Chapter 5

Phonological variation in Kusaal: A synchronic dialectological study

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The aim of this chapter is to discuss, analyze, and motivate patterns of phonological variation in two dialects of Kusaal, a Mabia language spoken in north-eastern Ghana where, ostensibly, the Toende dialect is more innovative than the Agole dialect. The paper adopts a synchronic dialectological approach to investigate the observed patterns of phonological variation in the dialects. It assumes a qualitative dimension with primary data sourced through interviews, elicitations and native intuitions. Alternations involving consonants and vowels are discussed. Devoicing of stops is widespread word-finally, while debuccalization of /s/ occurs in post-vocalic position. In addition, certain vowel sequences undergo deletion or coalescence in the Toende dialect.

1 Introduction

Language variation is an inherent property of any human language, with dialects which can be identified and analyzed both synchronically and diachronically (Labov 1990). Similarly, Wardhaugh (2010) notes that languages all over the world are not spoken uniformly due to people's different social and regional

backgrounds. The two regional dialects of Kusaal are not exempt from these assertions, wherein we observe pertinent variations at the phonological level of the Toende and Agole dialects. Kusaal is a Mabia (Gur) language spoken in northeastern Ghana. The language is geographically split into two by the White Volta River, forming two mutually intelligible dialects with distinct phonological patterns. The phonology of the dialects varies significantly in terms of segment alternations, which are quite obvious, such that it is possible to determine the regional affiliation of the speaker from a casual observation of their speech.

This chapter thus sets out to examine the observed synchronic variations using generative dialectological rules. It seeks to describe the segment alternations that occur in the language which result in these pronunciation differences. The study assumes a synchronic approach to dialect studies, where the descriptions of the dialects are based on how they are spoken today without recourse to their historical antecedents.

1.1 Brief linguistic profile of Kusaal

Kusaal has nine phonemic vowels, /i ɪ e ɛ a ɔ o ʊ u/, which have their long correlates as /iː ɪː eː ɛː aː ɔː oː ʊː uː/. These vowels can be divided into Advanced Tongue Root [+ATR] /i e o u/ and non-Advanced Tongue Root [-ATR] /ɪ ɛ a ɔ ʊ/. In addition, Kusaal has five nasal vowels /ĩ ɛ̃ ɔ̃ ʊ̃ ã/ which are all -ATR. The language has eight vowel sequences: [ɪa], [ɪʊ], [aɪ], [aʊ], [ʊa], [ʊɔ], [ɔɪ] and [ʊɔɪ], which are all produced with a retracted tongue root. These will be referred to as *sequential vowels*. Vowels produced with an advanced tongue root [+ATR] do not occur in sequence in Kusaal. The lengthening and sequencing of vowels are distinctive in the two dialects of Kusaal. For instance, while long /eː/ and /oː/ are not preferred in Agole (except in loanwords), they are prevalent in Toende. On the other hand, while all the sequential vowels are observed in Agole, they are restricted in Toende. Sequential vowels that arise in Toende are /aʊ/, /ɔɪ/, /aɪ/ and /ɪʊ/, which are often observed in:

(1) a. some noun roots + class suffix: /bã+ʊ̃k/ [bãʊ̃k] 'shoulder' and/daː+ʊk/ [daːʊk] 'wood'
       b. Loanwords: *ajɔpɔɪ* 'seven', *bakɔɪ* 'a week', *wɪːʊk* 'red', *awaɪ* 'nine'
       c. Interjections: *ajaɪ* 'of course' *waɪː* 'wow' (Niggli 2014: 39).

As will be shown in our subsequent discussions, such sequential vowels in Agole are adapted by means of deletion or coalescence with compensatory lengthening in Toende.

Furthermore, Kusaal vowels are also categorized according to tongue region, such as front /i ɪ e ɛ/, back /u ʊ o ɔ/, and central /a/. As observed cross-linguistically, and particularly so for the Mabia group of languages, all the front vowels are non-round while the back ones are round. The vowels are also grouped based on the height of the tongue, such as high /i ɪ u ʊ/, low /a/ and mid /e o ɛ ɔ/. These phonemic inventories are present in both the Agole and Toende dialects of Kusaal (Musah 2018, Niggli 2014). Table 1 contextualizes these facts.

Table 1: The Kusaal vowel system

	Oral			Nasal		
	Front	Central	Back	Front	Central	Back
+ATR	i		u			
−ATR	ɪ		ʊ	ĩ		ʊ̃
+ATR	e		o			
−ATR	ɛ		ɔ	ɛ̃		ɔ̃
+ATR						
−ATR		a			ã	

As regards the consonantal inventory of Kusaal, we count 22 phonemic consonants. The consonants correspond to seven places of articulation and six manners of articulation with voiced and voiceless members at most articulatory points. The Toende and Agole dialects show these phonemic consonant distributions in their respective phonologies (Niggli 2014, Abubakari 2018, Musah 2018).[1] The data in Table 2 presents a consonantal chart depicting all the phonemic consonants in Kusaal for both dialects.

1.2 Phonological variation

Gaskell & Marslen-Wilson (1996) define phonological variation as systematic variations occurring within conjunctions of speech sounds which are triggered by varied phonological processes in different dialects of the same language. Roh (2004) also intimates that phonological variation occurs when a single underlying form in a language is mapped onto multiple outputs. Wolfram & Schilling

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[1] Note that this paper concludes that [r] is an allophone of /d/ rather a separate phoneme in §4.1.2, so the trill is not listed in the phoneme inventory.

Table 2: Phonemic Consonants of Kusaal

	Bilabial	Labio-dental	Alveolar	Alveo-palatal	Palatal	Labial-palatal	Velar	Labial-velar	Glottal
Stops	p b		t d				k g	k͡p g͡b	ʔ
Fricatives		f v	s z	ʝ					h
Nasals	m		n		ɲ		ŋ		
Approximants					j			w	
Lateral			l						

(2016) posit that phonological patterns can be indicative of regional dialect differences. They add that if a person has a good listening ear for language variation, one can pinpoint a speaker's regional affiliation with considerable accuracy based solely on the pronunciations of lexical items. Evidence drawn from Kusaal data attest to the fact that phonological variation in the dialects is equally obvious, such that even a cursory observation of conversations could straight away help determine the regional background of the speaker.

Gaskell & Marslen-Wilson (1996) analyze place of assimilation variation within some regional dialects of English and find that this kind of variation is usually seen in word boundaries, where a previous consonant adapts the place of articulation of the following segments in some regions, while a similar process is not seen in other regions in English. They note that this affects only coronals such as /t/, /d/ and /n/ when they are followed by non-coronals such as the labials /p/, /b/ and /m/ or the velars /k/, /g/ and /ŋ/. They also note that place assimilation is asymmetric in English, such that non-coronal segments cannot assimilate preceding coronals. For instance, a phrase such as [wɪkɪd pɹæŋk] 'wicked prank' is realized as [wɪkɪb præŋk] whiles 'black tie' [blæk taɪ] is not produced as [blæt taɪ] but as [blæk taɪ] because place assimilation is asymmetric in English (Gaskell & Marshen-Wilson, 1996: 145). Likewise, Mishra & Bali (2011) present a comparative analysis of phonological variation in Hindi dialects and observe that the prevailing cause for the variation in the dialects is vowel quality. According to them, while Awadhi shows allophonic free variation between [eː, oː] and [jɑː, wɑː], as in [djɑːkhɑu] ~ [deːkhɑu] (which can be shortened when the consonant /k/ is lengthened, e.g., [ekɑu] ~ [eːkɑu]), they are in complementary distribution with

the more common /i/ and /u/ in the Bagheli dialect [dustana] ~ [dostana] 'friend-ship'. Similarly, they maintain that high vowels in Bundeli tend to be lower in the other dialects. For instance, [bahota denõ se] in Bundeli is heard as [bahʊta dɪnõ se] 'from many days' in the other dialects of Hindi (Mishra & Bali 2011: 1392). We observe similar processes in Kusaal and will elaborate on these in the data analysis section.

In addition to the foregoing, Eze (2019: 60-61), in an investigation of linguistic variation in Umunze, a dialect of Igbo, establishes segment substitution as the most pronounced instance of phonological variation from standard Igbo. She observes that Umunze speakers use the close back vowel [ụ] in place of the close front vowel [i] in forms like [dụ] instead of [di] for 'is', and the voiced labio-dental fricative [v] in place of the voiced bilabial plosive [b] in forms such as [vuː] for [buː] 'to carry'. The velar sound [ɣ], written <gh>, in Umunze, is also the representation of the voiceless labiodental fricative [f] in Igbo. For instance, *oghe* in Umunze is *ofe* in Igbo for 'soup'. The voiced lateral consonant [l] in Umunze is substituted for the nasal alveolar sound [n] in a word like *chileke* instead of *chineke* in Igbo for 'God'. Her data shows that segmental substitutions are not systematic, as each segment could be used to substitute many segments in different words. Her data on Umunze and Igbo are similar to the case of Kusaal, as segment alternations mark the core trigger of phonological variations in the language. For instance, all voiced plosives [b d g] in word-final position in Agole are altered and replaced by their voiceless counterparts [p t k] in Toende.

2 Theoretical framework

This paper hinges on generative dialectology, which aligns with generative grammar and is set within the theory of generative phonology as proposed in *The Sound Pattern of English* (SPE) by Chomsky & Halle (1968). Generative dialectology asserts that since generative phonology accounts for surface forms that are different from underlying forms in one variety, it could also be used to account for the differences in different varieties (Abubakar 1982, Chambers & Trudgill 2004). According to these studies, since dialects are more or less from a uniform language, it is possible to show that they can, for the most part, be described in terms of a common set of underlying forms.

The theory of generative dialectology is guided by the principles of identifying underlying forms based upon which lexical forms are listed in the lexicon, then applying phonological rules to the underlying forms to convert them to surface forms and, ultimately, into their actual pronunciations. (Chambers & Trudgill

2004: 39) state that "in particular, forms involved in alternations of various kinds appear in the lexicon as only one form, the others being the result of the application of rules". The theory proceeds on the premise that a single underlying form can be postulated for related dialects, where the dialects differ based on (a) the phonological rule that applies to the underlying form; (b) the environment in which the rules apply; and/or (c) the order in which the rules apply. Generative dialectologists' concerns are thus the identification of the underlying forms. The remaining facts then derive from their interest in generating phonological rules and in using these rules to generate formulae to account for variations in related dialects.

3 Methodology

We follow the methods and procedures dialectologists use in identifying, describing and presenting dialect differences in line with synchronic dialectological perspectives in this paper. The study assumes a qualitative approach with primary data sourced through interviews, word list elicitations and native speaker intuitions. While the regions of the two dialects, eastern and western Bawku, constitute the research sites of the study, five participants from five communities in each of the dialect areas were consulted. The data was collected by administering questionnaires to participants and their responses captured and stored on an audio recorder. These were then transcribed and analyzed based on the theory of generative dialectology, whereby we first identified and postulated underlying forms for the two dialects while noting observed variations. Following from this, we determined the systematicity in the variations by applying phonological rules to the derived underlying forms.

In line with the theory of generative dialectology, dialectologists identify underlying forms, apply systematic phonological rule(s) to the underlying forms and derive variations from them to account for the differences in related dialects (Al-Hindawi & Al-Aadili 2018; Abubakar 1982; Chambers & Trudgill 2004). There are several methods for selecting underlying forms for dialect studies. Abubakar (1982), for instance, posits that early dialectologists described dialect differences in an ad hoc manner by arbitrarily taking forms from one dialect as the base form and deriving other forms from them for related dialect(s). In analyzing the dialects of modern Faroese, O'Neil (1963) uses this approach in the selection of underlying forms. According to Abubakar (1982), however, the arbitrary selection system was observed to sometimes not be reliable or accurate, thereby giving rise to the notion that underlying forms should be more abstract and independent. This opinion is buttressed by Thomas (1967), who affirms that one must

select forms that are more or less abstract, widespread and independent of the dialects under study. Variations are then derived from these forms and postulated for the dialects by applying phonological rules to the abstract forms.

Other methods used to determine underlying forms include dominance and usage (Goldstein & Iglesias 2001) and the historical antecedence of dialects (Newton 1972), and make apparent the fact that dialectologists do not entirely agree on one unique acceptable criterion for the identification and selection of so-called underlying forms. Abubakar (1982: 30) however, notes that "whichever method one adopts to establish the underlying forms, a claim is made that a generative treatment of dialect differences will formalise the essential fact about dialects: that they have much in common but still have some differences".

In this paper we employ underlying forms that are closer to the Agole dialect than the Toende dialect. We show with empirical evidence that most vowel and consonant changes have occurred in the Toende dialect, making it more divergent from Agole. In the next section, we present and analyze the data.

4 Segment alternation

Segment alternation is a phonological process that allows speakers of a language to alter or modify a segment or a group of segments due to some phonotactic constraints (Katamba 1989). Speakers of the Toende dialect of Kusaal apply this process to both consonants and vowels, mostly in word-medial and word-final positions. Even though this phenomenon is often observed in social dialects, where different social factors such as education, gender, social class, and age may influence the choice of one variable over another, as noted by Labov (1990), it is also observed in regional dialects, as is the case for the present study.

The consonant alternations that are observed in Toende include word-final devoicing (§4.1.1), [d]/[r] alternations (§4.1.2), and debuccalization of the voiceless alveolar fricative /s/ (§4.1.3).

In addition, segment alternations involving vowels of Kusaal are quite pervasive. This arises mostly where a number of sequential vowels in Kusaal are realized as single vowels in Toende, as shown in §4.2. These segment alternations underscore a clear distinction between the two regional dialects.[2]

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[2]Tone is not indicated in the transcriptions as there are sometimes minor differences between the dialects, which might distract from the segmental alternations that are the focus of the paper.

4.1 Consonant alternation

Consonant alternation separates the two regional dialects of Kusaal, where voiced obstruents in word-final positions are maintained in Agole but are neutralized (devoiced) in Toende in the same environment.

4.1.1 Devoicing

The data in (2) illustrate the distribution of /k/ and /g/ in Kusaal. In Agole there is a contrast between /k/ and /g/ in final position, as shown by comparing (2a-b) with (2c-d). In Toende, however, there is only [k] word-finally. Where Agole has [g], Toende has [k], as in (2c-i). This results in pronunciation discrepancies in the two regional varieties. The /g/ is assumed to be underlying but is devoiced in Toende. The data in (2j-m) shows that that the voiced velar /g/ is realized as [g] in non-final positions in both dialects. UR refers to the underlying representation.

(2)		**UR**	**Agole**	**Toende**	
	a.	/kʊk/	kʊk	kʊk	'chair'
	b.	/mak/	mak	mak	'measure'
	c.	/zug/	zug	zuk	'head'
	d.	/dʊg/	dʊg	dʊk	'pot'
	e.	/dɔːg/	dɔːg	dɔːk	'room'
	f.	/lɛːg/	lɛːg	lɛːk	'to dig'
	g.	/bʊʔɔg/	bʊʔɔg	bʊʔɔk	'valley'
	h.	/lɔdʊg/	lɔdʊg	lɔrʊk	'corner'
	i.	/dadʊg/	dadʊg	darʊk	'ladder'
	j.	/zigi/	zigi	zigi	'gravels'
	k.	/dagɔbʊg/	dagɔbʊg	dagɔbʊk	'left hand'
	l.	/gɪdɪma/	gɪdɪma	gɪrɪma	'respect'
	m.	/gãdɪg/	gãdɪg	gãrɪk	'to respond'

Similarly to the data with velar stops, a final voiced bilabial stop /b/ is realized as a voiceless bilabial stop [p] in Toende (3a-f). We note however that a similar occurrence does not apply to the voiced obstruent [b] at word-initial and word-medial positions in Kusaal (3g-j). There is no observed final [p] in Agole, but [p] can occur in other positions (3k-l), showing that there is a /p/ vs. /b/ contrast in both dialects.

(3)

		UR	Agole	Toende	
	a.	/sãb/	sãb	sãp	'abundance'
	b.	/sɛb/	sɛb	sɛp	'to squat'
	c.	/lɔb/	lɔb	lɔp	'to throw'
	d.	/ɔb/	ɔb	ɔp	'to chew'
	e.	/mɛ:b/	mɛ:b	mɛ:p	'building'
	f.	/dɔ:b/	dɔ:b	dɔ:p	'climbing'
	g.	/zaba/	zaba	zaba	'conflict'
	h.	/sabɪl/	sabɪl	sabɪl	'black'
	i.	/bãŋ/	bãŋ	bãŋ	'ring'
	j.	/bɛdɪgʊ/	bɛdɪgʊ	bɛrɪgʊ	'plenty'
	k.	/paŋ/	paŋ	paŋ	'strength'
	l.	/pʊpʊ:m/	pʊpʊ:m	pʊpʊ:m	'foam'

Agole shows a contrast between the voiced alveolar stop /d/ and the voiceless alveolar stop /t/ in word-final position (4a-l). However, Toende only has the voiceless alveolar stop [t] in word-final position. In addition, another instance of apparent dialect variation in Kusaal is also shown where the voiced alveolar plosive /d/ is optionally realized as the alveolar trill [r] word-finally in Agole, but still realized as [t] in Toende. This fact is reported in the literature on Kusaal, where it is established that the voiced alveolar plosive [d] and the trill [r] are free variants in word-final position in Agole, which is not the case in Toende (Musah et al. 2013, Musah 2018, Niggli 2014).

(4)

		UR	Agole	Toende	
	a.	/mat/	mat	mat	'wet.IDEO'
	b.	/kat/	kat	kat	'to chase'
	c.	/gbɛd/	gbɛd ~ gbɛr	gbɛt	'thigh'
	d.	/kʊkɔd/	kʊkɔd ~ kʊkɔr	kʊkɔt	'throat'
	c.	/da:d/	da:d ~ da:r	da:t	'wood'
	d.	/bɔ:d/	bɔ:d ~ bɔ:r	bɔ:t	'to want'
	e.	/bʊ:d/	bʊ:d ~ bʊ:r	bʊ:t	'to vindicate'
	f.	/vã:d/	vã:d ~ vã:r	vã:t	'leaves'
	g.	/dɔ:d/	dɔ:d ~ dɔ:r	dɔ:t	'dawadawa fruit'
	j.	/kpa:d/	kpa:d ~ kpa:r	kpa:t	'farmer'
	k.	/nɔ:d/	nɔ:d ~ nɔ:r	nɔ:t	'mouth'
	l.	/jʊʔʊd/	jʊʔʊd ~ juʔur	jʊʔʊt	'name'

A rule to account for the trill will be provided in §4.1.2.

There is no voicing alternation for sonorants that occur in word-final, position as shown below in (5).

(5)

		UR	**Agole**	**Toende**	
a.		/saːn/	saːn	saːn	'stranger'
b.		/puːm/	puːm	puːm	'flower'
c.		/bãŋ/	bãŋ	bãŋ	'ring'
d.		/bul/	bul	bul	'to germinate'

Labial-velar stops do not appear in word-final position, so they are excluded from the voicing alternation. Voiceless and voiced fricatives contrast word-initially in words like [saːm] 'to march' and [zaːm] 'evening' or [fãːd] 'to save' vs. [vãːd] 'leaves' (Agole dialect) (Musah 2018). However, only voiceless fricatives are found word-finally in both dialects, and there are no alternations. As this paper focuses on differences between the two dialects, we do not explore this further.

From the foregoing illustrations, it is apparent that there is a rule of word-final devoicing that applies to voiced stops in Toende. The rule does not also apply to stops in word-initial or medial positions.

(6) Devoicing

$$\begin{bmatrix} \text{-son} \\ \text{-cont} \end{bmatrix} \rightarrow [\text{-voice}] \ / \ \_\# \qquad \text{(Toende)}$$

Word-final devoicing has been studied systematically and extensively across many languages in the world (see Dinnsen 1985, Charles-Luce 1985, Slowiaczek & Dinnsen 1985, and Slowiaczek & Szymanska 1989 for some examples in German, Dutch, Polish, Catalan, and Turkish among others). Dinnsen (1985: 266) notes that the rule involves the merger of voiced and voiceless obstruents in favour of the voiceless at word-final positions. According to Charles-Luce (1985: 309), the word-final devoicing rule has been formulated to account for (i) the voice alternation between medial voiced obstruents and final voiceless obstruents, and (ii) the presumed absence of a voice contrast word-finally. The present study does not investigate alternations between word forms within a dialect, but focuses only on word-final devoicing as a difference between Toende and Agole.

4.1.2 [d] ~ [r] alternation

As discussed in §4.1.1, the alveolar trill [r] and the voiced alveolar plosive [d] are free variants in word-final position in Agole. It is, however, prudent to state that they do not substitute for each other in all phonological environments in

Kusaal, and Toende has a different distribution. In word initial position, only [d] occurs. [dadʊg] 'ladder' cannot be pronounced as [*radʊg] or [daːn] 'owner' be pronounced as [*raːn]. Furthermore, the alveolar trill [r] does not begin words in either dialect of Kusaal (Musah et al. 2013).

However, in word-medial position, [d] is found in Agole, but [r] (or [ɾ]) in Toende. Data in (7) show the differences.

		UR	Agole	Toende	
(7)	a.	/bɛdɪgʊ/	bɛdɪgʊ	bɛrɪgʊ	'plenty'
	b.	/bidibiŋ/	bidibiŋ	biribiŋ	'boy'
	c.	/bidikin/	budikin	birɪkin	'noble'
	d.	/lɔdʊg/	lɔdʊg	lɔrʊk	'corner'
	e.	/ɛdʊg/	ɛdʊg	ɛrʊk	'anxiety'
	f.	/fada/	fada	fara	'hardships'
	g.	/fɛdɪg/	fɛdɪg	fɛrɪk	'turn'
	h.	/pʊdʊg/	pʊdʊg	pʊrʊk	'share'
	i.	/jaːdɪm/	jaːdɪm	jaːrɪm	'salt'

This alternation only occurs if the /d/ is between two vowels. Any consonant sequences have [d]. For example, [jadda] 'faith' cannot be pronounced as *[jarra] or [tɪndãʔãn] 'a dry mud' be pronounced as *[tɪnrãʔãn]. As [r] is always a variant of /d/ and never contrasts with it in other positions, we conclude that they are not separate phonemes. The two rules are formulated in (8).

(8) Trilling

    a. /d/ → [r] / _# (optional)   (Agole)

    b. /d/ → [r] / V_V   (Toende)

As defined by the phonological rules, the /d/ to [r] variation rule applies in both dialects, but it is optional in Agole word-finally and obligatory in Toende between vowels in word-medial position.[3]

4.1.3 Debuccalization

Another salient phonological variation in the language is observed in the debuccalization of /s/ to [h] in word-medial and word-final positions in the Toende dialect, where the Agole dialect has [s]. Here, the voiceless alveolar fricative /s/ loses its original place of articulation and becomes [h] in Toende when following a vowel (Niggli 2014: 11, Hudu 2018). The data in (9) provide evidence of this

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[3]In word-medial position, it is pronounced as [r] or [ɾ].

trend in alternation. While the examples in (9a-e) highlight /s/ being realized as [h] in word-medial position in Toende, examples (9f-j) show the debuccalization of /s/ in word-final position.

(9)

	UR	Agole	Toende	
a.	/bɪʔɪsɪm/	bɪʔɪsɪm	bɪʔɪhɪm	'breast milk'
b.	/bʊʔɔsʊg/	bʊʔɔsʊg	bɔʔɔhʊk	'question'
c.	/faːsɪm/	faːsɪm	faːham	'swollen'
d.	/ɲɔsɪg/	ɲɔsɪg	ɲɔhʊk	'to miss (a target)'
e.	/kãsɪd/	kãsɪr	kãhãt	'hot weather'
f.	/tɛʔɛs/	tɛʔɛs	tɛʔɛh	'to think'
g.	/ɛbɪs/	ɛbɪs	ɛbɪh	'to scratch'
h.	/ɛːs/	ɛːs	ɛːh	'to wipe'
i.	/dɪʔɪs/	dɪʔɪs	dɪʔɪh	'to press'
j.	/ʊɔːs/	ʊɔːs	ɔːh	'to warm up'

It is pertinent to state that when the voiceless alveolar fricative /s/ occurs in word-initial position, it does not debuccalize in Toende, as shown in (10a-d). Furthermore, /s/ and /h/ contrast in word-initial position (10e), although underlying /h/ does not occur in other positions in either dialect.

(10)

	UR	Agole	Toende	
a.	/sugudu/	sugudu	suguru	'peace'
b.	/saman/	saman	saman	'compound'
c.	/sɔːd/	sɔːd	sɔːt	'liver'
d.	/sɪːg/	sɪːg	sɪːk	'spirit'
e.	/hali/	hali	hali	'a lot, very much, greatly'

The phonological rule can be written as follows:

(11) Debuccalization

/s/ → [h] / V__   (Toende)

The rule is applicable in the Toende data, where the voiceless alveolar fricative /s/ in the underlying form debuccalizes into the glottalic fricative [h] in word-medial and word-final positions following vowels.

It is also noted that the glottal fricative [h] and the stop /ʔ/ are phonologically transparent in Kusaal, and allow progressive spreading of vowel features across them. Examples in (9c-e) show that when debuccalization occurs, all features except [high] spread progressively across [h], including the feature [+nasal]. This

is an instance of translaryngeal harmony (Steriade 1986). We do not provide a formal rule for this variation, but note that debuccalization must apply prior to the harmony.

Closely related to the foregoing is the fact that debuccalization does not apply in compounded forms where /s/ is the onset of the second word or morpheme. Morphologically, the voiceless alveolar fricative /s/ can occur word-medially in Toende when the word in question arises from compounded forms. For example, in /daʊ + saan/ → [dasan] 'young man' and /zug + sʊŋ/ → [zusʊŋ] 'luck', /s/ does not debuccalize but remains the same for Toende as well as Agole. Similarly, when the low-central vowel /a/ is used as a prefix to a base beginning with /s/, the fricative does not change in Toende. This is mostly shown in nominal items where the prefix /a-/ functions as a nominalizer in Kusaal. Examples include /a-sibi/ → [asibi] 'Mr Saturday', /a-sɪda/ → [asɪra] 'Mr True', /a-saman/ → [asaman] 'Mr Compound' and /a-sɛr/ → [asɛt] 'Mr Wall-gecko'. where the underlying forms and surface representations remain the same for both dialects of the language, except in Toende where /d/ is realized as [r] in word-medial position. Ostensibly, this could be reflective of root-initial faithfulness in Kusaal, where /s/ is preserved in both dialects because it occurs in root-initial position. Similar observations are made by Ahn (2000a,b), Lee (2000) on root-faithfulness in English phonology.

Hudu (2018: 214) observes a similar process of debuccalization in Dagbani, a related Mabia language, and notes that the process targets coronals and dorsals, making them glottals in Dagbani. The data in (12) illustrate the phenomenon of /s/ → [h] alternation in Dagbani.

(12)   /s/ to [h] alternation in Dagbani (Hudu 2018: 214)

	UR	Dagbani	
a.	/má:sɨlɨ/	[máhɨlɨ]	'cool weather after rain'
b.	/nè:-sɨ̀/	[nɛ-hɨ̀]	'awaken-pl.'
c.	/mó:sɨ/	[mɔhɨ]	'become reddish'
d.	/ánà:sɨ/	[ánáhɨ]	'four'
e.	/bìsím/	[bìhím]	'milk'
f.	/bí:-sí/	[bí-hí]	'children'
g.	/bo:sɨ/	[bɔhɨ]	'ask'

From the data, it is apparent that the /s/ to [h] debuccalization in Dagbani is similar to that of the Toende dialect of Kusaal. However, while the glottalic fricative [h] is said to occur only as an allophone of /s/ in Dagbani, they are separate phonemes in Kusaal (Hudu 2018: 207; Niggli 2014; Musah 2018). Also, as

the data portray, debuccalization triggers shortening of preceding long vowels in Dagbani, whereas the preceding long vowels are not shortened in Kusaal. For instance, while /má:sɨlɨ/ is [máhɨlɨ] and /áná:sɨ/ is [ánáhɨ] for 'cold weather' and 'four' respectively in Dagbani, /ka:sʊg/ and /du:sug/ are realized as [ka:hʊk] and [du:huk] for 'crying' and 'cleaning' respectively in the Toende dialect of Kusaal.

4.2 Vowel alternation

There are several vowel alternations in Kusaal which constitute phonological variation between the two dialects. This is observed where sequential vowels in the underlying representation are maintained in Agole but undergo a process of vowel deletion or coalescence in Toende. There are eight types of sequential vowels in the language ([ɪa], [ɪʊ], [aɪ], [aʊ], [ʊa], [ʊɔ], [ɔɪ] [ʊɔɪ]) and alternations are observed with those that have a high vowel followed by a non-high vowel: [ɪa], [ʊa] [ʊɔ] [ʊɔɪ]. While some scholars of Kusaal describe sequential vowels as diphthongs and triphthongs (see Musah et al. 2013: 14, Musah 2018: 57, Abubakari 2018: 38, and Niggli 2014: 39), the current paper refers to them as sequential vowels (SVs) (see Adongo 2018 for a similar observation in Gurenɛ). Each of the SVs can be optionally bisected by the glottal stop /ʔ/, thereby reshaping the word, with the /ʔ/ forming the onset of a new syllable in the word. For instance, /sɪak/ 'agree' and /fʊɔɪ/ 'remove', which are CVVC and CVVV respectively, could be reshaped as [sɪʔal] 'to meet' and [sʊʔɔɪ] 'own', to assume forms as CV.CVC and CV.CVV respectively (Musah 2018; Asitanga 2021). Since diphthongs and triphthongs are assumed to be inseparable, we argue that they are sequential vowels rather than diphthongs and triphthongs.

The Agole and Toende dialects of Kusaal differ in their phonology with respect to vowel sequence alternations in the language. The variety of Toende spoken in Ghana does not accept certain vowel sequences within morpheme boundaries, except those that are morphologically conditioned such that a noun root + class suffix could produce a diphthong, some loanwords and interjections, as identified by Niggli (2014) and explained in (1). Due to this restriction, some SVs are always adapted by means of either vowel deletion or coalescence in Toende.

4.2.1 Vowel deletion

The vowel deletion process occurs with the nasal SV /ɪã/, while the coalescence process occurs with the oral SV /ɪa/. Consider the data in (13). Deletion makes the SV /ɪã/ in the UR surface in Toende as [ã]. Examples (13g-h) demonstrate that the deletion does not occur with sequences of oral vowels /ɪa/.

(13)   **UR**   **Agole**   **Toende**
  a.   /dɪ̃ãʔãd/   dɪ̃ãʔãd   dãʔãt   'dirt'
  b.   /kpɪ̃ãk/   kpɪ̃ãk   kpãk   'to economise'
  c.   /pɪ̃ãʔã/   pɪ̃ãʔã   pãʔã   'to speak'
  d.   /tɪ̃ãg/   tɪ̃ãg   tãk   'to massage'
  e.   /zɪ̃ãg/   zɪ̃ãg   zãk   'to wither off'
  f.   /ɲɪ̃ãg/   ɲɪ̃ãg   ɲãk   'stimulus'
  g.   /lɪabʊg/   lɪabʊg   lɛːbʊk   'disturbance'
  h.   /sɪak/   sɪak   sɛk   'fit'

The phonological rule in (14) states that vowels delete before nasal vowels. This makes the nasal SV /ɪ̃ã/ becomes [ã] in Toende. There are no such alternations on the other nasal sequential vowels.

(14)   Vowel deletion

$$V \rightarrow \varnothing \, / \, \_ \begin{bmatrix} V \\ +nasal \end{bmatrix}$$ (Toende)

The [+nasal] feature triggers the deletion process, as examples (13g-h) that do not have nasal vowels show a different process rather than deletion. The preservation of [ã] in Toende is also motivated by its degree of sonority, which is higher than the front high vowel /ɪ/. Niggli (2014: 47) also notes that in Kusaal as well "when one vowel of a diphthong is to be deleted, it is the high vowel, not a low or mid vowel".

4.2.2 Coalescence

As hinted above, the SV /ɪa/ becomes [ɛ] in Toende. Here, the SV undergoes a process of coalescence together with compensatory lengthening, preserving the moraic value or timing positions of the input vowels. Under coalescence, the [-back] value of the first vowel is preserved, and the [-high] value of the second vowel is maintained, producing a front mid vowel.

(15)   **UR**   **Agole**   **Toende**
  a.   /dabɪam/   dabɪam   dabɛːm   'fear'
  b.   /fɪam/   fɪam   fɛːm   'freedom'
  c.   /tɪaŋ/   tɪaŋ   tɛːŋ   'beard'
  d.   /bɪal/   bɪal   bɛːl   'naked'
  e.   /pɪan/   pɪan   pɛːn   'a type of cloth'
  f.   /bɪa/   bɪa   bɛː   'to go astray'
  g.   /fɪa/   fɪa   fɛː   'to blame'
  h.   /wɪas/   wɪas   wɛːh   'to analyze'

Coalescence affects not only /ɪa/ to [ɛː] but also /ʊa/ to [ɔː], /ʊɔ/ to [ɔː], and /ʊɔɪ/ to [ɔː] in Toende. Under coalescence, the [+back, +round] values of the first vowel are preserved, and the [-high] value of the second vowel is maintained, producing a back rounded mid vowel.

(16)

		UR	Agole	Toende	
	a.	/jʊal/	jʊal	jɔːl	'to babysit'
	b.	/sʊas/	sʊas	sɔːh	'to startle'
	c.	/vʊaŋ/	vʊaŋ	vɔːŋ	'a cotton tree'
	d.	/ʊas/	ʊas	ɔːh	'to warm up'
	e.	/zʊal/	zʊal	zɔːl	'to perch'
	f.	/bʊɔlʊg/	bʊɔlʊg	bɔːlʊk	'calling'
	g.	/jʊɔlɪm/	jʊɔlɪm	jɔːlʊm	'later on'
	h.	/vʊɔl/	vʊɔl	vɔːl	'whistle'
	i.	/kʊɔsʊg/	kʊɔsʊg	kɔːhʊk	'selling'
	j.	/sʊɔl/	sʊɔl	sɔːl	'advantage of'
	k.	/lʊɔɪ/	lʊɔɪ	lɔː	'take some'
	l.	/bʊɔɪ/	bʊɔɪ	bɔː	'to pour'
	m.	/vʊɔɪ/	vʊɔɪ	vɔː	'to uproot'
	n.	/dʊɔɪ/	dʊɔɛ	dɔː	'to get up'
	o.	/fʊɔɪ/	fʊɔɪ	fɔː	'to remove'

In each of these vowel alternations, the SVs coalesce into a long [ɛː], and [ɔː], preserving the bimoraic length of the SVs in the underlying representation.[4] Furthermore, coalescence occurs in both final and non-final syllables. The vowel alternations are formalized by the rule in (17).

(17)   Coalescence

$$
\begin{bmatrix} V \\ \alpha back \\ \alpha round \\ +high \end{bmatrix}
\begin{bmatrix} V \\ -high \end{bmatrix} (V) \rightarrow
\begin{bmatrix} Vː \\ \alpha back \\ \alpha round \\ -high \\ -low \end{bmatrix}
\qquad \text{(Toende)}
$$

This rule employs alpha notation, which states that a sequence of a high vowel and a non-high vowel (or two vowels) becomes a long mid vowel of the same backness and rounding as the first vowel. The rule is context-free, reflecting the

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[4]Sequences of three vowels occur in open syllables, but are reduced to a long vowel with double vowel length, not triple vowel length.

fact that it applies in a variety of environments: in open syllables, and when followed by sonorants or fricatives.

If the following consonant is a voiceless velar or glottal stop, however, the vowel length is not maintained and a short vowel results. This is shown with /ɪa/ → [ɛ] in (18a-f) and /ʊa/ → [ɔ] in (18g-k) when followed by either [k] or [ʔ].

(18)

		UR	Agole	Toende	
	a.	/sɪak/	sɪak	sɛk	'enough'
	b.	/wɪak/	wɪak	wɛk	'to hatch'
	c.	/tɪak/	tɪak	tɛk	'to exchange'
	d.	/kpɪak/	kpɪak	kpɛk	'to restrain'
	e.	/vɪak/	vɪak	vɛk	'to be burnt'
	f.	/kpɪaʔa/	kpɪaʔa	kpɛʔɛ	'neighbor'
	g.	/bʊak/	bʊak	bɔk	'to cut open'
	h.	/kʊak/	kʊak	kɔk	'to hug'
	i.	/lʊak/	lʊak	lɔk	'to elude'
	j.	/mʊak/	mʊak	mɔk	'to suck'
	k.	/sʊak/	sʊak	sɔk	'a type of fishing equipment'

This process is not observed in Agole, which clearly differentiates the two dialects in the pronunciation of words with such phonological make-ups.

Instead of proposing a second coalescence rule that is context-specific to velars and glottal stops and produces a short vowel, we propose that vowels are shortened before voiceless stops in Toende. The rule does not apply before voiceless fricatives, so the feature [-cont] is included.

(19)   Vowel shortening

$$\text{V:} \rightarrow \text{V} \, / \, \_ \begin{bmatrix} \text{-son} \\ \text{-cont} \\ \text{-voice} \end{bmatrix} \qquad \text{(Toende)}$$

Neither dialect has long vowels preceding underlying voiceless stops, so the vowel shortening rule accounts for this phonotactic restriction as well. Toende does have long vowels preceding devoiced stops, as shown in (20). Furthermore, long vowels derived from vowel coalescence can appear before devoiced stops (20g-h). This shows that the language treats voiceless stops and devoiced stops differently.

(20) | | **UR** | **Agole** | **Toende** | |
|----|-------|---------|----------|---|
| a. | /dɔːg/ | dɔːg | dɔːk | 'room' |
| b. | /lɛːg/ | lɛːg | lɛːk | 'to dig' |
| c. | /daːd/ | daːd ~ daːr | daːt | 'wood' |
| d. | /bɔːd/ | bɔːd ~ bɔːr | bɔːt | 'to want' |
| e. | /mɛːb/ | mɛːb | mɛːp | 'building' |
| f. | /dɔːb/ | dɔːb | dɔːp | 'climbing' |
| g. | /lɪab/ | lɪab | lɛːp | 'to court' |
| h. | /kʊɔb/ | kʊɔb | kɔːp | 'farming' |

If devoicing is ordered after vowel shortening, this pattern can be accounted for. However, there are apparently no examples of oral vowel sequences before voiced velar stops to compare directly with the data in (18) before voiceless velar stops; predictions about rule ordering are made based on the data in (20) for voiced labials. This is discussed in the next section.

4.3 Rule ordering

It is imperative to state that the rules are logically ordered in Toende. First, the vowel deletion rule applies only before nasal vowels, whereas the vowel coalescence rule applies to vowels in general. One could add the feature [-nasal] to the coalescence rule, or one could order the vowel deletion rule first, as is done here. This ensures that the oral-nasal vowel sequence is repaired before coalescence applies. Second, vowel shortening follows vowel coalescence because vowel coalescence creates the long mid vowel that is then shortened. This is shown in (21). SR indicates surface representation.

(21) | UR | /tɹak/ | /tɹãg/ |
|----|--------|--------|
| Deletion | – | tãg |
| Coalescence | tɛːk | – |
| Shortening | tɛk | – |
| Devoicing | – | tãk |
| SR | [tɛk] | [tãk] |
| | 'to exchange' | 'to massage' |

Finally, devoicing follows vowel shortening to ensure that shortening only occurs before underlying voiceless stops, not those that have been devoiced. Sample derivations of this interaction are shown in (22). The vowel is shortened with /tɹak/ as the /k/ is underlying. But there is no shortening for /dɔːg/ or /lɪab/ because the stop is voiced at that point in the derivation. The devoicing applies following the shortening.

(22) UR   /tɹak/   /dɔːg/   /lɹab/
      Deletion   –   –   –
      Coalescence tɛːk   –   lɛːb
      Shortening   tɛk   –   –
      Devoicing   –   dɔːk   lɛːp
      SR   [tɛk]   [dɔːk]   [lɛːp]
                   'to exchange' 'room'   'to court'

The rules of debuccalization and trilling are not crucially ordered with respect to the other rules as they does not interact with them. Shortening only applies before stops, and both [s] and [h] are fricatives. Debuccalization must occur prior to translaryngeal harmony, as it creates the context for the harmony rule; however, we do not formalize this. Trilling optionally applies word-finally in Agole, and obligatorily word-medially in Toende, so there is no interaction with word-final devoicing in Toende.

5 Conclusion

This chapter examined phonological variation in Kusaal from a synchronic dialectological perspective. It showed that segment alternation is a pertinent trigger of phonological variation in the two dialects of Kusaal. The study revealed that while voiced obstruents are observed in word-final positions in Agole, their voicing features are neutralized in Toende, because Toende restricts voiced obstruents in word-final position, creating obvious phonological disparities between the dialects. Similarly, while sequential vowels such as /ɹa/, /aʊ/, /ʊɔ/ and /ʊɔɪ/ are barred in Toende, they are allowed in Agole. As a result, a casual observation of how the speakers use the language could adduce accurate results of whether the speaker speaks the Agole or Toende Kusaal variety. This paper therefore explored several of the alternations that cause variations in the phonology of Kusaal, including alternations at the consonantal and vocalic levels. At the consonantal level, prominent alterations include those that result in word-final devoicing of stops as well as the debuccalization of /s/ to [h] following vowels in Toende. As regards the vocalic alternations, we find several instances of dialectal variations between Agole and Toende in instances where high vowel – non-high vowel sequences become long mid vowels in Toende. These are important markers of dialect variations. Finally, we showed that shortening of vowels due to coalescence only occurs before underlyingly voiceless consonants, not those that are devoiced, necessitating rule ordering.

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