Chapter 9

A unified account of grammatical tone and length in Gã

Katherine Russell
University of California, Berkeley

In Gã [Kwa: Ghana], several aspectual and modal distinctions are exponed through changes in tone. These grammatical tones may be realized on a subject proclitic, or on a verbal prefix when the subject is not pronominal. Previous analyses of this phenomenon have differed in the representation of the underlying forms: in particular, whether the alternations are suppletive or the result of predictable phonological processes has been a point of discussion. In this paper, I present novel data which sheds light on these processes and propose that the emergence of portmanteau STAMP (Subject, Tense, Aspect, Mood, Polarity) morphs in Gã is fully predictable from regular phonological processes present in the language, including independently motivated vowel hiatus resolution strategies, syllable structure restrictions, and tone association rules. I argue that the STAMP morphs in Gã are best analyzed as derived phonologically from combinations of individual underlying items, where each morphosyntactic feature contributes a distinct phonological component. This analysis is able to account for grammatical distinctions which involve changes in vowel length as well as tone.

1 Introduction

STAMP morphs — portmanteau morphemes which simultaneously expone subject, tense, aspect, mood, and/or polarity features — are common across the Macro-Sudan Belt (Anderson 2016, Garvin et al. 2021). For example, in Degema [ISO:deg, Nigeria] (Kari 2004), the sole difference between affirmative and negative polarity lies in the surface form of the proclitic (1).

Katherine Russell. 2024. A unified account of grammatical tone and length in Gã. In James Essegbey, Brent Henderson, Fiona McLaughlin & Michael Diercks (eds.), *Pushing the boundaries: Selected papers from the 51–52 Annual Conference on African Linguistics*, 185–203. Berlin: Language Science Press. DOI: 10.5281/zenodo.14038747

(1) STAMP in Degema (Kari 2004: p. 130)

a. **me**=tá mú éki
1SG=go to market
'I am going to the market.'

b. **mî**=tá mú éki
1SG.NEG=go to market
'I am not going to the market.'

These morphemes, which exhibit properties of both pronominals and auxiliaries, present an opportunity to examine the interface between phonology and morphology. As an areal property and a vector for furthering understanding of this interface, the properties of STAMP morphs have become a topic of growing interest in the literature (Anderson 2011, 2015, 2016, Konoshenko 2020, Rolle 2022, Felice 2021, Garvin et al. 2021). In many languages with STAMP morphs, the fused pronoun-auxiliary complexes have been grammaticalized and are not synchronically separable. In this paper, however, I present novel data from Gã which sheds light on the formation and synchronic morphophonology of STAMP morphs. This data supports an analysis in which STAMP morphs are derived phonologically from the combination of two individual underlying items: a subject proclitic and the tone, or tones, associated with a particular grammatical specification. The surface form of each combination is predictable from independently motivated phonological phenomena in the language, including vowel hiatus resolution strategies and syllable structure constraints.

The goal of this paper is to present a case of a language in which surface portmanteau STAMP morphs can be decomposed into distinct underlying morphemes and derived using regular language-internal phonological processes. In doing so, two different kinds of suprasegmentals — tone and length — can be analyzed within a single unified account across the language. I begin in Section 2 with background on Gã and information concerning tone and pronominal marking. I turn in Section 3 to discussion of each relevant grammatical specification, focusing particularly on important differences between clauses involving pronominal and non-pronominal subjects. I also introduce new data relating to constructions in which a constituent may intervene between subject and verb, which offer insight into the compositionality of STAMP morphs in the language. In Section 4 I briefly discuss prior analyses of the phenomena I have described in Gã, and assess how their conclusions may accommodate novel data. I then present my analysis in Section 5, in which I demonstrate that the surface forms I have described are fully predictable from regular phonotactics and phonological processes. I note several exceptional forms and point to potential avenues

for future research in Section 6. Finally, I conclude in Section 7, arguing that pronominal and aspect morphemes are synchronically decomposable in Gã, and undergo a process involving deletion and tone reassociation in specific phonological environments.

2 Language background

Gã [ISO:gaa] is a Kwa language spoken by approximately 800,000 people in and around Accra, Ghana (Eberhard et al. 2022). The data presented in this paper comes from a corpus of 5299 sentences collected with native speakers, comprised of data from elicitations and oral narratives. The language makes use of both lexical and grammatical tone (Kropp Dakubu 2002). There is a two-way surface contrast between L and H (Table 1). The tone-bearing unit (TBU) is the mora.[1]

Table 1: L vs. H in Gã

	L	H
Noun	là 'fire'	lá 'blood'
	wù 'husband'	wú 'bone'
Verb	là 'dream'	lá 'sing'
	bɛ̀ 'beckon'	bɛ́ COP.NEG

This two-way surface contrast reflects an underlying three-way distinction between toneless (∅), L and H. This three-way contrast is made clear with verbs once grammatical tone is involved, as toneless verbs pattern with L verbs in some contexts but with H verbs in others (Table 2). In the perfective, which is marked by a floating L tone prefix, toneless verbs pattern with L verbs. However, in the imperative, marked by a floating H tone suffix, toneless verbs pattern with H verbs.

There is evidence for leftward tone association in Gã from the behavior of toneless verbs in imperative contexts. For instance, the verb 'swim' is toneless, and surfaces as L in the perfective (2a). As previously mentioned, the imperative

[1]Generally, more than one tone cannot surface on a single mora in Gã. There are a few lexical exceptions to this generalization, though, and one morpheme-specific exception. Some verbs of the shape CVV surface with a HL contour on the final mora when they appear at the end of an intonational phrase (Kropp Dakubu 2002). In other contexts, they surface simply as H, and there is no evidence of a following floating L tone. Additionally, a H tone directly preceding the progressive marker *Ǹ-* surfaces with a HL contour on a single mora: see (15d).

Table 2: Three-way underlying tonal contrast in Gã

	∅	L	H
Gloss	'come'	'dream'	'ask'
Underlying	/ba/	/là/	/bí/
Perfective	bà	là	bí
Imperative	bá	làá	bí

is marked by a H tone suffix.[2] The H tone of the imperative spreads from right to left, originating from the suffix *-mɔ́* (2b). This tone spreading affects only TBUs which are not underlyingly associated with a particular tone (Kropp Dakubu 2002).

(2) a. kòfí sèlè
Kofi swim
'Kofi swam.'

b. sélé-mɔ́
swim-IMP
'Swim!'

Subject proclitics, below in Table (3), are unspecified for tone, and instead receive their surface tone from elsewhere (Kropp Dakubu 2002).

Table 3: Subject proclitics

	SG	PL
1	ĩ=	wɔ=
2	o=	ɲɛ=
3	e=	amɛ=

These subject morphemes are not agreement markers, but rather proclitics (3) (Campbell 2017). The sentence in (3c), in which the nominal subject is followed by a pronominal prefix on the verb, is ungrammatical for this meaning: instead, it would be interpreted as topicalization of the subject.

[2]The imperative has two allomorphs: following monosyllabic verbs, its exponent is simply a floating H tone, but following disyllabic verbs, its exponent is a segmental suffix *-mɔ́*.

(3) a. **è**=jò
3SG=dance
'She danced.'[3]

b. yòó=ˈé jò
woman=DEF dance
'The woman danced.'

c. *yòó=ˈé **è**=jò
woman=DEF **3SG**=dance
intended: 'The woman danced.'

3 Distinctions made with STAMP morphs

Dakubu (2008) meticulously describes an elaborate set of hierarchical aspect and modality features which comprise Gã verbal morphology, including [+/-REALIS], [+/-VOLITIONAL], and many more. In doing so, she makes reference to cases of what she terms 'segmental deletions and contractions', in which a grammatical prefix to the verb sometimes surfaces as a segmental syllable and sometimes only as the tone of the preceding syllable — in other words, as STAMP morphs. In this paper, I discuss only those grammatical specifications which make up this subset of Gã verbal morphology. Several grammatical contrasts in Gã are made through the use of STAMP morphs, including the perfective, perfect, subjunctive and progressive. The corresponding portmanteau forms of each subject proclitic are provided below in Table (4). Only singular pronouns show alternations in the progressive, so the cells for the plural are left blank.

Perfective forms differ from their perfect counterparts only in tone; all segments are identical. Perfect and subjunctive forms are identical, with the sole exception of the first person singular.

3.1 Perfective

The perfective, used to indicate the completion of an action, takes the form of a floating L tone verbal prefix. The L of the perfective associates to the toneless subject proclitic (4). I use the three verbs 'come', 'dream', and 'ask' throughout to represent toneless, L, and H verbs, respectively.

[3]The third person singular in Gã is not differentiated on the basis of gender. Translations into English reflect the context in which each sentence was elicited.

Table 4: STAMP portmanteau morphs in Gã

	Perfective	Perfect	Subjunctive	Progressive
1SG	ì̀=	ì́=	má=	mí̋í̋=
2SG	ò=	ó=	ó=	òò=
3SG	è=	é=	é=	èè=
1PL	wɔ̀=	wɔ́=	wɔ́=	
2PL	ŋɛ̀=	ŋɛ́=	ŋɛ́=	
3PL	àmɛ̀=	àmɛ́=	àmɛ́=	

(4) a. è=bà
3SG=come
'He came.'

b. è=là
3SG=dream
'He dreamed.'

c. è=bí
3SG=ask
'He asked.'

When the subject is non-pronominal, the effects of the floating L tone are visible. Following a subject with a final H tone, a verb-initial H is realized as downstepped (5b). This downstep results from the floating L of the perfective wedged between the final H of 'Kofi' and the initial H of the verb.

(5) a. è=bí lɛ̀
3SG=ask 3SG.ACC
'He asked her.'

b. kòfí ꜜ**bí** lɛ̀
Kofi ask 3SG.ACC
'Kofi asked her.'

In summary, the exponent of the perfective aspect is a floating L tone prefix on the verb, with no segmental component. When the subject is pronominal, that floating tone associates to the toneless proclitic. When the subject is non-pronominal, the presence of the floating L tone is visible only in between H tones, as it causes downstep.

3.2 Perfect

In perfect contexts, tonal alternations occur on both subject proclitics and verbs. The subject proclitic is always realized as H in the perfect (6). The tone of the verb, on the other hand, is affected by the presence of a floating L tone prefix: as such, the exponent of the perfect can be analyzed as a HL contour tone. The effects of the floating L part of the contour are notable on verbs in which the initial TBU is toneless or H. A toneless verb is realized as L. A H verb-initial TBU is downstepped in the perfect, as an effect of the floating L wedged in between the H pronoun and initial H of the verb (6c).

(6) a. é=bà
3SG.PRF=come
'He has come.'[4]

b. é=là
3SG.PRF=dream
'He has dreamt.'

c. é=ꜜbí
3SG.PRF=ask
'He has asked.'

When the subject is non-pronominal, a verb-initial prefix *é-* appears, and realizes the H tone of the perfect (7b). The L tone component of the perfect is still realized on the verb.

(7) a. é=bà
3SG.PRF=come
'He has come.'

b. kòfì é-bà
Kofi PRF-come
'Kofi has come.'

In 7, this PRF prefix looks just like the 3SG subject proclitic, as they are both pronounced *é*. Although they may be identical on the surface, new data provides

[4]Here, and throughout, I gloss the subject proclitic as exponing a grammatical meaning to indicate that it is realizing the only exponent of that morpheme. For instance, I gloss the proclitic here as 3SG.PRF since the exponent of the perfect morpheme is tone, which is realized on the pronoun. I do not make any claims about the composition of these morphemes at this point.

evidence that they are in fact entirely distinct morphemes. In comitative, instrumental and some locative constructions in Gã, a constituent can intervene between a pronoun and the inflected verb (8).[5] The pronoun, which here is free, surfaces as L. The same prefix exponing the perfect shows up with subjects of all person and number specifications. This affix exponing the perfect is clearly not the subject proclitic itself, as it is invariably *é*.

(8) a. ì̀ kɛ̀ lɛ̀ **é**-bà
1SG with 3SG.ACC PRF-come
'I have come with her.'

b. ò kɛ̀ lɛ̀ **é**-bà
2SG with 3SG.ACC PRF-come
'You have come with her.'

c. è kɛ̀ lɛ̀ **é**-bà
3SG with 3SG.ACC PRF-come
'He has come with her.'

d. wɔ̀ kɛ̀ lɛ̀ **é**-bà
1PL with 3SG.ACC PRF-come
'We have come with her.'

Attempts at using portmanteau forms exponing both subject and aspect features, or with an inflected pronoun separated from the verb, are judged as wholly ungrammatical (9).

(9) a. *ì̀ kɛ̀ lɛ̀ ɪ́-bà
1SG with 3SG.ACC **1SG.PRF**-come
intended: 'I have come with her.'

b. *ɪ́ kɛ̀ lɛ̀ bà
1SG.PRF with 3SG.ACC come
intended: 'I have come with her.'

Instrumental phrases may appear either pre-verbally (10a) or post-verbally (10b), with no difference in meaning. When subject features are exponed by the

[5]There are various analyses of these constructions: Campbell 2017 analyzes them as serial verb constructions that may be in the process of grammaticalization, while Felice (this volume) argues that there is morphosyntactic evidence indicating that they should be analyzed as adjuncts to the verb. Regardless of their syntactic status, there are a small number of constructions that behave this way: comitatives with *kɛ̀*, instrumentals with *kɛ̀*, and some locatives with *jɛ̀*.

proclitic, that proclitic surfaces with the H tone component of the perfect. When the pronoun is free, however, the H of the perfect is realized on the perfect prefix.

(10) a. ì̀ kɛ̀ pɛ́ŋ é-ŋmà
1SG with pen PRF-write
'I have written with a pen.'

b. ḯ=ŋmà kɛ̀ pɛ́ŋ
1SG.PRF=write with pen
'I have written with a pen.'

In summary, the perfect is multiply marked, with both a tonal component and a segmental component. A segmental verbal prefix *é-* expones the perfect. The perfect is also associated with a floating L tone, which affects the tone of the verb. When the subject of a clause is pronominal, however, the segmental component of the perfect does not appear on the surface, and instead, the proclitic realizes its H tone.

3.3 Subjunctive

In subjunctive contexts, tonal alternations take place on both subject proclitics and verbs. Just like the perfect, when the subject is pronominal, the proclitic is always realized as H (11).[6]

(11) a. é=ꜜbá
3SG.SBJV=come
'He should come.'

b. é=ꜜlá
3SG.SBJV=dream
'He should dream.'

c. é=bí
3SG.SBJV=ask
'He should ask.'

While both the perfect and subjunctive involve realizations of a H tone on the proclitic, the two clearly differ in non-pronominal contexts: the subjunctive appears with a verbal prefix *á-* (12).

[6]The tone of the verb in the subjunctive is attributable to the effects of a systematic rule in the language, the HL Rule (Paster 2003), in which a sequence of a H tone followed by an utterance-final L raises to HꜜH. As such, the verbs 'come' and 'dream' in (11), which are underlyingly toneless and L respectively, appear as downstepped H on the surface.

(12) a. kòfì é-bà
Kofi PRF-come
'Kofi has come.'
b. kòfì **á**-ꜜbá
Kofi SBJV-come
'Kofi should come.'

Similarly, when a constituent intervenes between the pronoun and verb, this same *á-* prefix appears on the verb (13a). When the subject is cliticized to the verb, however, the prefix does not appear and the proclitic is instead H-toned (13b).

(13) a. ò kɛ̀ blɔ́ á-tsúꜜmɔ́
2SG with broom SBJV-clean
'You should clean with a broom.'
b. ó=tsúmɔ̀ kɛ̀ blɔ́
2SG.SBJV=clean with broom
'You should clean with a broom.'

To summarize, the subjunctive is marked by a segmental prefix *á-*. All surface tonal alternations are fully predictable from rules that apply throughout the language. The segmental prefix exponing the subjunctive does not appear on the surface when a proclitic is present: instead, the proclitic realizes its H tone.

3.4 Progressive

The progressive is realized in two distinct ways: as an alternation in the vowel length of the pronoun, or as a prefix of a L-toned nasal consonant on the verb. This allomorphy is conditioned by pronoun shape, which corresponds to number: the vowel length allomorph attaches to singular pronouns, which all consist of a single vowel (14).

(14) a. mi̋i̋=ꜜbá
1SG.PROG=come
'I am coming.'[7]
b. òò=bà
2SG.PROG=come
'You are coming.'

[7]This 1SG.PROG form is exceptional: see section 6 for further discussion.

c. èè=bà
3SG.PROG=come
'He is coming.'

Elsewhere, the nasal consonant allomorph appears. The progressive in these contexts is exponed by a L-toned nasal which receives its place of articulation from the following consonant (15). When the TBU immediately preceding the verb has an underlying H tone, it surfaces with a HL contour tone, as is visible from the form of 'Kojo' in (15d).

(15) a. wɔ̀=m̀-bà
1PL=PROG-come
'We are coming.'

b. ɲɛ̀=ǹ-jò
2PL=PROG-dance
'You (pl.) are dancing.'

c. àmɛ̀=ɲ̀-ɲɛ́
3PL=PROG-walk
'They are walking.'

d. kòjô ŋ̀-kánè wòlú=ꜜɛ́
Kojo PROG-read book=DEF
'Kojo is reading the book.'

Similarly, clauses with free pronominal subjects show an identical pattern (16a).

(16) a. ı̃̀ yɛ̀ skû ŋ̀-kánè nı̃́ı̃̀
1SG at school PROG-read thing
'I am reading at school.'

b. mı̃́ı̃́=kánè nı̃́ı̃̀ yɛ̀ skú
1SG.PROG=read thing at school
'I am reading at school.'

To summarize, the progressive aspect has two distinct allomorphs: the lengthening of the vowel of singular proclitics, and a segmental prefix *Ǹ*-, in which N represents a nasal homorganic to the following consonant. The progressive does not affect the tone of the verb, but does have an impact on the surface realization of a preceding tone, as evidenced by the behavior of 'Kojo' in (15)d and 'school' in (16)a. I consider this evidence that the progressive has both a segmental and tonal component: the verbal prefix *Ǹ*- as well as a floating L tone prefix.

3.5 Interim summary

The tonal and segmental exponents of various grammatical specifications in Gã are presented below in Tables 5 and 6. The segmental components of certain morphemes are visible as transcribed only when a subject proclitic is not present.

Table 5: Exponents of grammatical specifications in the absence of a subject proclitic

	Perfective	Perfect	Subjunctive	Progressive
Tonal	L	L		L
Segmental		*é-*	*á-*	*Ǹ-*

When a proclitic is present, any segmental component is not realized on the surface; instead, the proclitic realizes its tone. As such, the exponence of these four morphemes is solely suprasegmental in the presence of a subject proclitic.

Table 6: Exponents of grammatical specifications in the presence of a subject proclitic

	Perfective	Perfect	Subjunctive	Progressive
Tonal	L	HL	H	LL (+ lengthening for SG proclitics)

4 Prior analyses

Several prior analyses of Gã verbal morphology address the phenomena I have described here, in which a verbal prefix alternates with the tone of the pronoun in various grammatical contexts (Kropp Dakubu 2002, Dakubu 2008, Paster 2003). However, these prior works differ in their analyses about representation of the underlying forms. Dakubu considers these alternations to result from the deletion of the prefix before a pronoun, in which the tone of the prefix delinks and reassociates to the pronoun. Paster, on the other hand, argues that the process of prefix deletion before pronouns is not part of the synchronic phonology. She claims that there is no independent motivation in Gã for such deletion rules, as she argues that it would not pattern with vowel hiatus resolution strategies elsewhere in Gã. Paster therefore proposes that these pronouns should be analyzed

as suppletive portmanteaux. The realization of the segmental prefixes exponing aspect and mood, then, is morphologically blocked when the subject is a prefix.

Neither author makes any reference to the constructions in which a constituent intervenes between the pronoun and the verb (as in (16), for instance). These constructions raise some issues for Paster's analysis of portmanteau morphs: if the process of prefix deletion before pronouns is not part of the synchronic phonology, as Paster argues, how can we account for these constructions? In addition, Paster claims that the prefixes exponing aspect and mood are subject pronouns in all contexts: this analysis cannot account for the constructions in which both subject pronouns and aspect prefixes are realized within a single sentence.

Following Kropp Dakubu 2002, I argue that the novel data I have presented from comitative, instrumental and locative constructions supports the conclusion that STAMP morphs result from the deletion of the segmental component of a verbal prefix in the presence of a subject proclitic. I now proceed to lay out the specifics of this analysis in a constraint-based model.

5 Constraint-based analysis of surface realizations

I have presented the realizations of several grammatical specifications in various contexts, including clauses involving pronominal subjects (both as free pronouns and proclitics) as well as those involving non-pronominal subjects. Prior analyses of these phenomena have differed in their representations of the underlying forms: specifically, whether they should be considered to be suppletive portmanteaux, or the result of predictable phonological processes. I have shown that an analysis involving suppletion is not the most appropriate for the data, and as such, in this section I demonstrate that the described surface realizations of STAMP morphs in Gã can be straightforwardly derived from regular phonological processes present in the language.

5.1 Vowel hiatus resolution

Despite claims to the contrary, the process of prefix deletion after a subject proclitic is in fact completely in line with vowel hiatus resolution in Gã.[8] This phenomenon is clear in the possessive construction (17): when a proclitic of the shape

[8] Paster's specific claim is that 'there is no independently motivated rule in Gã that deletes an /a/ after another vowel, nor is there a rule that deletes /i/ before /a/' (Paster 2003: 29). While this is true, there is no reason why rules targeting specific vowel qualities would be necessary, rather than referring to the vowel hiatus resolution strategy I describe which applies to a specific position within the word.

V attaches to a V-initial noun, the first vowel of the noun deletes. When a VV onset would be created, as in (17)c, the second vowel deletes in order to prevent that onset from surfacing.[9]

(17) a. òmɔ́
rice
'rice'

b. è=mɔ́
3SG=rice
'his rice'

c. *è=òmɔ́
3SG=rice
intended: 'his rice'

This process exactly parallels what we find with the alternations between proclitics and verbal prefixes, such as the subjunctive *á-* (18).

(18) a. kòfí á-ꜜbá
Kofi SBJV-come
'Kofi should come.'

b. é=ꜜbá
3SG.SBJV=come
'He should come.'

c. *è=á-ꜜbá
3SG=SBJV-come
intended: 'He should come.'

I make use of three constraints: *#VV, which penalizes an initial syllable consisting of a sequence of two vowels; MAX-TONE, which penalizes the deletion of a tone present in the underlying representation; and MAX, which penalizes the deletion of a segment present in the underlying representation. When ranked such that *#VV and MAX-TONE outrank MAX, we are able to correctly derive the surface form found in (19). I assume, following Kropp Dakubu 2002, that the underlying form of the word includes both the prefix (here, *é-*) and the proclitic

[9] A reviewer has suggested that the initial consonant of 'rice' could be analyzed as a prefix, in which case the possessive morpheme would simply take the place of the prefix. However, there is no independent evidence in the language to suggest that the initial /o/ here should be analyzed as prefixal, and all vowel-initial nouns in Gã (regardless of which vowel) pattern as shown in (17).

(here, *ĩ=*). In the underlying representation, both the proclitic and verb are toneless. The underlying representation of the perfect includes the segmental prefix *é-*, which itself carries a H tone, as well as a floating L tone, represented as a superscript L.

(19) ḯ=bà
1SG.PRF=come
'I have come.'

ĩ=é-^{L}-ba	*#VV	MAX-TONE	MAX
a. ɛ̀ébà	⁎!		
☞ b. íbà			⁎
c. ɛ̀bà		⁎!	

Candidate (a), in which the floating L of the perfect associates to the verb and the toneless proclitic is assigned a default L tone, is penalized for having a dispreferred VV initial syllable. In candidate (b), the segmental component of the perfect prefix is deleted, resulting in the reassociation of its H tone to the toneless proclitic to its left. This contrasts with candidate (c), in which deletion of the prefix occurs, but its tone does not reassociate with the subject proclitic. Since the H tone associated with the perfect does not appear in the output, this candidate violates MAX-TONE. Therefore, candidate (b) is the winner. This constraint ranking is able to account for the surface realization of specifications in which the segmental exponent is a single vowel. Therefore, this ranking can also take care of the perfect and subjunctive forms. However, correctly accounting for the surface forms of the progressive involves delving further into language-internal phonotactic rules.

5.2 Syllable structure constraints

The progressive looks slightly different on the surface from the other grammatical constructions I have presented: while the others are clearly exponed tonally, the STAMP forms of the progressive involve vowel length. However, I argue that these forms are still attributable to tone, thereby unifying the analyses of grammatical tone and length in Gã. Recall that STAMP morphs in the progressive are limited only to singular pronouns: lengthening results only with pronouns of the shape V. I propose that the segmental component of the progressive, a nasal consonant unspecified for place of articulation, is always present in the underlying structure. However, a restriction on the phonological shape of words in Gã comes into play: a syllable cannot have a coda with no onset. As such, VN is not

a possible syllable in Gã. A possible way to get around this constraint on syllable structure while maintaining features of both segments could be to nasalize the vowel of the proclitic: however, the mid +ATR vowels /o/ and /e/ have no nasal counterparts in the Gã inventory.[10]

These observations can be rewritten in constraint form: *VN assigns a violation for a syllable of the shape VN; *ẽ assigns a violation for any nasal mid +ATR vowel in the output, and IDENT[CONS] assigns a violation for an output segment which differs from the input in the feature [consonantal]. Additionally, the faithfulness constraint MAX-NAS penalizes a change between input and output in the feature [nasal].[11] When ranked alongside the previously introduced constraints MAX-TONE and *#VV, we can correctly derive the surface form we see in (20). The progressive is represented in the underlying form by its segmental component, the verbal prefix *Ǹ*, as well as a floating L tone to its left.

(20) èè=bà
3SG.PROG=come
'He is coming.'

e=^{L}-Ǹ-ba	*VN	*ẽ	MAX-TONE	*#VV	IDENT[CONS]	MAX-NAS
a. èm̀bà	*!					
b. ẽ̀ẽ̀bà		*!			*	
☞ c. èèbà				*	*	*
d. ẽ̀bà		*!	*			
e. èbà			*!			*

Candidate (a), in which the unspecified nasal of the progressive morpheme receives its place of articulation from the following consonant, violates the markedness constraint *VN and is thereby eliminated. In candidate (b), the mora of the progressive morpheme is retained but is realized as a lengthening of the vowel of the proclitic, maintaining the nasalization associated with the mora of the progressive. The floating low tone associated with the progressive associates to the

[10]These two vowels specifically are relevant since the 1SG proclitic is already a nasal vowel, and therefore is not affected by nasalization; the 2SG proclitic is *o=*, and the 3SG *e=*, precisely those vowels which may not nasalize.

[11]An anonymous reviewer additionally suggested the inclusion of the constraint MAX-MORA. I agree that this constraint correctly captures the pattern in the data; however, in this particular tableau, it is superfluous since each tone is associated with exactly one mora, so the relevant effects are captured by the violations of MAX-TONE. In the rare contexts in Gã involving multiple tones surfacing on one mora, however, MAX-MORA would certainly be a necessary addition to the list of constraints.

proclitic to its left. The presence of the surface form [ẽ] violates a highly ranked markedness constraint in the language. Candidate (c) shows the same process as (b), but does not maintain nasalization. In candidate (d), deletion of the mora associated with the progressive morpheme occurs; however, doing so incurs a violation of the constraint MAX-TONE, as there is one more tone present in the input than in the output. Candidate (e) differs only in that it does not maintain input nasalization. Ultimately, candidate (c) is the winner, as it does not violate any of the highly ranked constraints in the tableau.

6 Exceptional forms

The surface forms of several portmanteau morphs, listed below in Table (7), cannot be predicted from the regular phonology. All three involve the first person singular, and all involve the unexpected appearance of an initial bilabial nasal consonant.[12] The first person singular pronoun in Gã was in fact historically pronounced as *mĩ*, and is still written as such in the orthography (Campbell 2017).

Table 7: Exceptional portmanteau forms

	PREDICTED	OBSERVED
1SG.PROG	ɪ̀ɪ̀=	mɪ́ɪ́=
1SG.SBJV	ɪ́=	má=
1SG.IRR	ɪ̀=bàá	má=

A possible analysis of these exceptional forms could involve morpheme-specific suppletive allomorphy. The 1SG.SBJV and 1SG.IRR forms could potentially result from the segmental fusion of adjacent morphemes. As the segmental form of the subjunctive is *á*, a potential analysis could cite the phonological fusion of the nasality of the first person singular proclitic with the vowel of the subjunctive. While all other attested STAMP morphs can be straightforwardly derived from the regular phonological processes I have described, these three forms remain unpredictable. I acknowledge that these three forms of the first person singular proclitic are exceptional, but leave the specific implementation of a solution to this piece of the paradigm for future work.

[12] I have not discussed the formation of the irrealis in Gã here: in all cases except for the first person singular, the irrealis simply involves the cliticization of a proclitic to the auxiliary *bàá*.

7 Conclusions

I have presented new data collected with native speakers of Gã that sheds light on STAMP processes in the language. I have shown that this data supports an analysis in which surface STAMP morphs are fully predictable from the combination of decomposable subject proclitics and verbal prefixes. The emergence of STAMP morphs in Gã can be accounted for through phonotactic restrictions and regular phonological phenomena present in the language for which there is ample independent evidence. This approach greatly simplifies underlying representations of exponents of grammatical specifications in that it does not need to resort to suppletive allomorphy in order to account for portmanteau morphs. Additionally, the difference in exponence between grammatical tone and length (namely, that tone is marked on all pronouns but only singular pronouns undergo lengthening) is attributable to the phonological shape of pronouns. This analysis thereby is able to present a single unified account of both grammatical tone and length in Gã. This data provides support for an account in which pronominals and aspect prefixes are synchronically decomposable, but undergo a process of deletion and tone reassociation in specific phonological environments. This work contributes to the theoretical literature on STAMP morphs, particularly by highlighting a language in which pronominals and aspect prefixes are separable, and offers insight into how now-grammaticalized STAMP morphs may have functioned and developed in the past.

Abbreviations

1	first person	DEF	definite
2	second person	NEG	negative
3	third person	PRF	perfect
SG	singular	SBJV	subjunctive
PL	plural	PROG	progressive
ACC	accusative	IRR	irrealis

Acknowledgements

I would like to thank Tracy Mensah for her immense generosity in sharing her time and knowledge of Gã. Thanks also to Hannah Sande, Larry Hyman, Lydia Felice, Ishmael Annang, the members of the Fall 2019 Field Methods course at Georgetown University, and Phorum at UC Berkeley for their helpful support and discussion.

References

Anderson, Gregory D. S. 2011. Auxiliary verb constructions in the languages of Africa. *Studies in African Linguistics* 40(1). 1–410.

Anderson, Gregory D. S. 2015. STAMP morphs in Central Sudanic languages. In Angelika Mietzner & Anne Storch (eds.), *Nilo-Saharan: Models and descriptions* (Nilo-Saharan – Linguistic analyses and documentation 28), 151–167. Cologne: Rüdiger Köppe.

Anderson, Gregory D. S. 2016. STAMP morphs in the Macro-Sudan Belt. In Doris L. Payne, Sara Pacchiarotti & Mokaya Bosire (eds.), *Diversity in African languages: Selected papers from the 46th Annual Conference on African Linguistics*, 513–539. Berlin: Language Science Press. DOI: 10.17169/langsci.b121.497.

Campbell, Akua. 2017. *A grammar of Gã*. Rice University. (Doctoral dissertation).

Dakubu, Mary Esther Kropp. 2008. Ga verb features. In Mary Esther Kropp Dakubu & Felix Ameka (eds.), *Aspect and modality in Kwa*, 91–134. Amsterdam/Philadelphia: John Benjamins.

Eberhard, David M., Gary F. Simons & Charles D. Fennig. 2022. *Ethnologue: Languages of the world*. 25th edn. Dallas: SIL International. http://www.ethnologue.com.

Felice, Lydia. 2021. *A new argument for PF operations: STAMP morphs in Gã*. Presentation at the Linguistic Society of America.

Garvin, Karee, Katherine Russell & Hannah Sande. 2021. STAMP morphology in the Macro-Sudan Belt. Presentation at WOCAL 10.

Kari, Ethelbert E. 2004. *A reference grammar of Degema*. Cologne: Rüdiger Köppe Verlag.

Konoshenko, Maria. 2020. Phonetics pushing syntax: S/Aux fusion and the rise of subject cross-reference in Mande. *Language in Africa* 1(1). 7–33.

Kropp Dakubu, Mary E. 2002. *Ga phonology* (Language Monograph Series 6). Accra: Institute of African Studies, University of Ghana.

Paster, Mary. 2003. Floating tones in Gã. *Studies in African Linguistics* 32(1). 17–39.

Rolle, Nicholas. 2022. Unpacking portmanteaux: Non-linear morphology in the Ebira STAMP system. *Studies in African Linguistics* 51(1). 140–179. DOI: 10.32473/sal.v51i1.124229.