

Depressor Consonants in Gengbe: A Phonetic and Phonological Survey

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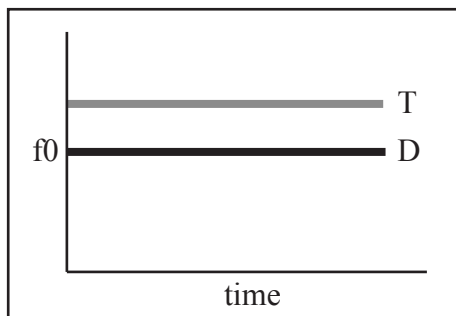
Overview

- Background on depressor consonants and phonologization
- Phonetic and Phonological Data from Gengbe
- In Gengbe, depressor effects are not uniform across different morphological domains.
- Specifically, nouns and verbs differ as to what onset types they treat as depressors.

1. Background

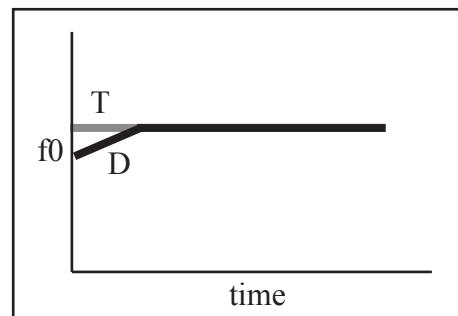
- (1) **Depressor Consonants:** Consonants that trigger lower f₀ (pitch) on adjacent vowels.
 - a. Depressor consonant effects are widespread and depressor consonants are usually voiced obstruents, but they may also be sonorants (Ohala 1973, Bradshaw 2000, Tang 2008).
 - b. Even English uses slight initial f₀ lowering as a voicing cue (Lea 1973, Oglesbee 2008).
- (2) **Two types of phonetic depressor effect: f₀ register (2a) and f₀ contour (2b)**

a. f₀ register: effect persists across the vowel



Korean, Japanese (Oglesbee 2008)

b. f₀ contour: effect localized to the left edge of the vowel



English (Lea 1973, Oglesbee 2008)

- (3) **Phonologization of f₀ register cues**
 - a. Thai disallows voiced stops in the onsets of high tone syllables (Perkins 2011).
 - b. In Kera, the full L-M-H tone contrast is only in syllables with sonorant onsets (Pearce 2005).
 - c. Ansre (1961): Ewe Non-high toneme is realized as L after voiced, and M after voiceless obstruents.
- (4) **Phonologization of f₀ contour cues: Tonal Bifurcation (Hyman 2013).**

a. [+voice] manifests as redundant f₀ cue on left edge of vowel

b. Voiced obstruents trigger Rising rather than High tone

c. Voicing contrast is lost
Contrasting tone remains

/pá/ vs /bá/ → [pá] vs [bǎ] → /pá/ vs. /pǎ/
English (w/o the tone) Ewe, Gengbe Nguni, Shona
(Lea 1973, Oglesbee 2008) (Ansre 1961, Bole-Richard 1983) (Downing 2009)

- (5) **Studying phonologization of f0 cues for voicing**
- When the phonology of a language makes use of and enhances these phonetic cues, distinctions are phonologized.
 - In this area, what is phonetic and what is phonological is not always clear.
 - Requires snapshots of languages in an intermediate stage phonologizing depressor effects.
 - Gengbe, a Gbe language spoken in Southern Togo and Benin, gives us that opportunity.
- (6) **Phonological and Acoustic data**
- Representative acoustic data appear throughout, to illustrate key observations.
 - Pilot data from 1 male speaker recorded in Bloomington, Indiana.
 - Data analysis: Praat (Boersma & Weenink 2016), Prosody Pro (Xu 2013).
 - Presented here: time-normalized f0 tracks to compare across tokens.

2. Depressor consonants in nouns

- (7) **Nouns**
- Most restrictive domain for what counts as a depressor consonant
 - Where we collected the most robust pilot data
- (8) **Evidence for two underlying tonemes: L and H**
- Where tonal minimal pairs exist, non-depressor consonant onsets introduce L vs. H opposition, while depressor consonant onsets introduce L vs. LH opposition (9-11).
 - The distribution of H and LH tone is predictable (12).
- (9) **Controlled environment: monosyllabic nouns in isolation**
- In phrase-initial position, monosyllabic nouns appear with a L tone nominal prefix *e-* or *a-* (the choice of which is lexically determined).
- (10) **Tonal minimal pairs with non-depressor onsets (voiceless obstruents and sonorants)**

	L tone	Gloss	H tone	Gloss
a)	èkpě̀	'whistle'	èkpě́	'cough'
b)	èkò̀	'neck'	èkó	'sand'
c)	àtǎ̀	'nest'	àtǎ́	'apple'
d)	èpǎ̀	'cow'	èpǎ́	'bee'
e)	èmǎ̀	'corn mill'	èmǎ́	'way'
f)	àǎ̀	'stupidity'	àǎ́	'sheep'

- (11) **Tonal minimal pairs with depressor onsets (voiced obstruents)**

	L tone	Gloss	LH tone	Gloss
a)	ègà̀	'metal'	ègà́	'chief'
b)	èdò̀	'sickness'	èdò́	'work'
c)	àdǎ̀	'squirrel'	àdǎ́	'beak'

(12) **Preceding L (as in nominal prefixes) triggers depressor effect, while preceding H does not.**

a. ànígbá + èdòó → ànígbádó
 ‘earth’ ‘work’ ‘earth work’

b. ègbèé + àvùú → ègbèévú
 ‘bush’ ‘dog’ ‘bush dog’

(13) **What counts as a depressor consonant in Gengbe nouns?**

a. Voiced obstruents, including [d], as in (14).

b. Depressor effect disregards following glides and liquid in clusters, as in (14k-l) and (15m-o)

(14) **Depressor onsets (nouns)**

	Onset	Noun	Gloss
a)	[b]	àbòó	‘arm’
b)	[d]	èdòó	‘work’
c)	[g]	ègǎǎ	‘bigness’
d)	[gb̄]	ègbǎǎ	‘buttocks’
e)	[dʒ̄]	èdʒǎǎ	‘bow’
f)	[v]	àvòó	‘cloth/clothes’
g)	[z]	èzǎǎ	‘night’
h)	[β]	èβǎǎ	‘spear’
i)	[h]	èhǎǎ	‘group/variety’
j)	[d]	èdǎǎ	‘dirt’
k)	[gl]	àglòó	‘joy’
l)	[h̄j]	èh̄jǎǎ	‘poverty’

(15) **Non-depressor onsets (nouns)**

	Onset	Noun	Gloss
a)	[t]	àtí	‘tree’
b)	[k]	èkú	‘death’
c)	[kp̄]	èkpá	‘fence’
d)	[ɸ]/[p]	àfá/ápá	‘shout’
e)	[f]	àfí	‘here’
f)	[s]	èsó	‘horse’
g)	[m]	èmú	‘mosquito’
h)	[n]	ànǎ	‘bridge’
i)	[ɲ]	èɲí	‘bee’
j)	[l]	èlò	‘crocodile’
k)	[w]	èwó	‘corn flour’
l)	[j]	àjá	‘air’
m)	[kl]	àkló	‘flat boat’
n)	[fj]	èfjó	‘monkey’
o)	[wl]	èwlí	‘shout’

(16) **Acoustic study result preview**

a. LH tone is coupled with vowel lengthening (18).

b. L tone is lower following a voiced obstruent than following a sonorant

(17) **Nouns: Pilot acoustic study data**

a. 11 vowels

b. 2 tones (L & H)

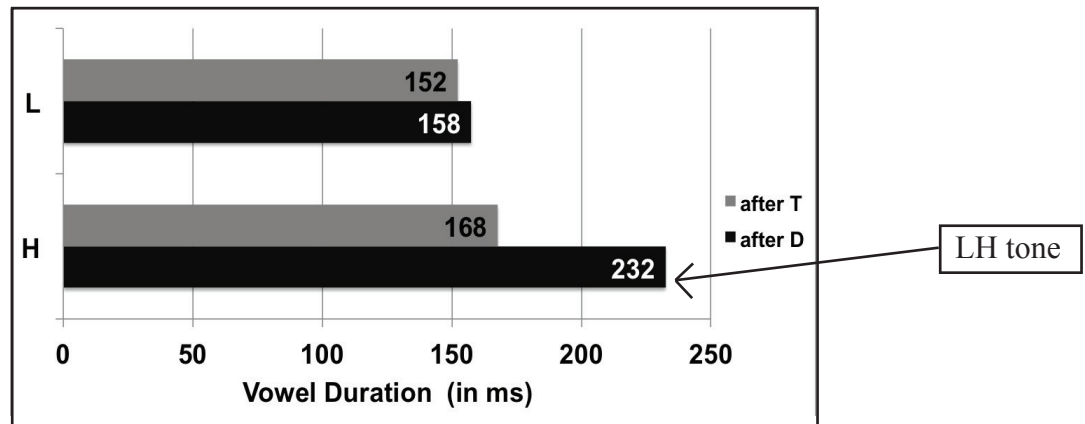
c. 2 onset types (voiceless ‘T’ & voiced ‘D’)

d. 3 contexts (isolation, following H, & following L)

e. 2 repetitions each

f. Total: 264 tokens

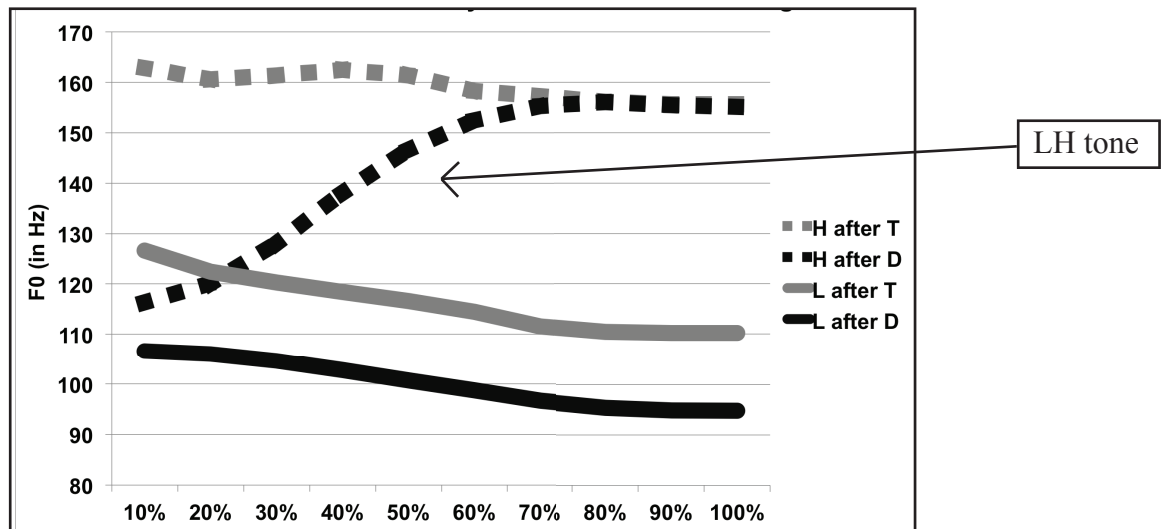
(18) LH vowels are longer than L or H (average of nouns)



(19) Depressor consonants lower f0 register of L tone

- a. Ansre (1961): Non-high toneme in Ewe is realized as L after voiced and M after voiceless obstruent.
- b. A strategy found in Korean and Japanese: f0 register as a voicing cue (Oglesbee 2008).
- c. Different literatures treat this phenomenon as phonetic or phonological.

(20) Noun L and H tone-average of time normalized f0 curves



3. Depressor consonants in verbs

(21) Verbs

- a. Allows more onset types to count as depressor consonants
- b. Gives us a controllable phonological frame to study depressor consonants followed by level H tone

(22) In what environments do we see verbs with LH tone?

- a. In non-phrase initial environments, all H tone verbs regardless of onset type, are realized as H.
- b. In phrase-initial environments, H tone verbs with depressor consonant onsets are realized as LH, while others are realized a H (Interaction with an initial boundary L tone).
- c. Unlike the nominal system, verbal tone treats sonorants and consonant-liquid clusters as depressor consonants.

Non-Phrase-Initial	Phrase-Initial
<p><u>(23) Predication</u></p> <p>a. mǔ kpó òtísi I see lime 'I saw a lime.'</p> <p>b. mǔ bú òtísi I lose lime 'I lost a lime.'</p> <p>c. mǔ ṣá gòṁèḍḍèḍḍèé-á I know beginning-the 'I know the beginning.'</p>	<p><u>(24) Citation</u></p> <p>a. kpó see 'to see'</p> <p>b. bùú lose 'to lose'</p> <p>c. ṣáá know 'to know'</p>
<p><u>(25) Plural Imperative (overt subject)</u></p> <p>a. mǐ tú èhòtrú youPL close door 'Close the door, you all!'</p> <p>b. mǐ vá youPL come 'Come, you all!'</p> <p>c. mǐ lé úsù-à youPL arrest man-DEF 'You all arrest the man!'</p>	<p><u>(26) Singular Imperative (no overt subject)</u></p> <p>a. tú èhòtrú close door 'Close the door!'</p> <p>b. vàá come 'Come!'</p> <p>c. lèé úsù-à arrest man-the 'Arrest the man!'</p>
<p><u>(27) Reduplication (preposed object)</u></p> <p>a. èlǎ fá~fá meat cool~NOM 'cooling meat'</p> <p>b. èlǎ vó~vó meat decay~NOM 'decaying meat'</p> <p>c. ṣáṣá jó~jó woman call~NOM 'calling a woman'</p>	<p><u>(28) Reduplication (no preposed object)</u></p> <p>a. fá~fá cool~NOM 'cooling'</p> <p>b. vòó~vó decay~NOM 'decaying'</p> <p>c. jóó~jó call~NOM 'calling'</p>

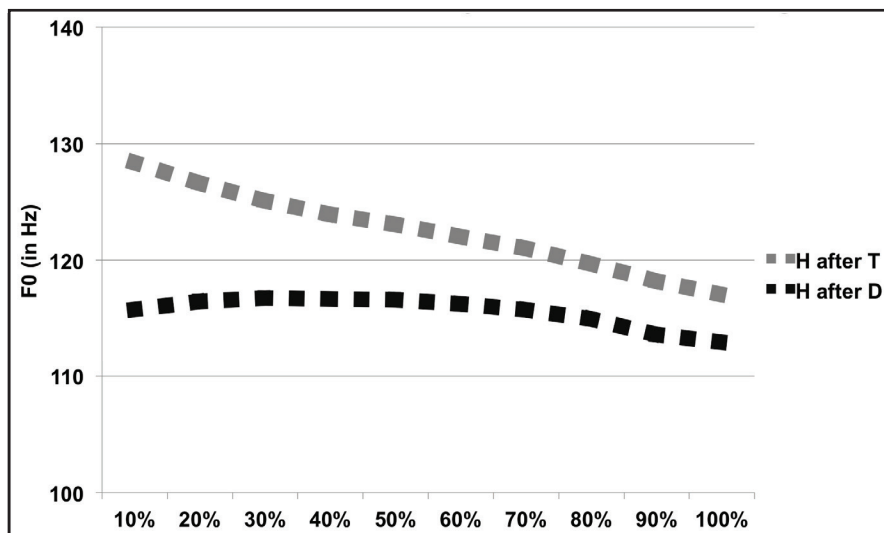
(29) **Verbs: Pilot acoustic study data**

- a. 4 vowels (i, u, a, ã)
- b. 2 tones (L, H)
- c. only H tone: 6 repetitions
- d. Total: 48 tokens

(30) **In non-phrase initial position (where we do not see LH tone), depressor effect lower level H**

- a. Predication gives us a controllable environment to study H tone (not LH) after depressors
- b. Frame: *úsià _____ vò* “The man _____ already.”
- c. Lower f0 in general than noun study because the H is not the first H in the phrase (downstepping)
- d. Suggests depressor effect is present in level H as seen in level L
- e. Strongest effect is after the release of the consonant on the left edge of the vowel

(31) **Verbs level H tone-time normalized f0 curves**



(32) **Consonant Clusters in Verbs**

- a. In nouns, clusters pattern with their initial consonant
- b. In verbs, consonant-glide clusters pattern according to the initial consonant (33).
- c. In verbs, consonant-liquid clusters are always depressors (34).

(33) **Consonant-Glide clusters in verbs (citation form)**

- a. *fjǒ* 'to teach'
- b. *ljàá* 'to climb'
- c. *hǒǒ* 'to need'

(34) **Consonant-Liquid clusters in verbs (citation form)**

- a. *klòó* 'to fade'
- b. *ŋlǒǒ* 'to fold'
- c. *glòó* 'to boast'

(35) **Summary Table of onsets types count as depressors across lexical categories (filled in cells)**

	TV	TLV	TGV	DV	DLV	DGV	NV	NLV	NGV
Nouns									?
Verbs									

T=Voiceless Obstruent, D=Voiced Obstruent, N=Sonorant, L=Liquid, G=Glide, V=Vowel

(36) **Bradshaw's (2000) analysis**

- Bradshaw analyzes the singular imperative in Ewe as formed by a prefixed L tone morpheme that docks with the vowel only when the onset is transparent (i.e. a depressor consonant).
- Non-depressors are opaque and block tone docking.
- We adapt this analysis for Gengbe, but consider the initial L to be a boundary tone.

(37) **Boundary L effect**

a. Non-Depressor Consonant Onset	b. Depressor Consonant Onset
<p>Boundary L —*— H</p> <p style="text-align: center;"> </p> <p style="text-align: center;">kpó</p>	<p>Boundary L — H</p> <p style="text-align: center;"> </p> <p style="text-align: center;">bú</p> <p style="text-align: right;">—————></p> <p style="text-align: right;">LH</p> <p style="text-align: right;"> </p> <p style="text-align: right;">bùú</p>

(38) **Phonologization and Grammaticalization**

- Verbs treat more onset types as depressors than nouns.
- Verbs interact with covert L tone, nouns interact with overt L tone.
- In general, verbs are more prone to grammaticalization as adpositions, auxiliaries, etc.
- The verbal complex is a good place to look for lexical distinctions emerging between H and LH.

(39) **Where H and LH contrast.**

- A case of a boundary tone effect blocked by unpronounced material.

(40) **Jussive**

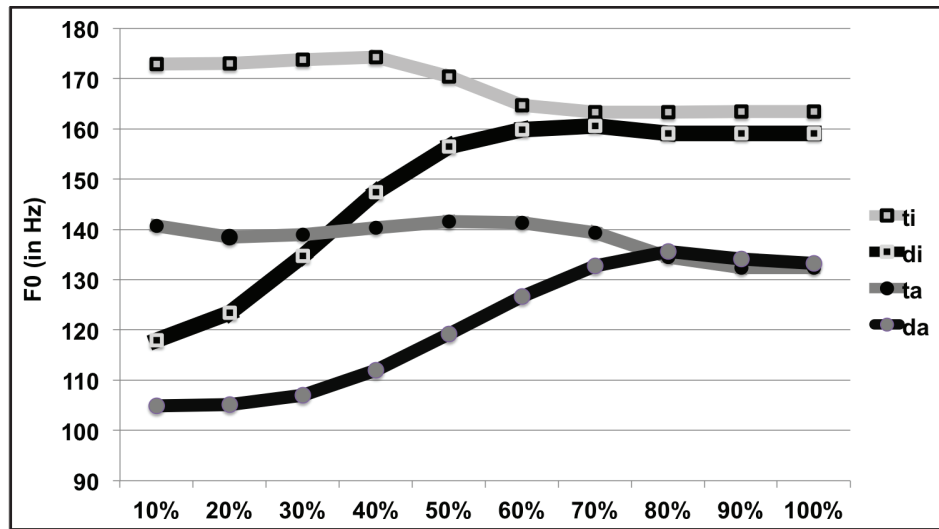
(ná nɛ́) má ɖù nú
 (JUSS MOOD) I.FUT eat thing
 'Let me eat!'

(41) **Future**

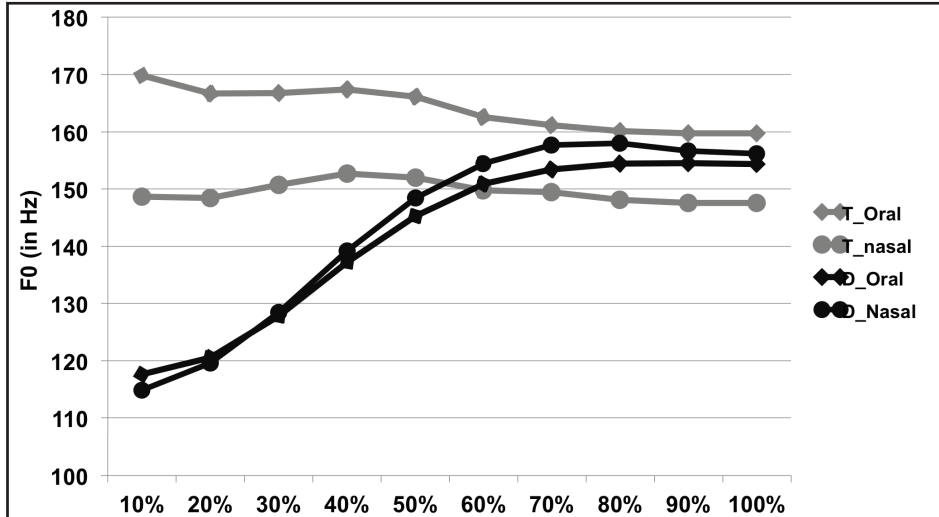
máá ɖù nú
 I.FUT eat thing
 'I will eat.'

4. Additional Data

- (42) **f₀** is present in the signal whenever there is voicing, so it is constantly available as a cue
- It is a cue for vowel height.
 - Where no depressor effect is present, it is a cue for nasality.
- (43) **Higher f₀** corresponds with high vowels



- (44) **Vowel nasality** lowers f₀ in vowels with voiceless onsets



5. Conclusion

(45) f₀ is complex and segmental influence is diverse

- a. Depressor consonants trigger LH tone (with vowel lengthening) in the right environments.
- b. Verbs and nouns differ in what they count as phonological depressor consonants.
- c. Verbs and nouns also differ in whether overt L tone triggers depressor effects.
- d. Depressor consonants effect f₀ register across vowels with level L and H tone.
- e. Vowel nasality, vowel height, and phrase position also effect the surface realization of tone.

(46) Future research

- a. This study is preliminary, we will soon be collecting more data in Togo.
- b. Do sonorants trigger lower register f₀? Since verbs, but not nouns count sonorants as depressors, do we see a difference in L tone register based on lexical category?
- c. What can the depressor behaviour of consonant clusters tell us about syllable structure?
- d. What does variation look like between speakers? Communities? Gbe lects?

Thank You!

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