theoretical approach that best accounts for tone asymmetry. The phonologically and syntactically conditioned tonological operations showed that:

- The M tone is in asymmetry to the H and L tones. Iṣẹ̣kírì data showed that perceptually and acoustically, the M tone is deleted in vowel contact with both the H and L tones.
- Tone asymmetry can be properly and simplistically accounted for by constraint ranking. An Optimality theory version that developed constraints of implicational statements through the inclusion of some grounding conditions in Heiberg (1999) adequately showed the pliant nature of the M tone through its position in a ranking hierarchy. Tone asymmetry is adequately accounted for by the constraint hierarchy MAX[H]>>*H↔M, *M↔H, *L↔H, *M↔L >> MAX[L] >>*MULTIPLE>> MAX[M].
- Tonological operations found in the language include Leftward high tone spread (LHTS) and Rightward high tone spread (RHTS). Leftward high tone spread showed the tonal replacement of the tone of the last vowel of the noun phrase, which resulted from the processes of the assimilation of the high tone syllable *é* to the vowel of its immediate left, a leftward spread of the [+Upper] feature of a H tone to a preceding [-Upper] feature of an M and a [+Upper] and [+Raised] feature to a [-Upper, -Raised] feature of a L tone and then the deletion of the HTS. Rightward high tone spread is sensitive to tone type and number of syllables. A high tone on a pre-verbal particle spreads to the verb, that is, the high tone of the word preceding the verb spreads to the first syllable of the verb. An examination of data in Iṣẹ̣kírì revealed that the rightward spread of the high tone is governed by two constraints; the number of syllable in the verb stem (at least disyllabic), and the tonal melody (a LL or LLL).

Mechanisms employed for the realization of F_0 contours in Iṣẹ̣kírì

The determination of the mechanisms employed for the realization of F_0 contours in Iṣẹ̣kírì was the third objective of this study, and we found out that:

- F_0 mechanisms employed in the language include declination, final lowering, and downstep.
- Declination varies with tone type and sentence length with a significant effect for M and L tones ($p < 0.05$). There was no significant effect for H tone for the various utterance lengths ($p = 0.394$, 0.304 and 0.135 respectively). The short sentence has

a better fit regression model (R square = 0.9) with the coefficient in the regression equation as +1.45 signifying a positive slope. This implies an absence of declination in this utterance. The medium and long sentences both have negative slopes with a better fit regression model (R square = 0.8 and 0.9) respectively. The regression equation is y = 224.4 - 0.825x for the medium sentence and y = 223.63 - 0.678 for the long sentence.

- The domain of final lowering is the last syllable.
- Boundary tones used to distinguish declaratives from different question types are zero% for statement intonation and L% for question intonation. Contrary to cross-linguistic expectations, Iṣẹkírì polar question shows a final fall in pitch which occurs late in the utterance and a lack of suspension of downstep.
- There is a consistent effect of initial pitch raising in questions which combines with the phonetic characteristics of final syllable lengthening and increased intensity.
- Complex declaratives show a partial pitch reset at the left edge of an embedded ι-phrase and the only attested prosodic unit above the prosodic word is the Intonational Phrase (IP), which is usually marked by a pause and pitch reset.

An OT analysis of the intonation patterns in Iṣẹkírì

In order to analyze the intonation patterns evident in the language which this study set out to achieve as its fourth objective, Optimality theory was employed with the following findings:

- The intonation patterns in Iṣẹkírì is evaluated by the constraint hierarchy Align L%(Rt, ip)>> Align 0%(Rt, ip)>> *Finσ-L>>Dep T >> Align (CP, L, ip, R)>> Align R(Tσ)>> *Finσ-I
- Pitch features and other phonetic cues such as, final syllable lengthening and increased intensity, make a distinction between declaratives and interrogatives.
- Iṣẹkírì shows a falling intonation for both statement and question intonation controlled by tone type and tonal interactions for statements and distinguished by intonation features for interrogatives.

The tone-intonation interaction in Iṣẹkírì

The fifth objective for this study was to explain the tone-intonation relationship in the language. This relationship showed the following:

- Underlying lexical tones are not affected by intonation with the exception of sentence-final tones of question intonation.
- Partial submission and avoidance are tone-intonation strategies employed in Iṣẹkírì. Question intonation show partial submission of the lexical tone to intonational tone and not total submission because the intonational tone does not totally override the lexical tone.

5.3 Conclusion

Pitch features considered at the lexical and post-lexical levels of Iṣẹkírì prosodic grammar in this study revealed tone and intonation patterns that correctly described the language's phonological grammar. Lexical pitch features revealed the language's tonal contrast and substantiated the tonemic characterisations. Acoustic evidence and copious data showed the M tone as the most unstable tone differing from the reference to the L tone as the most malleable tone in Omamor (1979).

The description of intonation in this study demonstrates that declination, downdrift and final lowering operate in Iṣẹkírì in one way or the other and that they in addition to the lexical and boundary tones determine the resulting F_0 contour of the different phrasal structures. Most works on intonation in tone languages have been descriptive, this study not only describes intonation in a tone language but also analyzes within OT.

The study concluded that the role of pitch is of immense importance in phonological discourse. Indubitably, the basic components of pitch provide insights into the workings of the Iṣẹkírì language at all levels of prosodic discourse. Falling intonation in polar questioning and zero boundary tone for statements are diagnostic patterns of the language. The language also operates downstep, bidirectional tone spreading and partial submission in its prosodic phonology.

5.4 Recommendations

This research fills the gap of serious formal studies on the Isẹkírì language but cannot claim to be exhaustive. There are many areas open for further studies most especially at the phrasal level. We did not investigate the intonation of focus, emotions and other intonational issues. We recommend that future researches should investigate the expression of focus and prosodic focus marking. This study also recommends further research geared towards establishing a single constraint hierarchy for pitch phenomenon at both lexical and post lexical levels of Iṣẹkírì phonological descriptions.

In line with one of the findings of this study, which recognized an interface between intonational phrasing and the syntax of the language, we recommend that future studies on the Isẹkírì phonology should pay more attention to the phonology - syntax interface in the organization of the language’s phonological grammar. The relationship between tone and grammatical behaviour requires more attention.

5.5 Contribution to knowledge

The relevance of this study is most importantly recognizable in its exposition on Iṣẹkírì prosody. Prior works as earlier noted, have not extensively examined tonal phenomenon in the language. This study through empirical evidence and data has provided a more in-depth exploration of tonal issues both at the lexical and post-lexical levels. This work therefore contributes to studies on Iṣẹkírì prosody in no small way. A number of Iṣẹkírì language enthusiasts have made efforts to document the language by writng story books and some elementary literature books. While we recognize and commend these efforts, the majority of them are not tone marked and for those that are, the tone marks are riddled with inaccuracies and rarely convey the intended meaning. As a result, this study will serve as a guide and reference material for accurate tone marking in Iṣẹkírì in a significant way.

There is a threat to the survival of the Iṣẹ̣kírì language due to dwindling usage among the younger generation. This work serves as a printed and documented resource to safeguard and preserve the Iṣẹ̣kírì language from endangerment.

This study also contributes to phonological theorizing in its theoretical re-analysis of tone asymmetry. This is because it addressed concerns raised in previous proposals and analysis of the mid tone, most especially in Yoruba, a sister language. The present account of Iṣẹ̣kírì tonology is therefore, a contribution to the development of Yoruboid studies and adds to the body of knowledge on African Linguistics.

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APPENDICES

APPENDIX 1: LIST OF IṢẸ̣KÍRÌ LEXICAL ITEMS

NOUNS

arọ	/ārɔ̄/	‘lame man’
ẹ̀kpò	/ɛ̀k͡pò/	‘bag’
ekpo	/ēk͡pō/	‘oil’
orígho	/ōríɣō/	‘head’
irọn	/īrɔ̃̄/	‘hair’
ejú	/ēʤú/	‘eye’
etin	/ẹ̄tĩ́/	‘ear’
imọ́	/īmɔ́/	‘nose’
ẹjí	/ɛ̄ʤí/	‘teeth’
arun	/ārũ̄/	‘mouth’
ìgbẹ̀n	/ìgbɛ̃̀/	‘chin’
ughọ́	/ūɣɔ́/	‘navel’
ọma	/ɔ̄mā/	‘child’
uwán	/ūwã́/	‘tongue’
ara	/ārā/	‘body’
oríkẹ́sẹ̀n	/ōríkɛ́sɛ̃̀/	‘knee’
ẹ̀kòkó	/ɛ̀kòkó/	‘buttocks’
ẹwọ́	/ɛ̄wɔ́/	‘hand’
isángì	/īsã́gì/	‘blood’
ọ̀jẹ̀	/ɔ̀ʤɛ̀/	food’
eran	/ɛ̄rã̄/	‘meat’
àràn	/àrã̀/	‘worm’
ọ̀sà	/ɔ̀sà/	‘orange’
iféyẹ̀	/īféyɛ̀/	‘tobacco’
ulọ	/ūlɔ̄/	‘grinding stone’
uná	/ūná/	‘fire’
akásí	/ākásí/	‘spear’
ore	/ōrē/	‘mother’
ukpúkpòròn	/ūkpúkpɔ̀rɔ̃̀/	‘stone’
ẹ̀gè	/ɛ̀gè/	‘well’
afẹ́rẹ́	/āfɛ́rɛ́/	‘wind’
àgbàrùn	/àgbàrũ̀/	‘jaw’
akínkán	/ākĩ́kã́/	‘nails’ (finger nails)
iyọ́	/ījɔ́/	‘penis’
ìgbùdùgbudù	/ìgbùdùbūdù/	‘thigh’
ẹgó	/ɛ̄gó/	‘vagina’
ekpikpò	/ēk͡pīk͡pò/	‘skin’
ẹsú	/ɛ̄sú/	‘bone’
ìtọ̀	/ìtɔ̀/	‘urine’
itsútsu	/īʃúʃū/	‘faeces’
omi	/ōmī/	‘water’

omi ọ̀jè	/ōmī #ɔ̀ʤɛ̀/	[ōmjɔ̄ʤɛ̀] ‘soup/stew’
ekpo	/ēk͡pō/	‘fat’
eja	/ɛ̄ʤā/	‘fish’
ekpo	/ēkpō/	‘oil’
uwangúẹ́	/ūwā̃gwɛ́/	‘salt’
orúsùn	/ōrúsũ̀/	‘yam’
ìmìdakà	/ìmìdākà/	‘cassava
imíyò	/īmíjò/	‘maize’
ẹ̀wà	/ɛ̀wà/	‘beans’
ògòlo	/ògòlō/	‘pepper’
ìkàrànbò	/ìkàrã̀bɔ̀/	‘okro’
ògẹ̀dẹ́yìbó	/ɔ̀gɛ̀dɛ́yìbó/	‘banana’
ọ̀sà	/ɔ̀sà/	‘orange’
ìsãngùè	/ī̀sā̃gwè/	‘groundnut’
òbì	/òbì/	‘kolanut’
ìyàwu	/ìjàwū/	‘cotton’
eso	/ēsō/ or [ēswēgī̃] ‘seed’	
ìsùn	/ìsũ̀/	‘grass’
egin	/ēgī̃/	‘tree’
iwoko	/īwōkō/	‘leaf’
ìrìn egin	/ìrĩ̀ēgĩ/ [ìrjēgī̃]	‘root’
igún	/īgṹ/	‘thorn’
egin	/ēgī̃/	‘stick’
egin uná	/ēgjūná/	‘firewood’
egherighò	/ɛ̄ɣɛ̄rīɣɔ̀/	‘smoke’
ẹrúbogún	/ɛ̄rúbógṹ/	‘ashes’
ùtsà	/ùʃà/	‘waterpot’
ẹ̀wò	/ɛ̀wò/	‘cooking pot
ugbá	/ūgbá/	‘calabash’
ugúrúnjẹ	/ūgũrúʤɛ̄/	[ūgṹʤɛ̄̃] ‘mortal’
ọbẹ	/ɔ̄bɛ̄/	‘knife’
utsutsẹ	/uʃuʃɛ/	‘hoe’
utsegĩ	/ūʃēgī̃/	‘axe’
ùdà	/ùdà/	‘matchet’
akasi	/ākāsí/	‘spear’
ẹkpéde	/ɛ̄kpédē/	‘arrow’
urẹn	/ūrɛ̄̃/	‘iron’
àbìba	/àbìbā/	‘mat’
àkpèrè	/àkpɛ̀rɛ̀/	‘basket
èkpò	/ɛ̀kpò/	‘bag’
ẹ̀gbède	/ɛ̀gbèdē/	‘needle’
owú	/ōwú/	‘thread’
atso	/āʃɔ̄/	‘cloth’
ẹ̀wù	/ɛ̀wù/	‘robe’
ẹ̀kòro	/ɛ̀kòrō/	‘hat/cap’
ìsàbatù	/ìsàbātù/	‘shoe’
oghó	/ōɣó/	‘money

ẹ̀kùn	/ɛ̀kũ̀/	‘door’
ara ulí	/ārā # ūlí/	[ārūlí] ‘wall’
abẹ́tẹ̀	/ābɛ́tɛ̀/	‘room’
ulí	/ūlí/	‘house’
àjà	/àʤà/	‘town’
ẹ̀gè	/ɛ̀gè/	‘well’
ẹ̀ghẹ̀rìghọ̀	/ɛ̀ɣɛ̀rìɣɔ̀/	‘smoke’
àtìtàn	/àtìtã̀/	‘rubbish heap’
ọ̀nà	/ɔ̀nà/	‘road’
ọ̀bòn	/ɔ̀bɔ̃̀/	‘market’
ugbó	/ūgbó/	‘farm’
ẹri	/ɛ̄rī/	‘river
okun	/ōkū̃/	‘sea’
ọ̀kọ̀	/ɔ̀kɔ̀/	‘boat’
ukpúkpọ̀rọ̀n	/ūkpúkpɔ̀rɔ̃̀/	‘stone’
ukpókìtì	/ūkpókìtì/	‘mountain’
àlè	/àlɛ/	‘ground’
ẹyé	/ɛ̄j̄é/	‘earth’
ìbù	/ìbù/	‘sand’
ẹ̀ghọ̀rìghọ̀	/ɛ̀ɣɔ̀rìɣɔ̀/	‘mud’
afẹ́fẹ́	/āfɛ́fɛ́/	‘wind’
eji	/ēʤī/	‘rain’
òrùnrùn	/òrũ̀rũ̀/	‘sunshine’
òrùn	/òrũ̀/	‘sun’
ọnọ́rọn	/ɔ̄nɔ́rɔ̃/	moon’
àgùrà	/àgùrà/	‘star’
ejú ọjọ́	/ēʤú # ɔ̄ʤɔ́/	[ēʤwɔ́ʤɔ̀] ‘day’
orun	/ōrū̃/	‘night’
ejúmá	/ēʤúmá/	‘dawn’
òkùkùn	/òkùkũ̀/	‘darkness’
ejú orun	/ēʤú # ōrū̃/	[eʤwórũ] ‘sleep’
utsẹ́	/ūʃɛ́/	‘work’
ogun	/ōgū̃/	‘war’
ẹ̀rùbíbà	/ɛ̀rùbíbà/	‘fear’
ebi	/ēbī/	‘hunger’
ebi ugbọ́fun	/ēbī # ūgbọ́fū̃/	[ebjugbɔ́fū̃] ‘thirst’
ọdọ́n	/ɔ̄dɔ̃́/	‘year’
òbwẹ̀	/òbwɛ̀/	‘rainy season’
ẹ̀rùnrùn	/ɛ̀rũ̀rũ̀/	‘dry season’
ẹrin	/ɛ̄rī̃/	‘song’
ita or arọ́	/ītā /or /ārɔ́/	‘story’
ọ̀fọ̀	/ɔ̀fɔ̀/	‘word’
itekun	/ītēkū̃/	‘lie’
urun	/ūrū̃/	‘thing’
ẹran	/ɛ̄rā̃/	‘animal’
ekérégbè	/ēkérégbè/	‘goat’
ekérégbè ọkẹrẹn	/ēkérégbè # ɔ̄kɛ̄̃rɛ̄̃/	[ēkégbɔ́kɛ̄̃rɛ̃] ‘he-goat’

àgùtàn	/àgùtã̀/	‘sheep’
īmìla	/īmìlā/	‘cow’
ẹtsin	/ɛʃĩ̄/	‘horse’
ikẹ́rẹkẹ́tẹ́	/īkɛ̣́rɛ́kɛ́tɛ́/	‘donkey’
ẹ̀rẹ̀njà	/ɛ̀rɛ̃̀ʤà/	‘dog’
ipósì	/īpósì/	‘cat’
ekútélé	/ēkútélé/	‘rat’
egbélé	/ēgbélé/	‘chicken’
egbélé okẹnrẹn	/ēgbélé # ɔ̄kɛ̃̄rɛ̃̄/	[ēgbélɔ́kɛ̃̄rɛ̃] ‘cock’
ẹghẹn	/ɛ̄ɣɛ̃̄/	‘egg’
iká	/īká/	‘wing’
ìlèle	/ìlèlē/	‘feather’
ẹgho	/ɛ̄ɣō/	‘horn’
ùrù	/ùrù/	‘tail’
oléwósì	/ɔ̄lɛ́wósì/	‘leopard’
agbákàrà	/āgbákàrà/	‘crocodile’
iyẹmẹriko	/ījɛ̄mɛ̄rīkō/	[ijɛmɛko] ‘elephant’
akidọn	/ākīdɔ̃̄/	‘monkey’
ẹgúálè	/ɛ̄gúálɛ̀/	[ɛ̄gwálɛ̀] ‘snake’
ọlọ́de	/ɔ̄lɔ́dē/	‘lizard’
ìdìbì	/ìdìbì/	‘crab’
ẹkère	/ɛ̄kèrē/	‘toad’
umọta	/ūmɔ̄tā/	‘snail’
alíka	/ālíkā	‘housefly’
oyin	/ōjĩ̄/	‘bee’
imúrẹ́n	/īmúrɛ̃́/	‘mosquito’
ekérégbè orígho	/ēkérégbèōríɣō/	[ēkégbōríɣō] ‘louse’
egbélé	/ēgbélé/	‘bird’
àkàlà	/àkàlà/	‘vulture’
ẹ̀gòdì	/ɛ̀gòdì/	‘kite’
ùdì	/ùdì/	‘hawk’
adan	/ādã̄/	‘bat’
ira ẹyé	/īrā # ɛ̄jé/ [īrɛ̄jé]	‘person’
ọrúko	/ɔ̄rúkɔ̄/	‘name’
ọnọkẹnren	/ɔ̄nɔ̄kɛ̃̄rɛ̃̄/	‘man’
onobiren	/ōnōbīrɛ̃̄/	‘woman’
obiren	/ōbīrɛ̃	‘female’
elígbó	/ɛ̄lígbó/	‘old person’
olare	/ɔlarɛ/	‘senior’
ọsá	/ɔ̄sá/	‘father’
ore	/ōrē/	‘mother’
oma	/ɔ̄mā/	‘child’
oma onokenren	/ɔma # ɔmɔnɔkɛ̃̄rɛ̃̄/	[ɔmɔnɔ̀kɛ̃̀rɛ̃] ‘son’
oma onobiren	/ɔ̄mā # ōnōbīrɛ̃/	[ɔmonòbìrɛ̃] ‘daughter’
ina	/īnā/	‘in-law’
ẹ̀jòjì	/ɛ̀ʤòʤì/	‘guest’ (stranger)
ukun	/ūkũ̄/	‘friend’

ọlája	/ɔ̄láʤā/	‘king’
ọdẹ	/ɔ̄dɛ̄/	‘hunter’
òlè	/òlè/	‘thief’
ẹwó	/ɛ̄wó/	‘doctor’
òjòyè	/òʤòjè/	‘chief’
irawo	/īrāwō/	‘medicine’ (charm)
okú	/ōkú/	‘corpse’
òrìtsè	/òrìʃè/	‘God’

ADJECTIVES

dún	/dṹ/	‘black’
gbó	/gbó/	‘old’
ghán	/ɣã́/	‘costly’
go	/gō/	‘tall’
ro	/rō/	‘bitter’
yá	/já/	‘quick’
yò	/jɔ̀/	‘happy’
kéré	/ke̜ré/	'small'
fẹ́n	/fɛ̃́/	‘clean’
kùtú	/kùtú/	‘short’
dede	/dē̜dē/	‘all’
sèngùa	/sɛ̃̀gwà/	‘beautiful’
búrú ègùa	/búrú #̀ ɛgùa/ [búrɛ́gwà]	‘ugly’
gbán	/gbã́/	‘wise’
ẹkoko	/ɛ̄kōkō/	‘important’
atsítsán	/ā̜ʃíʃã/	‘empty’
fẹn	/fɛ̜̃/	‘white’
dẹ̀n	/dɛ̃̀/	‘red’
lá	/lá/	‘big’ (great\large)
sín	/sĩ́/	‘long’ (of stick)
kùtú	/kùṭú/	‘short’ (of stick)
titọn	/tītɔ̃́/	‘new’
rẹ	/rɛ̄/	‘wet’
gbẹ	/gbɛ̄/	‘dry’
gbọ́	/gbɔ́/	‘hot’ (as fire)
ọyẹ́	/ɔ̄jẹ́/	‘cold’
ẹwọ́tón	/ɛ̄wɔ́tɔ̃́/	‘right’
ẹwósì	/ɛ̄wósì/	‘left’
sàn	/sã̀/	‘good’
bàjẹ́	/b̜àʤɛ́/	‘bad’
yòn	/jɔ̃̀/	‘sweet’
wó	/wó̜/	‘heavy’
kón	/kɔ̃̃/	‘full’
ni	/nī/	‘strong’

ADVERBS

kọ́kọ́	/kɔ́kɔ́/	‘since’
jóya	/ʤójā/	‘fast’
gege	/gēgē/	‘immediately’
yòyò	/jòjò/	‘hotly’
sìgọ̀sìgọ̀	/sìgɔ̀sìgɔ̀/	‘sluggishly’
kokoroko	/kōkōrōkō/	‘firmly’
tètè	/tètè/	‘quickly’
kìtíkìtí	/kìtíkìtí/	‘as a matter of fact’
kpẹ̀lẹ́kpẹ̀lẹ́	/kpɛ̀lɛ́kpɛ̀lɛ́/	‘gently’
jọ̀jọ̀	/ʤɔ̀ʤɔ̀/	‘very/really’

VERBS

je	/ʤɛ̄/	‘eat’
mọ	/mɔ̄/	‘drink’
fẹ̀mì	/fɛ̀mì/	‘swallow’
bùjẹ	/bùʤɛ̄/	‘bite’
lá	/lá/	‘lick’
dángho	/dã́ɣō/	‘taste’
titọ́	/tītɔ́/	‘spit’
sẹ̀n	/sɛ̃̀/	‘vomit’
dẹ̀rẹ̀	/dɛ̀rɛ̀/	‘watch’
tọ̀	/tɔ̀/	‘urinate’
tsu	/ʃū/	‘defecate’
bí	/bí/	‘give birth’
kú	/kú/	‘die’
soró	/sōró/	‘stand’
tsikalẹ̀	/ʃīkālɛ̀/	‘sit’
dàkún	/dàkṹ/	‘kneel’
nanara	/nānārā/	‘lie’
sùn	/sũ̀/	‘sleep’
lọ́lá	/lɔ́lá/	‘dream’
rè	/rè/	‘go’
bú	/bú/	‘abuse’
jà	/ʤà/	‘fight’
kpè	/kpè/	‘call’
rán	/rã́/	‘send’
gín	/gĩ́/	‘say’
bírọ̀	/bírɔ̀/	‘ask’
kọ̀kọ̀	/kɔ̀kɔ̀/	‘refuse’
fẹ́	/fɛ́/	‘like’
fẹ́	/fɛ́/	‘want’
sọ̀nọ̀	/sɔ̀nɔ̀/	‘lose something’
sere	/sērē/	‘gather things’
nẹ́	/nɛ́/	‘get’
jí	/ʤí/	‘steal’

gbà	/gbà/	‘take’
gbé	/gbé/	‘carry’
múghàn	/múɣã̀/	‘Show’
múgbẹ́	/múgbɛ́/	‘give’
tà	/tà/	‘sell’
nẹ̀	/nɛ̀/	‘choose’
rà	/rà/	‘buy’
san	/sã/	‘pay’
kà	/kà/	‘count’
kpén	/kpɛ̃́/	‘divide’
tán	/tã́/	‘finish’
mú	/mú/	‘catch’
tàlùgbẹ̀	/tàlùgbɛ̀/	‘shoot’
kpa	/kpā/	‘kill’
fàghò	/fàɣò/	‘skin/flay’
sè	/sè/	‘cook’
dẹ́n	/dɛ̃́/	‘fry’
sọn	/sɔ̃̄/	‘roast’
gún	/gṹ/	‘pound’
lọ	/lɔ̄/	‘grind’
dà	/dà/	‘pour’
sọ	/sɔ̄/	‘throw’
gbá	/gbá/	‘sweep’
jó or sọn	/ʤó/ /sɔ̃̄/	‘burn’
run	/rū̃/	‘extinguish’
ban	/bã/	‘plait’
sẹ	/sɛ/	‘sew’
mú ẹ̀wù ni	/mú# ɛ̀wù# ni/	‘put on clothes’
bọ́ átsọ	/bwáʃɔ̄/	‘take off clothes’
fò	/fɔ̀/	‘wash things’
gùe	/gwɛ̀/	‘wash body’
ràghà	/ràɣà/	‘wring clothes’
gúógbè	/gwɔ́gbɛ̀/	‘pull’
tìn	/tĩ̀/	‘push’
lù ògùmè	/lwògùmɛ̀/	‘beat drum’
kpa ẹsétè	/kpā#ɛ̄sétè/ [kpɛ̄sétè]	‘break pot’
tsé egin	/ʃɛ́#egĩ/ [ʃégĩ]	‘break firewood’
gbén	/gbɛ̃́/	‘tear’
wànà	/wànà/	‘split’
lùghò	/lùɣò/	‘pierce’
gù òlò	/gù # ɔ̀lɔ̀/[gwɔ̀lɔ̀]	‘dig’
gbèn eso egin	/gbɛ̃̀#èso#egĩ/[gbɛ̃̀swegĩ]	‘sow seeds in hole’
rì	/rì/	‘bury’
kọ́	/kɔ́/	‘build house’
ma	/mā/	‘mould’
tse	/ʃē/	‘make’
din okùn	/djjkũ̀/	‘tie rope’

bọ́	/bɔ́/	‘untie’
dé ẹ̀wò	/dé # ɛ̀wò/[dwɛ́wò]	‘cover a pot’
rú ẹ̀kùn	/rú#ɛ̀kũ̀/[rwɛ́kũ̀]	‘open door’
se	/sē/	‘close’
gbè	/gbè/	‘be rotten’
rùn	/rũ̀/	‘smell’
wú	/wú/	‘swell’
fòfò	/fòfò/	‘blow with mouth’
jù	/ʤù/	‘blow of wind’
bòghò	/bɔ̀ɣɔ̀/	‘surpass’
kàni ubo	/kàni # ubo/[kànūbō]	‘dwell’
kójō	/kóʤɔ̄/	‘gather’
dání	/dání/	‘hold’
wá	/wá/	‘come’
lùdẹ̀	/lùdɛ̀/	‘return’
gún	/gṹ/	‘arrive’
wò	/wɔ̀/	‘enter’
gùn	/gũ̀/	‘climb’
tsálẹ̀	/ʃálɛ̀/	‘descend’
tsubu	/ʃūbū/	‘fall’
rèn	/rɛ̃̀/	‘walk’
sá	/sá/	‘run’
fò	/fò/	‘fly’
bòghò	/bɔ̀ɣɔ̀/	‘pass by’
jùbòghò	/ʤùbɔ̀ɣɔ̀/	‘turn around’
lèlè	/lèlè/	‘follow’
tsọ́n	/ʃɔ̃́/	‘look’
gbọ́	/gbɔ́/	‘hear’
gbèwoto	/gbɛ̀wɔ̄tō/	‘touch’
mà	/mà/	‘know’
tìgbì	/tìgbì/	‘remember’
gbègbe	/gbɛ̀gbē/	‘forget’
rò	/rò/	‘think’
kó	/kɔ́/	‘learn’
rín	/rĩ́/	‘laugh’
son	/sɔ̃̄/	‘weep’
ko	/kɔ̄/	‘sing’
jó	/ʤó/	‘dance’
ṣeré	/ʃēré/	‘play games’
bèrù	/bɛ̀rù/	‘fear’
kín	/kĩ́/	‘greet’

APPENDIX 2: STORIES

Story 1: Why the Crab Is Headless

//ìtà jè/ jè/ mó k͡pā ɣɛ́rɛ́ɣɛ́rɛ́ mó kà k͡pà nóríɣìdìbì bírí āɣã̄ ɛ̄rã̧ edʒúkɛnɛkú tō tā rí nábjomi/ ɔ̄lɔ́gwáɣã̄ nómī kà gĩ́ ww fɛ́ móríɣō g͡bɛ́ āɣã̄ ɛ̄rã̄ tō bó ō wábjómī ɣã̌/ ó kā dírā tó wāá g͡bà móríɣō g͡bɛ́ āɣã̄ ɔ̀kɔ̀kã̀/ ɔ̄dʒɔ́ ʃɔ́gwá g͡bà tó ó kà ʃɔ̄dʒɔ́ tág͡bǎ móríɣō g͡bídìbì/ ōwĩ̄dé g͡bá rè g͡bà bɔ́lɔ́gwá tō fɛ́ móríɣō g͡bídé/ ó kà móríɣō g͡bídé/ ó ʃārājíjɔ̃̀ g͡bídé g͡bá dʒó g͡bá jí bùtɛ̀ bùtɛ̀/ g͡bá dàkk g͡bɛ́ ɛ̄ g͡bá gí wō dɔ́kpɛ́/ īrā tīdé g͡bà bɔ̀ɣɔ̀ kúrò/ á kà k͡pjã̀ ōmírɛ̃̀ mírɛ̃̀ g͡bá móríɣō g͡bá ɣã̄ kɛ́rɛ̃̀/ ɔ̄dʒɔ́ tá g͡bà móríghō g͡bídìbì g͡bā tó/ ōwũ̄ ìdìbì g͡bá k͡pjūdʒó/ g͡bá k͡pjùlù dá ā wá bówũ̄ dʒó/ dɛ̄rɛ́ kē é/ e dè dá móríɣō g͡bɛ́ ɛ̄ kúrò dé sī dʒó g͡bá jɔ̀ g͡bà rūbō tá kélè wá móríɣō g͡bɛ́ ɛ̄ wé/ ō wínɔ́ rè g͡bá dʒó/ g͡bá jálūbō dēdē g͡bá rúkōmī/ ōmī wé kà rùkù g͡bā á túbō tōlɔ́gwá tō fɛ́ móríɣō g͡bɛ́ ɛ̄ wé ɣā/ ōww g͡bá gĩ́ nīké dà ʃí/ nēsɛ̃́ wínɔ́ kɔ̃̀ núbō dēdē g͡bómī wé g͡bá rúkù wá wéwé/ ā g͡bá gĩ́ g͡bɛ́ ɛ̄ gĩ́/ wúwū gĩ́ wō fɛ́ móríɣō g͡bídìbì/ ìdìbì wé kɔ̃ núbō dēdē gbá rúkōmī wé/ e búrú/ mō wínɔ́ dě/ ídíbí báɣã̄ tō gbá bó ō dʒó gbá rè gbā túbō tɔlɔ́gwá tō wá móríɣo ɣbɛ́ ɛ̄ wé ɣā/ ōwũ̄ ɔ̄lɔ́gwáɣã̄ g͡bá bírɔ̀ gĩ́ nīké dà g͡bíɣã̌ dēdē ʃí/ wē tē g͡bōríɣō wō wínɔ́ jālūbō dēdē g͡bá rúkōmī g͡bá tjjbō dēdē tí mê g͡bà nárātútũ̀ dʒūwɛ́rè//

//tērí wō fɛ́ móríɣō g͡bɛ́ rɛ̄/ ōwũ̄ ɔ̄lɔ́gwá g͡bá gĩ́, tērí gĩ́ mō fɛ́ móríɣō g͡bɛ́ rɛ̄ wō g͡bá dʒó g͡bá jālūbō dēdē g͡bá rúkōmī wé/ mê tè móríɣō g͡bɛ́ rɛ̄ wō wínɔ́ jálūbō dēdē/ bí wō wínɔ́ dʒó g͡bá rúkōmī wé dēdē, mō mā móríɣō g͡bɛ́ rɛ̄ kédɛ̀ nīké sí wá ʃí/ wā lémī kwórí ūbō tī mó ɣā/ tērɛ́rɛ̃̀ rè me nóríɣō tī má mú g͡bɛ́ rɛ̄ dʒūwérɛ̀/ ōwũ̄ ìdìbì g͡bá ʃēbìnɔ́ g͡bà rè/ kwɔ́dʒɔ́rɛ̃̀ g͡bà rè/ ō wũ̄ ré ʃē tìdìbì ê g͡bà nóríɣō/ tōrí gĩ́ īrā tá g͡bā fɛ́ móríɣō g͡bɛ́ ɛ̄/ ê dè dá móríɣō g͡bɛ́ ɛ̄ kúrò dê sī wínɔ̄ dʒó g͡bá rè/ ējí kà ʃērũ̄ tê dʒɛ́ dídìbì nóríɣō/ ītā jè//

Story 2: Why the Tortoise Has an Uneven back

//ìtà jè/ jè/ mō fɛ́ k͡pārɔ́ tó lèɣèjĩ̀ ólūkúmɛ̀ g͡bā ʃē kótí kōtī/ nīrá gídídʒɛ̄ tó bɔ̀ɣɔ̀/ á kà rí gĩ́ ōnírɔ̀kã̀ tāg͡bá fɛ́ ʃùgè nédʒɔ́rɔ̃̄ nɔ́ɣɔ̃́/ ɔ̄nɛ̄ tó k͡pjùgè wé/ gĩ́ dáɣã̄ ēg͡bélókō tō ʃíbɔ̀ ɣã̌ dēdē bírí ɛ̄rã̄ mírɛ̃̀ mírɛ̃̀ gĩ́ dáɣã̄ wá ʃùgè/ ēg͡bélókō ɣã̌ bɛ́rã̄ ɣã̌ tō ʃíbɔ̀ kà fōrídʒɛ́ gĩ́ āɣã́ wá rè/ ólūkúmɛ̀ ká ʃɔ̀kã̀ nébwērã̄ tō gĩ́ wã́ báɣã̄ rè/ ɔ̄dʒɔ́ tág͡bā fɛ́ rè g͡bā tó/ ā g͡bá rí gĩ́ āɣã̄ fɛ́ rè/ ólūkúmɛ̀ kà gĩ́ teri wee wewe ti won gba a mimi re teri gin weenika tó g͡bà némí fò g͡bā rūbō tá kèlè fɛ́ ʃúgè wé/ ōwũ̄ ō g͡bá bjāɣã́ ēg͡bélókō tó ʃíbɔ̀ dá ā tɔ̄rīká g͡bɛ́ ólūkúmɛ̀/ tōrí ká tá tɔ̄rɔ̄ g͡bólūkúmɛ̀ ɣã/ āɣã̄ e ʃãɣēdʒɔ́kã̀/ ó kà lèɣè ólūkúmɛ̀ g͡bā dʒɔ̀lɔ̀ sɛ̃̀gwà/ g͡bā mɔ́ sɛ̃̀gwà dʒwāɣã̄ dēdē tō ʃíbɔ̀ tōríká rō īká tó wáɣō ēdʒú kɛ́nɛ́kú tō rɛ̃̀/ dá ɣã̄ é sì rè ké/ ólūkúmɛ̀ kà gĩ́g͡báɣã̄ ēg͡bélókō tō ʃíbɔ̀ gĩ́/ bɛ́nɛ̄ wínɔ́ rè wé/ ójēlé dɛ́nɛ̄ gbàk͡pùdʒà tā g͡bà k͡pjènɛ́/ ēgbélékō ɣã tō ʃíbɔ̀/ ã̄ e kpè núrũ̄kúrũ̄/ āɣã́ kà gĩ́ g͡bólūkúmɛ̀ dó ō g͡bàk͡pùdʒà tō wu/ ólūkúmɛ̀ g͡bá gĩ̄/ tēnɛ̄ wínɔ́ rè wé/ àk͡pùdʒà mī ré ʃē tāɣã̄dēdē/ āɣã́ fōrídʒɛ́ kɛ́ rɛ̃̀ gĩ́ ɛ́rɛ̃̀ ré ʃē àk͡pùdʒólūkúmɛ̀/ aɣã g͡ba fo g͡ba tobo ta kele fɛ ʃuge we/ aɣã g͡ba towe/ ɔ̄nɛ̄ tō múk͡pè g͡bá ɣã dáɣã̄ bówũ̄ ʃùgè wé g͡bá kwódʒɛ̀ bómī ʃí g͡bá gĩ́ dáɣã̄ dʒɛ̄ g͡bá gĩ́ dáɣã̄ jɔ̀ bó kwódʒɛ̀ bómī bɛ́mɔ̄ ʃóríɣīmɛ́dʒɛ̀/ ó kà gĩ́ g͡báɣã̄ gĩ́/ ējíwé tāɣã̄ dēdē rɛ̃/ólūkúmɛ̀ ka g͡bedʒu rurarɛ/ g͡bà ʃɛ́g͡ gĩ́ ólūkúmɛ̀ má dʒɛ̄ tōrō kúrò/ á wá kó tāɣã̄ wá/ ōwũ̄ ólūkúmɛ̀ g͡bá dʒɔ̄lārá ʃí g͡bá dʒɔ̀lɔ́ dʒó g͡bá dʒɔ̀dʒɛ̀ wé, g͡bá dʒ̄ɛ tã́/ bó dʒɛ̄ kúrò ēg͡bélékō ɣã tō ʃíbɔ̀ wínɔ́ dè dã módʒɛ̀ tāɣã̄ wá/ tāɣã́ sì g͡bɔ́ kà ʃē gĩ́ ɔ̄nɛ̄ tó k͡pjùgè wé gĩ́ ùgè wé tã́ rɛ̃́/ ó kà ʃērũ̄ tó ʃèbīnɔ́ gbáɣã̄ tō síbɔ̀ ɣã tōrí āɣã̄ ê rjɔ́dʒɛ̀ bɛ́mɔ̄/ āɣã́ kà wínɔ́ ʃébìnɔ́ ke g͡bā gĩ́ dólūkúmɛ̀ dō míká tá tɔ̄rɔ̄ g͡bɛ̂ jídɛ̀/ ōwã̄ɣã́ g͡bà g͡bìká ɣã̄ kwárólūkúmɛ̀/ólūkúmɛ̀ ká dɔ̄nɛ̄ tê níká tō g͡bā fò g͡bà wá nálɛ̀ dʒūwɛ̄rɛ̀/ ōwũ̄ kē g͡bá gĩ́ g͡báɣɔ̃̀kã̀ gĩ́/ tūwō wínɔ́ rè wé wō kā gĩ́ g͡bájā mī bɔ́tɔ̃́ mī ɣã̌ bāɣã̄ tó ʃūkũ̄ mī gĩ́ dáɣã̄ fɛ́ rũ̄ tó rɔ̀ tō wúlí tê wínɔ́lē dáɣã̄ kó ʃúbō dówũ̀ g͡bà némí fò ʃí/

/āɣã̄ tó ʃūkũ̄ rō bájā rō bɔ́tɔ̃́ rō ɣã̌ g͡bá kwárārō g͡bá tò márā/ āɣã́ ʃē ʃē ʃē āɣê némí ʃē dárólūkúmɛ̀ g͡bá ʃē bótéɣā ʃí/ ɛ́rɛ̃̀ ré ʃē tág͡bà riF gĩ́ kwɔ́dʒɔ́ rɛ̃̀ g͡bà rè/ ólūkúmɛ̀ ká dɛ̄rã̄ tɛ̀jĩ̀ rê ʃē k͡pērēk͡pērē/ g͡bà dɛ̄rã̄ tɛ̀jĩ̀ rō dēdē ʃē kótíkōtī/ ējí ré nɛ́ tɛ̀jĩ̀ ólūkúmɛ̀ g͡bà ʃē kótíkōtī/ ìtà jè/ jè//

APPENDIX 3: FITTED LINE PLOTS OF H TONED UTTERANCES FOR ALL SPEAKERS

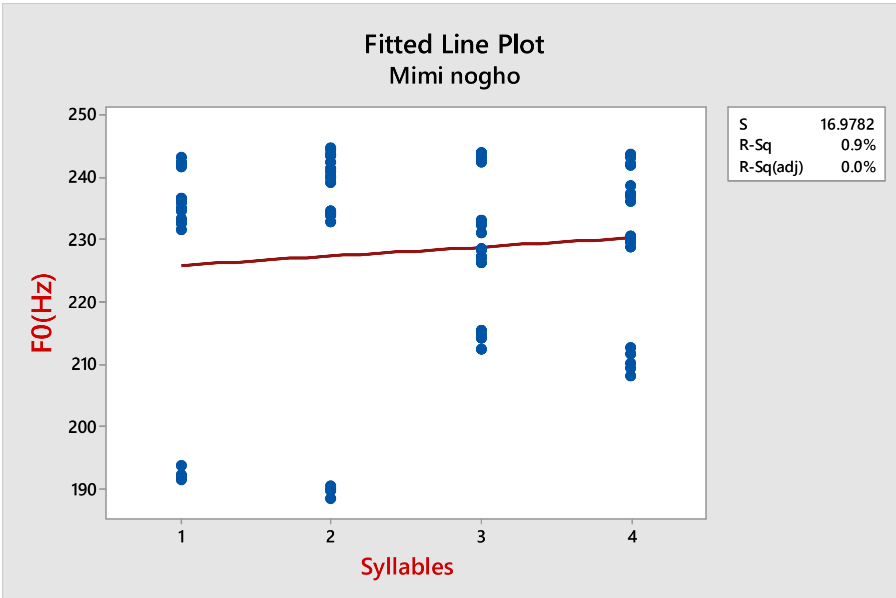

Fig. 1. Fitted line plot for *Mímí nóghó* 'Mimi has money'

Regression summary for *Mímí nóghó* 'Mimi has money'

Coefficients:

Terms:	value	p-value
Constant	224.54	0.000
x	1.45	**0.394**

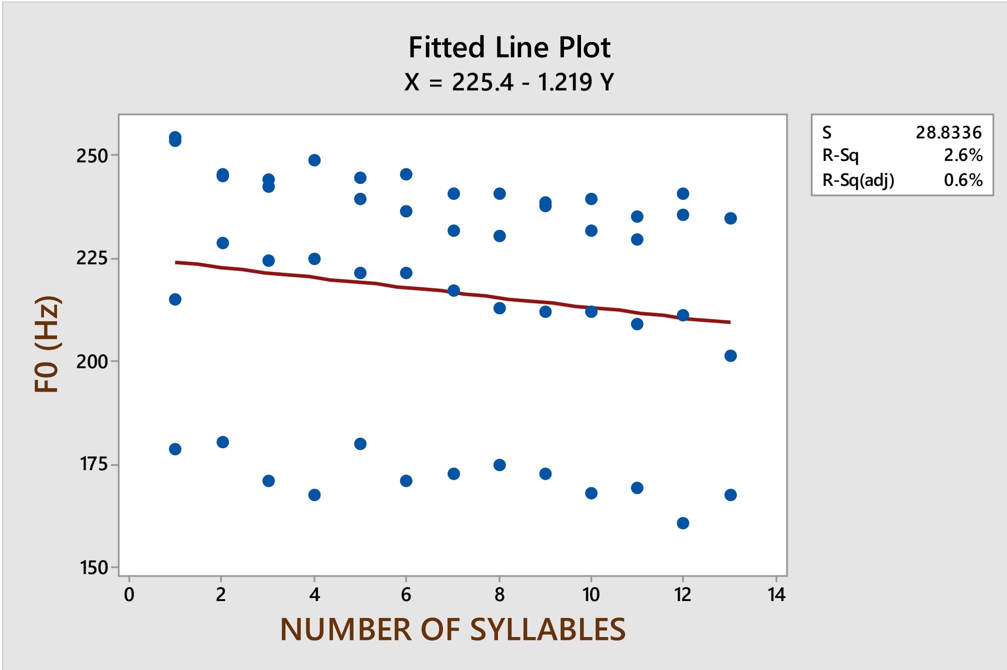

Fig. 2. Fitted line plot for *Tuọ́kpẹ́ wúlí gbá rúwé* ‘Tuọ́kpẹ́ is reading at home.’

Regression summary for *Tuọ́kpẹ́ wúlí gbá rúwé* ‘Tuọ́kpẹ́ is reading at home’

Coefficients:

Terms:	value	p-value
Constant	224.4	0.000
x	0.825	**0.304**

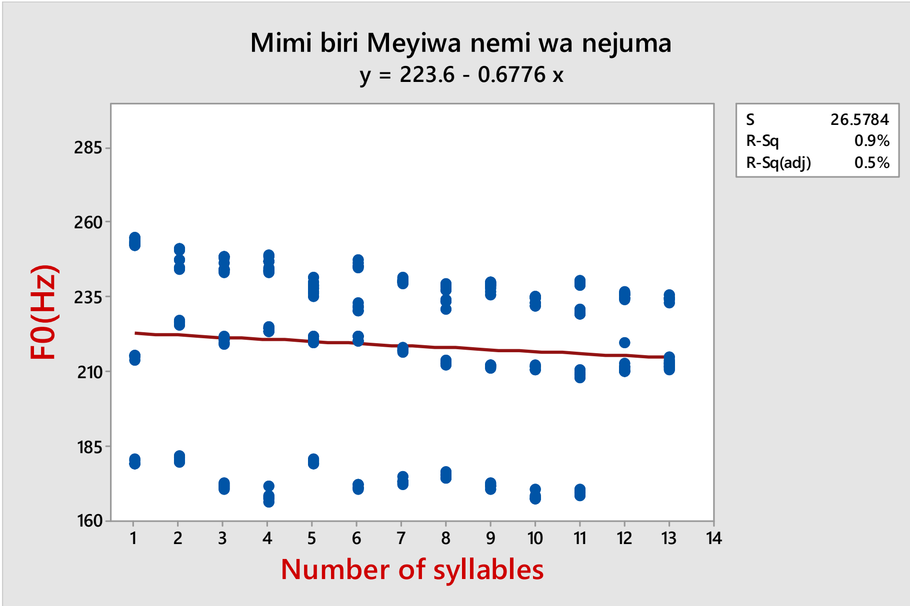

Fig.3. Fitted line plot for *Bíbí bírí Méyíwá némí wá néjúmá* 'Bíbí and Méyíwá can come tomorrow'

Regression summary for *Bíbí bírí Méyíwá némí wá néjúmá* 'Bíbí and Méyíwá can come tomorrow'

Coefficients:

Terms:	value	p-value
Constant	223.63	0.000
x	0.678	**0.135**

APPENDIX 4: PITCH TRACKS, GRAPHS AND REGRESSION ANALYSIS FOR THE L TONE MEDIUM AND LONG SENTENCES

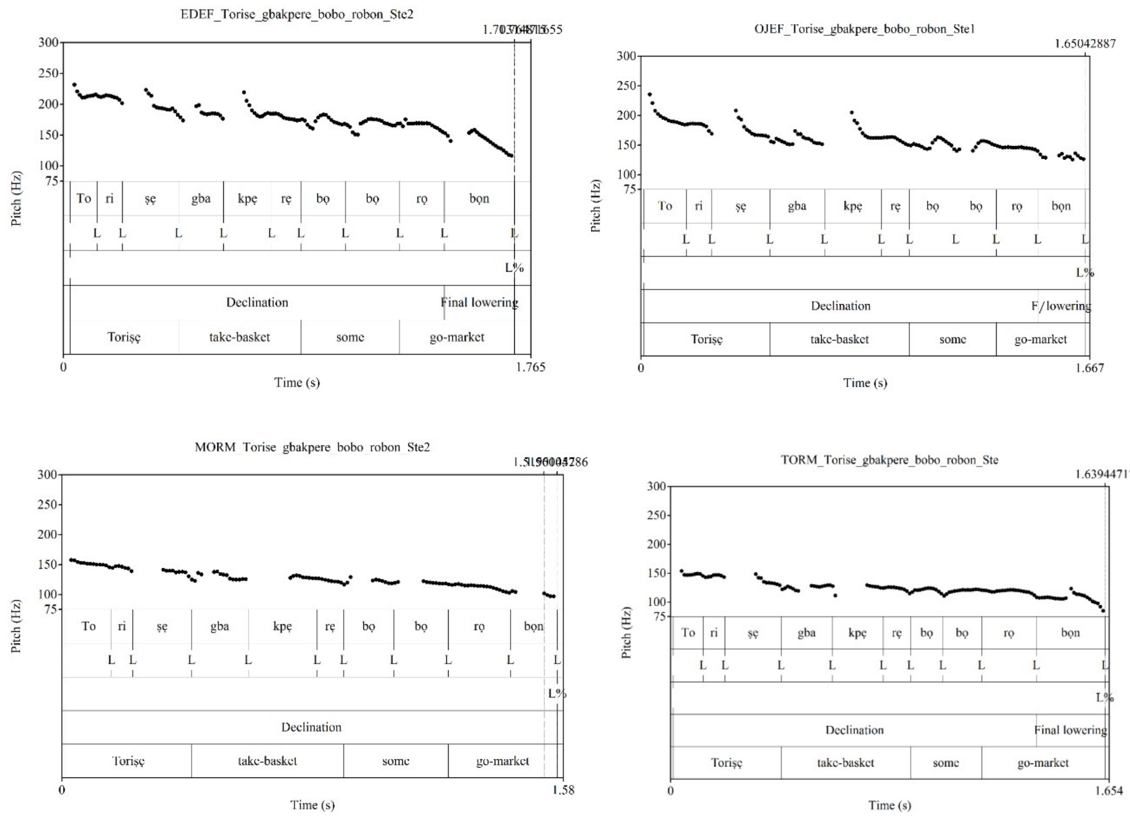

Fig.4. Pitch tracks of the all low toned sentence *Tòrìsẹ̀ gbàkpèrè bọ̀bò ròbọ̀n* ‘Tòrìsẹ̀ take some baskets to the market’

Table 1. F_0 values and the differences between positions of four speakers for *Tòrìsẹ̀ gbàkpèrè bò̀bò ròbọ̀n* 'Tòrìsẹ̀ take some baskets to the market'

SPEAKERS:		EDEF		OJEF		MORM		TORM	
		F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.
Syllable	**Tone**								
To	**L**	210.28		184.19		144.72		144.96	
ri	**L**	201.43	8.85	168.75	15.44	139.03	5.69	142.8	2.16
ṣẹ	**L**	181.66	19.77	158.69	10.06	125.16	13.87	125.24	17.56
gba	**L**	173.43	8.23	150.62	8.07	124.72	0.44	119.25	5.99
kpẹ	**L**	176.49	-3.06	161.68	-11.06	126.71	-1.99	111.19	8.06
rẹ	**L**	173.46	3.03	149.33	12.35	116.98	9.73	114.66	-3.47
bọ	**L**	159.56	13.9	141.2	8.13	116.28	0.7	112.64	2.02
bọ	**L**	148.36	11.2	140.02	1.18	116.92	-0.64	110.59	2.05
rọ	**L**	153.55	-5.19	139.26	0.76	102.74	14.18	108.86	1.73
bọn	**L**	116.31	37.24	124.89	14.37	96.69	6.05	85.06	23.8

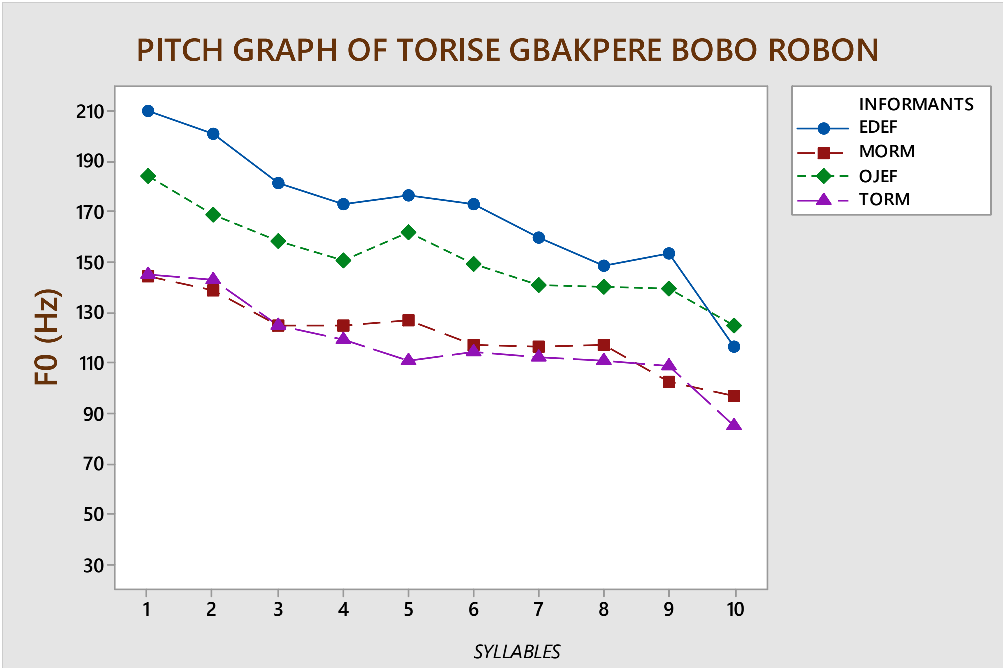

Fig.5. Pitch graph of *Tòrìsẹ̀ gbàkpèrè bȍbò ròbọ̀n* 'Tòrìsẹ̀ take some baskets to the market'

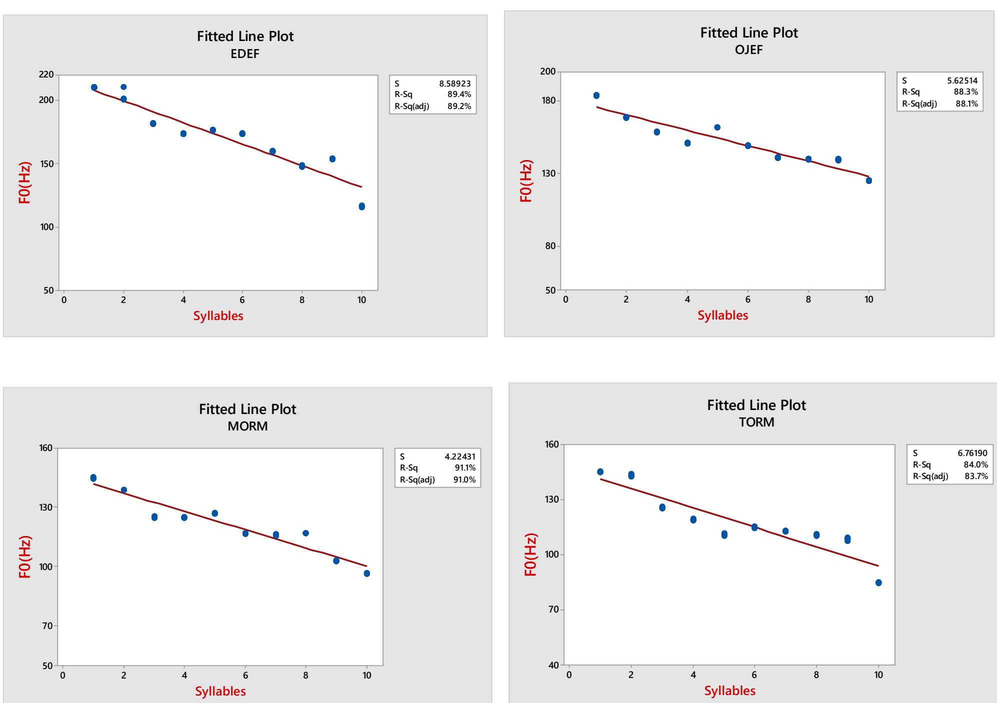

Fig.6. Fitted line plot for *Tòrìsẹ̀ gbàkpèrè bȍbò ròbọ̀n* 'Tòrìsẹ̀ take some baskets to the market'

Table 2. Regression summary for *Tòrìṣẹ̀ gbàkpẹ̀rẹ̀ bọ̀bọ̀ rọ̀bọ̀n* ‘Tòrìṣẹ̀ take some baskets to the market’

Coefficients:

	EDEF		OJEF		MORM		TORM	
Terms:	equation	p-value	equation	p-value	equation	p-value	equation	p-value
Constant	216.5	0.000	181.0	0.000	146.5	0.000	146.7	0.000
Y	-8.506	**0.000**	-5.282	**0.000**	-4.620	**0.000**	-5.283	**0.000**

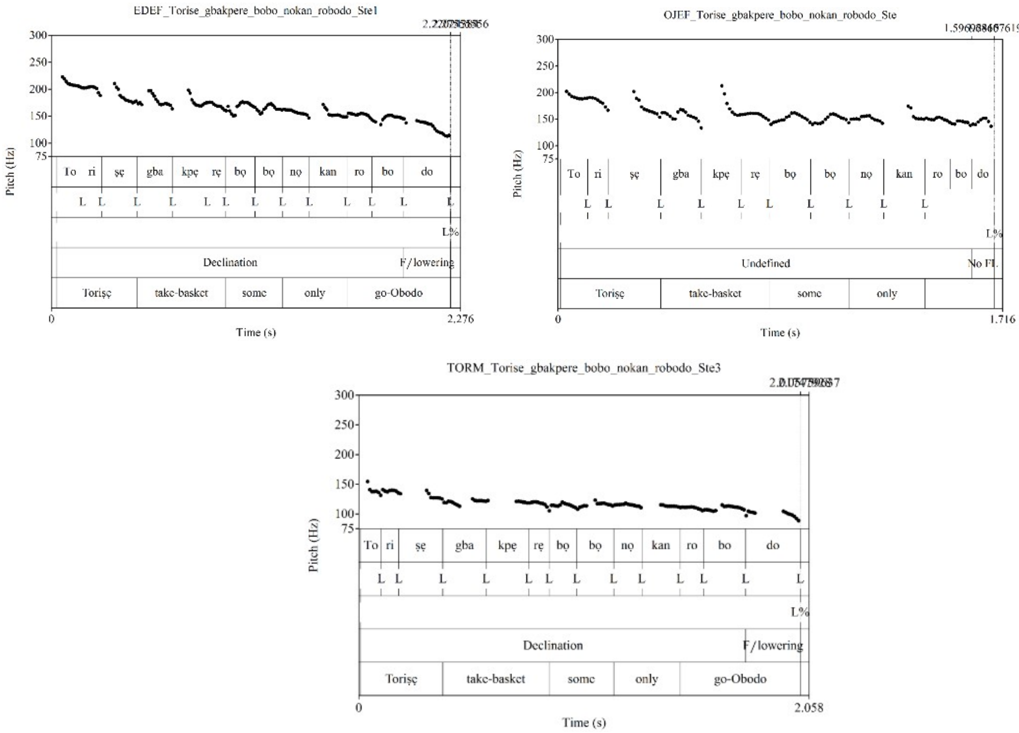

Fig.7. Pitch tracks of the all low toned sentence *Tòrìsẹ̀ gbàkpèrè ọ̀kàn nọ̀kàn ròbòdò* 'Tòrìsẹ̀ take only one basket to Obodo'

Table 3. F_0 values and the differences between positions of four speakers for *Tòrìsẹ̀ gbàkpèrè ọ̀kàn nọ̀kàn ròbòdò* ‘Tòrìsẹ̀ take only one basket to Obodo’

SPEAKERS:		EDEF		OJEF		TORM	
		F_0 (Hz)	Diff.	F_0 (Hz)	Diff.	F_0 (Hz)	Diff.
Syllable	**Tone**						
To	**L**	202.35		187.85		130.98	
ri	**L**	188.04	14.31	166.67	21.18	133.95	-2.97
ṣẹ	**L**	174.71	13.33	153.46	13.21	122.74	11.21
gba	**L**	163.49	11.22	145.84	7.62	112.62	10.12
kpẹ	**L**	163.49	0	157.02	-11.18	118.39	-5.77
rẹ	**L**	160.36	3.13	144.35	12.67	105.97	12.42
bọ	**L**	149.92	10.44	139.64	4.71	105.18	0.79
bọ	**L**	153.62	-3.7	140.04	-0.4	107.62	-2.44
nọ	**L**	146.4	7.22	142.15	-2.11	110.44	-2.82
kan	**L**	145.4	1	149.41	-7.26	110	0.44
rọ	**L**	143.44	1.96	142.97	6.44	105.33	5.11
bo	**L**	134.27	9.17	138.03	4.942	101.5	3.83
do	**L**	112.65	21.62	136.29	1.738	88.25	13.25

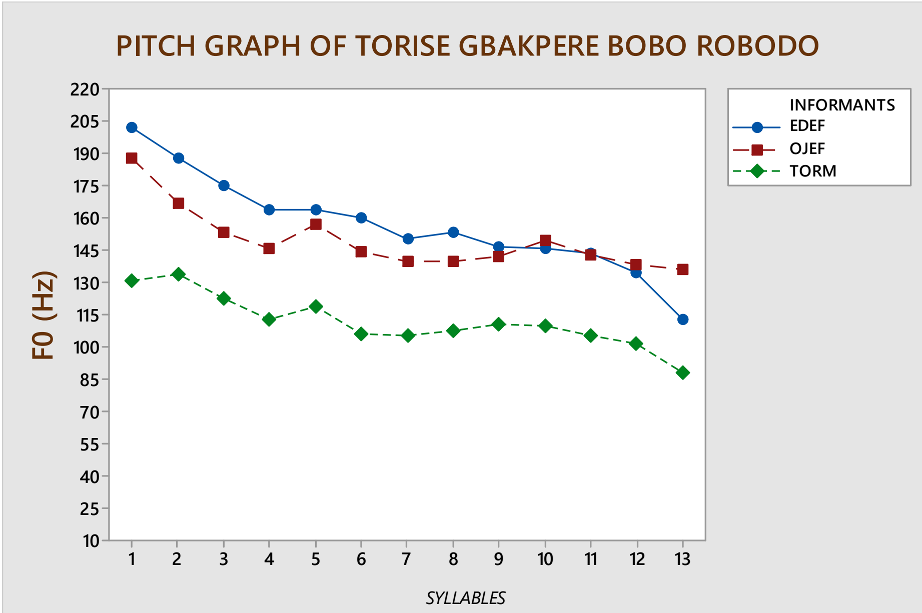

Fig.8. Pitch graph of *Tòrìsẹ̀ gbàkpèrè ọ̀kàn nọ̀kàn ròbòdò* 'Tòrìsẹ̀ take only one basket to Obodo'

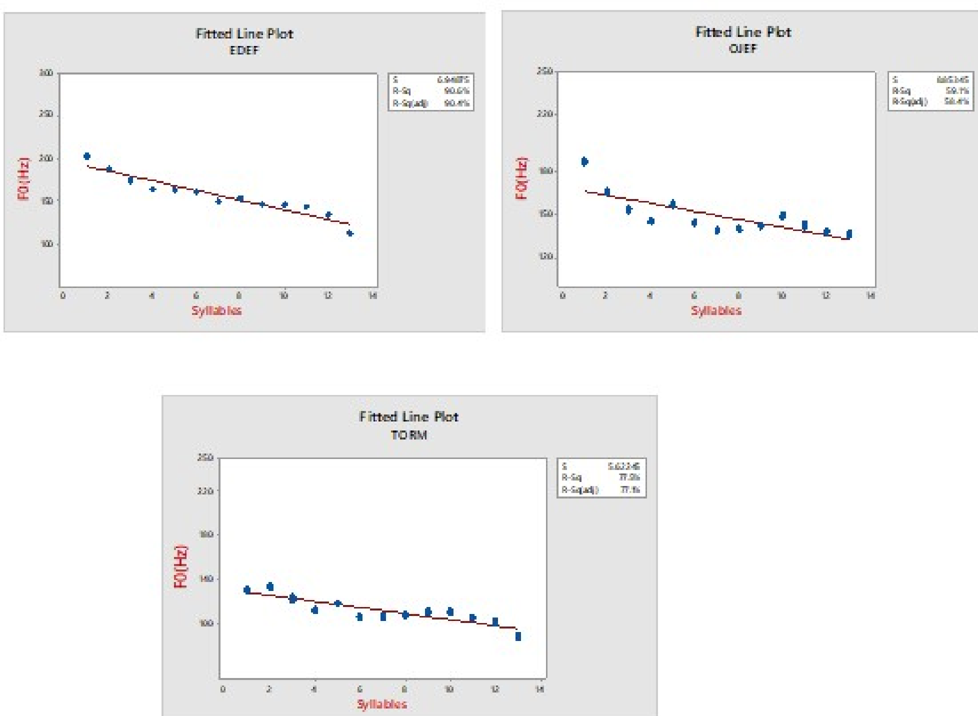

Fig.9. Fitted line plot for *Tòrìsẹ̀ gbàkpèrè ọ̀kàn nọ̀kàn ròbòdò* 'Tòrìsẹ̀ take only one basket to Obodo'

Table 4. Regression summary for *Tòrìṣẹ̀ gbàkpẹ̀rẹ̀ bọ̀bọ̀ ròbòdò* ‘Tòrìṣẹ̀ take some baskets to Òbòdò’

Coefficients:

	EDEF		OJEF		TORM	
Terms:	equation	p-value	equation	p-value	equation	p-value
Constant	196.6	0.000	169.17	0.000	130.96	0.000
Y	-9.673	**0.000**	-7.8	**0.000**	-7.744	**0.000**