Hidden morpheme boundaries in Kabiye: a source of miscues in a toneless orthography

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Abstract

In many tone languages, decision makers have opted for zero representation of tone. This generates homographic tonal minimal pairs that may trigger oral reading miscues. But it would be wrong to attribute the source of all miscues just to tonal minimal pairs; there may be other aspects of the orthography's profile that inhibit word recognition.

In the standard orthography of the Kabiye verb phrase, subject pronouns and modal morphemes are written attached to the root. The unforeseen secondary effect of this decision is that the identity of the root is often masked because the morpheme boundary is not explicit. A homograph analysis reveals that morphemic mismatches generate numerous tonal minimal pairs. But a miscue analysis reveals that the problem extends beyond these to any verb phrase that contains infrequent, alternating or multiple prefixes, whether or not they are homographs.

It follows that to disambiguate just tonal minimal pairs would only solve half the problem. A modification that highlights the morpheme boundary would directly address the real source of readers' difficulties. The results of a dictation task in a classroom experiment indicate that root initial capital letters would be a promising solution.

1. Introduction

Zero tone marking is a common strategy in the emerging orthographies of African languages (Bird, 1999). Social and political considerations often constrain decision makers, as demonstrated by the anglophone reluctance to use diacritics in Ghana (Cahill, 2001) and a government discouraging their use in Mali (Thomas Blecke, personal communication).

This paper carries no assumptions that zero marking is necessarily undesirable in some social contexts. Indeed, from a pedagogical point of view, it may well prove to be an appropriate choice for language in which the functional load of tone is negligible. But what are the consequences of zero marking in languages in which tone has a higher functional load? The inevitable result is that readers miscue in oral reading. Several generations of field linguists and literacy specialists have observed this, to the point where even reporting it is banal. The desire to improve the orthography in such cases has typically led linguists on the hunt for tonal minimal pairs.

However, there may be other aspects of the inherited orthography's profile that interact with the tonal ambiguities to inhibit word recognition. This case study of Kabiye (Gur, Togo) reveals that readers' problems in identifying the verb phrase in the standard orthography extend beyond a limited set of homographic tonal minimal pairs. A careful analysis of the segmental morphology yields rich data that can inform tone orthography decisions. And as we shall see, viewing the verb phrase from this wider

perspective may lead the researcher beyond any presupposition that tone must be written with diacritics (Roberts, 2011b)

2. The Kabiye language

2.1. The sociolinguistic context

Kabiye was first written in the 1930s and officially standardised in the 1980s. This was the work of the Comité de Langue Nationale Kabiyè (CLNK) which operates under the auspices of the Togolese Ministry of Education (Roberts, 2011a). The CLNK has debated whether to change the zero tone marking policy on numerous occasions (CLNK, 1995a: 11-12; 1995b: 4-5, 16-17; 1998: 8-10). The research that follows was undertaken against this social backdrop. It involved a long process of networking with orthography stakeholders in the community (Sebba, 2007) and is a conscious attempt to view the problem from a new angle.

2.2. The tone system

Kabiye has two discrete level tones (H will be marked with an acute accent and L by absence of an accent), automatic and non-automatic downstep, and numerous lexical and post-lexical morphotonological processes (Delord, 1976; Kassan, 2000; Lébikaza, 2003; Lébikaza, 1994; Lébikaza, 1999; Roberts, 2002, 2003a, 2003b). Tone plays an important role in both the lexicon and the grammar, but it is in the latter that its functional load is greater.

Orthographic data is cited between chevrons and refers to the standard orthography unless otherwise stated. Phonetic data is cited between square brackets.

2.3.   The verb phrase

The classic Kabiye verb phrase consists of an obligatory root and a TAM suffix (1). It may optionally add up to two modal prefixes (2-3) and a subject pronoun prefix (4):[1]

1		<cɛlɩ !>				[cɛ́l-	ɩ́]	*give back!*
2		<tʋcɛlɩ>			[tʋ-	cɛl-	ɩ́]	*gave back even so*
3		<taatʋcɛlɩ>		[taa-	tʼɩ́ɩ́-	cɛl-	ɩ́]	*did not give back at all*
4		<ɛtaatʋcɛlɩ>	[ɛ-	taá-	tʼɩ́ɩ́-	cɛl-	ɩ́]	*he did not give back at all*
			SP3/1-	NEG-	ADV-	RT-	AOR	

This presentation of the data begs one obvious question: Why are the subject pronouns and modal morphemes written attached to the verb root in the first place? Shouldn't the CLNK have decided to write them as separate words when they standardised the orthography? Let us investigate these questions in the light of Dyken and Kutsch Lojenga (1993).

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[1] Suffixation also occurs but is not pertinent to the argument presented in this paper.

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2.4.   Word boundaries

Dyken and Kutsch Lojenga (1993) propose twelve criteria for establishing orthographic word boundaries (table 1):

Table 1: Criteria for establishing word boundaries (Van Dyken & Kutsch Lojenga, 1993)

Semantic criteria	
i.	Referential independence
ii.	Conceptual unity
iii.	Minimal ambiguity
Grammatical criteria	
iv.	Mobility
v.	Separability
vi.	Substitutability
Phonological criteria	
vii.	Pronounceability
viii.	Phonological unity
ix.	Phonological bridging
Inter-criteria considerations	
x.	Consistency
xi.	Redundancy
xii.	Conflicting criteria

First let us examine those criteria that speak in favour of separating subject pronouns and modal morphemes from the verb root. Amongst the semantic criteria, criterion 2 (conceptual unity) states that if a written word contains multiple concepts,

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it is a candidate for separation. This is indeed the case in Kabiye. Attaching the subject pronouns and modal prefixes to the verb root results in complex conceptual units, packed with meaning.

Two of the grammatical criteria argue in favour of separating subject pronouns. Criterion 5 (separability) states that two morphemes should be written as separate words when other morphemes can intervene between them. This is indeed the case, because the modal morphemes can intervene between subject pronouns and verb roots. Criterion 6 (substitutability) states that if the morpheme in question can be substituted by another grammatical element, this is an argument in favour of writing it separately. Again, this is the case with the subject pronoun prefixes, because they can be substituted by nouns and demonstratives.

Amongst the phonological criteria, criterion 7 (pronounceability) states that if a morpheme is pronouncable in isolation, this may be justification for writing it separately. All Kabiye subject pronouns and modal morphemes are indeed pronounceable in isolation.

Now let us look at those criteria that argue in favour of pronouns and modal morphemes being written attached to the verb root, as they are in the standard orthography. Among the semantic criteria, criterion 1 (referential independence) states that a morpheme qualifies as a word if it communicates meaning, even when heard or seen in isolation. Two mother tongue research assistants attest that this is not the case with Kabiye subject pronouns and modal morphemes. Pronouncable in isolation they

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may be, but their meaning is not recognizable. Criterion 3 (minimal ambiguity) evokes the principle that homography is best avoided. Yet to write these morphemes as separate words would multiply the number of short words; and the shorter a word is, the more likely it is to be a homograph.

Among the grammatical criteria, criterion 4 (mobility) states that when a morpheme can appear in different syntactic positions, it is best written as a separate word. But in Kabiye, subject pronoun prefixes and modal morphemes are both immobile, only ever appearing immediately to the left of the verb root. And returning to criterion 5 (separability) and 6 (substitutability), no elements can intervene between modal morphemes and the verb root and neither can they be substituted except by one another.

Among the phonological criteria, criterion 8 (phonological unity) requires that the resulting word should be a single phonological unit. This is indeed the case: the complex verb phrase in the standard orthography coincides with the domain within which certain vowel harmony and tone spreading rules operate (Roberts, 2004). Criterion 9 (phonological bridging) is based on the principle that it is better for any morphophonemic conditioning to occur within the orthographic word than across word boundaries. In Kabiye, the pronunciations of the first and second person singular subject pronouns (<ma> *I*, <ŋ> *you*) are conditioned by the character of the following segment. This suggests that they should be written attached.

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The fourth set of criteria deals with inter-criteria considerations. Criterion 10 (consistency) pleads for consistency within the writing system. In Kabiye, writing the verb phrase as a single word generates an entirely consistent orthographic paradigm. Criterion 11 (redundancy) states that cumulative evidence from several criteria is in itself another mark in favour of that evidence. In Kabiye, the fact that most criteria concur with each other in support of attachment adds a bonus point in its favour.

Finally, criterion 12 addresses cases of conflicting criteria. Firstly, it is advisable to look for agreement between at least two of the three sets. The above analysis confirms agreement in most cases. However, four criteria, one semantic (criterion 2), two grammatical (criteria 5 and 6) and one phonological (criterion 7), conflict with the others. In the absence of complete agreement, Dyken and Kutsch Lojenga advise prioritizing, with semantic criteria in prime position, then grammatical, and lastly phonological. With this in mind, the strongest violation is found in semantic criterion 2 (conceptual unity), but it is outweighed by the other two semantic criteria being satisfied. As for the violation of phonological criterion 7 (pronounceability), it is trumped by semantic criterion 1 (referential independence). This only leaves grammatical criteria 5 (separability) and 6 (substitutability), and even they only apply to subject pronouns not to modal morphemes.

This analysis confirms that the CLNK was justified in its decision to attach subject pronouns and modal morphemes to the verb root. But, as we will see, the decision has left some unintentional collateral damage in the standard orthography.

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2.5.   Verbs: a case of mistaken identity

This research will include an analysis of oral reading miscues (i.e. observed responses that do not match the expected responses). I will present this analysis in detail further on. But one important fact deserves highlighting from the outset. Among all the different elements of the sentence, it is the verb that attracts by far the most miscues in oral reading. Almost half (49.36%) of verbs are affected, and this is a much higher percentage than any other grammatical element (Figure *1*).

Figure 1: Grammatical distribution of miscues in an oral reading experiment
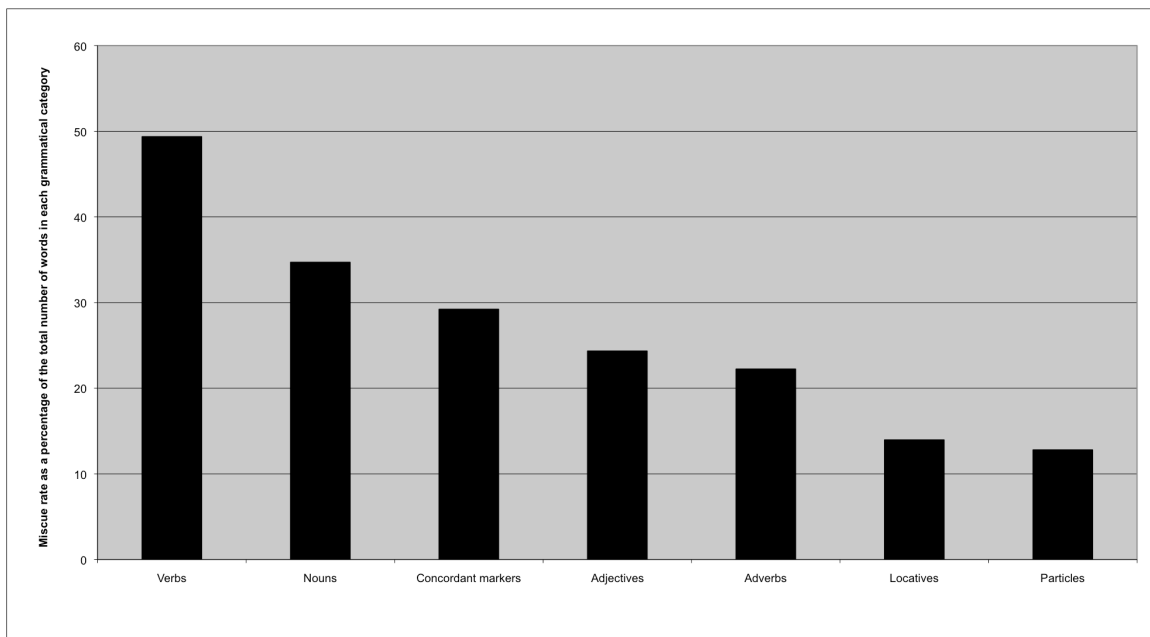
This begs for closer investigation. Why should it be that readers stumble over the verb more than other elements of the sentence? What is it about the orthography of the verb that makes it so difficult to identify and pronounce? Might it be possible to

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modify the orthography of the verb to make it easier for readers to identify it? To answer these questions, we will proceed in two stages. The first is a theoretical analysis based on a corpus of homographs and a corpus of natural texts. The second is a practical stage involving a classroom experiment of oral reading miscues.

3. Homograph analysis

1.1.   Corpora

Two computerised corpora served as a basis for the homograph analysis. The first was a homograph corpus (Roberts, 2008: A5-169)[2] containing all homographs with two or more distinct meanings. The second was a corpus of naturally generated texts containing a total of 142,483 words and 18,961 distinct word forms. (For a more complete description of these corpora and the methodology used, see Roberts, 2010a). Let us examine what they revealed about the nature of homography in the Kabiye verb phrase.

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[2] I am grateful to David Rowe and Neal Breakey for their help with the creation of this corpus.

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1.2.   Modal prefixes

Modal prefixes can sometimes be confused with verb roots that begin with the same sequences. There is a morphemic mismatch, because the morpheme boundary is not explicit in the orthography. This is the case with the negative aorist <ta> (5 - 10), the immediative <tɩ ~ ti>[3] (11 - 16), the adversative <tʊ ~ tii>[4] (17 - 20) and the prohibitive <taa>(21 - 22):

5	<εtasɩ-m>	[ε-	∅	tas-	í-	m]	*he added to me*
		SP3/1		RT	AOR	OP1s	
6	<εtasɩ-m>	[ε-	ta-	sɪ-	∅	ḿ]	*he did not accompany me*
		SP3/1	NEG	RT	AOR	OP1s	

7	<mantalaa>	[man-	∅	tal-	aá]	*I arrived*
		SP1s		RT	PER	
8	<mantalaa>	[man-	ta-	lá-	a]	*I did not perform sacrifices*
		SP1s	NEG	RT	AOR	

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[3] This morpheme is also homographic in isolation, having immediative or negative interpretations. I have analysed this dimension of ambiguity elsewhere (Roberts, 2008: 289-293, 398-399).

[4] This morpheme is also homographic in isolation, having adversative, habitual or expectative interpretations. I have analysed this dimension of ambiguity elsewhere (Roberts, 2008: 301-305, 406-407).

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9	\<ŋtayaɣ\>	[ŋ-	∅	tay-	ɑá]		*you were sharing*
		SP2s		RT	PI		
10	\<ŋtayaɣ\>	[ŋ-	ta-	yáɑ-	∅]		*you did not thump*
		SP2s	NEG	RT	AOR		
11	\<ɛtɪna-m\>	[ɛ-	∅	tɪn-	á-	m]	*he possesses me*
		SP3/1		RT	AOR	OP1s	
12	\<ɛtɪna-m\>	[ɛ-	tɪ-	ná-	∅	m]	*he saw me straightaway*
		SP3/1	IMM	RT	BP	OP1s	
13	\<ɛtɪyaa\>	[ɛ-	∅	tíy	aa]		*he consulted the charlatan*
		SP3/1		RT	PER		
14	\<ɛtɪyaa\>	[ɛ-	tɪ-	ya-	á]		*it exploded straightaway*
		SP3/1	IMM	RT	PER		
15	\<etituu\>	[e-	∅	tît-	uu]		*(as) he packs down*
		SP3/1		RT	DI		
16	\<etituu\>	[e-	ti-	tu-	ú]		*(as) he slides straightaway*
		SP3/1	IMM	RT	DI		

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17	<ɛtʊtaɣ>	[ɛ-	∅	tɪɪt-	ɑá]	*he was rubbing*[5]
		SP3/1		RT	PI	
18	<ɛtʊtaɣ>	[ɛ-	tʼíí-	tɑ-	á]	*he anoints in spite of it*
		SP3/1	ADV	RT	IMP	

19	<tiitiɣ !>		[∅	tiit-	ʊ�by̩ʊ̩]	*be in the habit of rubbing against!*
				RT-	IMP	
20	<tiitiɣ !>		[tii-	tʊ̩ʊ̩́-	∅]	*light fire in spite of it!*
			ADV	RT	IPF	

21	<taadɪ !>		[∅	taadʲ-	ɪ]	*stick!*
				RT	IPF	
22	<taadɪ !>		[taa-	dʲí-	∅]	*do not tie up!*
			NEG	RT	IPF	

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[5] Examples 17 and 19 are two different lexemes <tʊtʊʊ> *rub* and <tiituu> *rub against.* However, a participant at a regional orthography consultation (Pidassa & Roberts, 2005) noted that the long vowels in these words are due to the elision of a palatal consonant [y] that is still pronounced in certain dialects. Rendering this segment visible would disambiguate examples 17 ~ 18 (<ɛtɪyɪtaɣ> *he was rubbing* <ɛtʊtaɣ> *he anoints in spite of it*) and examples 19 ~ 20 (<tiyitiɣ !> *be in the habit of rubbing against!* <tiitiɣ !> *light fire in spite of it!*).

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This is only a representative sample of the possible homographic word forms generated by these modal prefixes. Those that begin with subject pronouns may vary according to person, number and class; this of course considerably multiplies the number of possible orthographic word forms.

1.3.   Subject pronoun prefixes

The subject pronoun prefixes generate similar confusions between verbs and nouns. Again there is a morphemic mismatch, because the morpheme boundary is not explicit in the orthography (23 - 28):

23   <ɖɪsɪ>   [ɖɪ́-sɪ]   *houses*

        N-6
24   <ɖɪsɪ>   [ɖɪ́-sí-∅]   *(and) we knew*

        SP1p-RT-AOR

25   <afelaa>   [afél-aa]   *sorcerers*

        N-6
26   <afelaa>   [a-fel-aá]   *they are of medium build*

        SP7-RT-PER

27   <ɛyaa>   [ɛy-áa]   *human beings*

        N-2
28   <ɛyaa>   [ɛ-ya-á]   *he called*

        SP3/1-RT-PER

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This brief analysis has identified certain homographs in the standard orthography and predicts that these may be the source of readers' difficulties. The second stage of the analysis takes a wider perspective. It does not ask "to what extent do homographs cause readers to miscue?" but rather the more general question "what causes miscues"?

4. Miscue analysis

1.1. Methodology

The second stage of the methodology was a classroom experiment involving analysis of oral reading miscues with 39 subjects. Twenty were female adult volunteer literacy monitors ("the monitors").[6] Nineteen were grade 10 pupils who had recently chosen written Kabiye as an optional subject ("the pupils").[7] The experiment was based on ten, one hundred word texts extracted from the literature corpus. Subjects were recorded individually reading aloud each text once in standard orthography with no tone marks

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[6] The monitors all work with AFASA (Association des Femmes pour l'Alphabétisation, la Santé et les Activités génératrices de revenues). I would like to thank the director, Mme Lucie Mozou, for letting giving us access to her premises and also for her tireless help in the administration of the experiment.

[7] The pupils were all enrolled at CEG Lama-Kolidè. I would like to thank the headmaster, M. Tchandikou Garba, for giving us access to his school.

added. The post-experiment phase involved annotating interlinearized texts, recording miscues using classic notation (cf. Schreiner, 1979: 59). Miscues included repetitions, substitutions, hesitations, omissions, insertions, metathesis and ignoring punctuation. The annotations also recorded the raw and average number of miscues per subject on each word. (For a more detailed description of the experiment methodology, see Roberts, 2010a).

The ten texts were chosen randomly and, as it happens, they contain not one homograph of the kind cited in examples 5 - 28. This should serve as a warning not to place too much store by isolated lists of minimal pairs. They may look impressive and they certainly satisfy the researcher's desire to leave no stone unturned. But if such lists are not at all representative of a randomly chosen sample of a thousand words, they are of limited use.

Given the absence of such homographs, why is it that the verbs in these ten texts still persist in attracting many more miscues than any other grammatical element? Clearly, we need to look beyond tonal minimal pairs. The ensuing analysis identifies three other sources of difficulty: infrequent subject pronouns, alternating subject pronouns and multiple prefixation.

1.2.   Infrequent subject pronouns

First let us investigate the contribution of infrequency. Text 5 is a newspaper article (Togo-Presse, 2004) that relates the visit of two government ministers to Kara prison.

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The journalist employs the focalising pronoun <ña> *as for them* with reference to the prisoners. This pronoun is extremely infrequent, representing only 1.4% of all subject pronouns in the literature corpus. (By way of contrast, the human noun classes *N.1* and *N.2* account respectively for 31.15% and 20.31%). So it is not surprising that the verb containing the pronoun <ña> attracts many miscues (figure *2*):

Figure 2: « ... for their health. As for the prisoners, they complained that... »
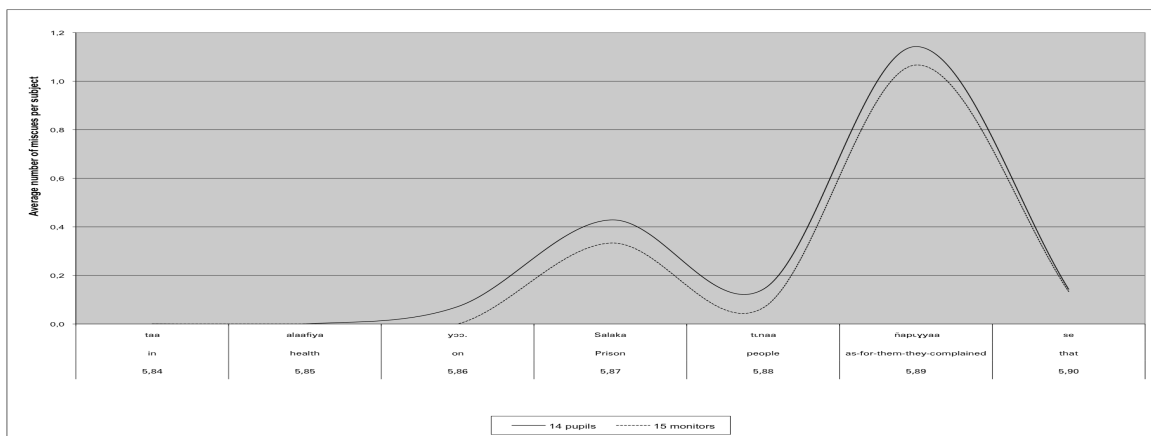
Let us examine the performance of one typical subject more closely. Example *29* should be read from the bottom upwards. An arrow ← indicates a repetition, a triple backslash /// indicates a very long hesitation and the symbol ⤫ indicates a meaningful substitution. This reader is unable to identify the perfective verb <ñapɩɣyaa> *as for them, they complained* even after six attempts. He makes an initial attempt to pronounce the first syllable but is unable to get any further (line 1). Then he substitutes not only the wrong lexeme <pɩs>- *to return,* but also the wrong conjugation -<aɣ> *past imperfective* (line 2). He then returns to the beginning of the sentence in an attempt to glean information from the preceding context (line 3). But to no avail: this time he

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substitutes the lexeme <pɩɣ>- *to pour,* adding the past imperfective suffix -<aɣ> as before (line 4)*.* After a long hesitation, he returns to the beginning of the sentence again, only to repeat the same mistake (line 5). Finally he tries to pronounce the verb in isolation, but still fails to identify it correctly (line 6):

6			← ✗
5	←		✗
4		[ñápíɣáá] /// ✗	*As for them, they were pouring*
3			
2	←	[ñápísáɑ] ✗	*As for them, they were returning*
1		[ñá]	*As for them...*

29	<Salaka	tɩnaa	~~ñapɩɣaa~~	se...>
	[sáláka-	tɩn-áa	ñá-pɩ́ɩ́ɩ́-aa	se]
	suffering_3	belongers-2	FOC-complain-PER	CNJ

The prisoners, as for them, they complained that...

Miscue analysis is always open to multiple interpretations. It could be that the reader stumbled over this verb because of the relatively unusual CVɣC- segmental structure of the root. Or perhaps the choice of imperfective suffix -<aɣ> is a response to seeing the letter <ɣ> in the root. Nevertheless, it is safe to conclude that along with any other possible causes of disturbance, the infrequent subject pronoun also contributes to the high number of miscues, because it masks the identity of the verb root.

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1.3.   Alternating subject pronouns

Text 1, the Flood folktale, shows the extent to which alternating subject pronouns can mask the identity of roots in a long sequence of verb phrases. Example 30 shows the full text:

| 30 | <Nakʊyʊ wiye pɩcaka kʊyaa kowolo Ɛsɔ cɔlɔ se ɛha-kɛ ɖoŋ nɛ weyi ɛtasɩɣ-kɛ tʊʊ se kɛfɛyɩ ñʊʊ lɛ, ɛsɩ kpaagbaa. Ɛsɔ ha-kɛ mbʊ kɔpɔzaa yɔ. Pɩcaka kʊyɩ Ɛsɔ cɔlɔ se kapɩsɩɣ tɛtʊ yɔɔ wondu lɛɛtʊ hɛkʊ taa lɛ, Ɛsɔ cɔna tɔm ndʊ tɩ-taa nɛ ɛna se pɩcaka fɛyɩna toovenim. Peeye etiya tɛʊ se kilo pɩcaka wayɩ nɛ kɩpasɩ ko-ɖoŋ sɔtʊ. Pɩtɛma nɛ tɛʊ wɛɛ kiloŋ nɛ kɩpɩyɩɣ yem waaa. Kɔkɔmaa kawɩzɩɣna tɛtʊ lɛ, kanaɣ lɩm wadɩ yem, pɩtɛma nɛ kɛkɛzɩ ka-tɩ nɛ kasʊʊ ɛwaɣ nakɛyɛ tɛɛ. Tɛʊ wɛɛ hɔɔʊ yɔɔ nɛ kikpezi pɩcaka yɔɔ sɔtʊ nɛ pɩsɛɣ ko-suu nɔɔ taa.> |
| | *One day, the Scorpion went to God to request a special force so that anyone who teased him because he didn't have a head would immediately die. God granted what he asked for. But when the Scorpion left and returned to the earth among the other animals, God thought better of his decision and realised that the Scorpion was in the wrong. So God sent the Rain and to chase after the scorpion and diminish the strength of his venom. The Rain chased him and started to pour heavily. When the Scorpion approached the earth, he saw water everywhere, so he turned back and hid underneath a rock. But the Rain continued to fall and washed away the scorpion's venom, so that it only remained in the end of his tail.* |

The story alternates between the protagonist from one noun class, <pɩcaka> *scorpion N-5,* and his adversary from another <tɛʊ> *rain N-3.* Both noun classes are relatively infrequent in the literature corpus (N-5 = 3.18% and N-3 = 1.7% of the total number of subject pronouns). But of course, once within a text containing them, they crop up again and again.

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Moreover, since vowel harmony is written transparently, the class 5 subject pronoun has five possible allographs <ka ~ kɛ ~ ke ~ kɔ ~ ko> and the class 3 subject pronoun has two <kɪ ~ ki>. So two subject pronouns that are already relatively infrequent have written forms each of which is even rarer. Nevertheless, six of the seven possible allographs appear in the space of this single hundred-word text. On top of all this, the two subject pronouns are graphically similar, both beginning with the grapheme <k>.

In the Flood folktale, the subject pronouns alternate between the two noun classes and between their respective allographs (31 - 44):

				Miscues
31	<kowolo>	[kó-wólo]	*(scorpion) went*	0.98
32	<kɛfɛyɪ>	[kɛ-fɛyí]	*(scorpion) did not have*	1.30
33	<kɔpɔzaa>	[kɔ-pɔz-aá]	*(scorpion) asked for*	0.90
34	<kapɪsɪɣ>	[ka-pís-ʉʉ̩]	*(scorpion) returned*	1.08
35	<kilo>	[kî-ló]	*(rain) chased*	2.00
36	<kɪpasɪ>	[kɪ-pás-ɪ]	*(rain) diminished*	1.42
37	<kiloŋ>	[kî-ló-ŋ]	*(rain) chases*	1.23
38	<kɪpɪyɪɣ>	[kí-píy-ʉʉ̩]	*(rain) pours*	1.37
39	<kɔkɔma>	[kɔ-kɔm-á]	*(scorpion) came*	1.68
40	<kawɪzɪɣna>	[ka-wíz-ʉʉ̩-na]	*(scorpion) came close to*	1.68
41	<kanaɣ>	[ka-ná-ɑ]	*(scorpion) sees*	0.92
42	<kɛkɛzɪ>	[kɛ́-kɛ́z-ɪ]	*(scorpion) turned*	1.12
43	<kasʊʊ>	[ká-só-ʊ]	*(scorpion) hid*	0.38

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44	<kikpezi>	[kí-kpéz-i]	*(rain) washed away*	1.60
			Average:	1.26

The right hand column registers the average number of miscues per subject on each verb. All of them are relatively high. The average for the whole set is 1.26 which means more than one miscue per subject per verb. But the three verbs that attract the highest number of miscues are in exactly the three places where the prefix alternates between these two infrequent, variable, and graphically similar subject pronouns (35, 39, 44). This suggests that constant oscillation between class prefixes may be causing readers to stumble.

1.4.   Multiple prefixation

Text 10, a series of proverbs extracted from Batchati (1997), offers a window onto the way in which multiple prefixation can make the root difficult to identify. Consider the following example (45):

45	<Tɪgbayʊ se : Mantɪna mbʊ pɪwɛ me-liu tɛɛ yɔ ; mantɪtɪna mɔ-nɔɔ taa ñɪm.>
	[tɪgbay-ʊ́ se máń-↓tíná ↓ḿbʊ́ pɪ-wɛ me-li-ú ↓tɛ́ɛ́ yɔ́ máń-tɪ́-tíná mɔ-nɔ-ɔ́ ↓táá ɲɪ́-m][8]

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[8] The non-automatic downstep [↓] in this example is due to a rule stipulating that an underlying /HLH/ melody surfaces as [H↓HH] or [HH↓H] (depending on the skeletal structure of the segments to which it associates).

	monkey-1 CNJ SP1s-possess_BP REL SP-be_BP PP1s-throat-3 under SUB SP1s-NEG-possess_AOR PP1s-mouth-5 in wealth-10
	The monkey says: what's in my throat is mine; what's in my mouth is not.

The second verb phrase <mantɪtɪna> [mántítíná] *I do not possess* carries a H tone melody which occurs in response the implied question "To whom does X belong?" It is composed of two prefixes followed by a root that, not insignificantly, begins with the same CV sequence as the negative prefix before it. The coincidence of double prefixation, segmental reduplication and a choice of tone interpretations was confusing to many readers. Out of 16 recordings - [9]

- three subjects pronounced the word correctly on the first attempt, though one of these repeated it several times as though to reassure himself. Three others took several attempts before pronouncing it correctly (46).

- one subject pronounced it with the LH melody that this word carries when it occurs in response to the implied question "Does X belong to you?" [10] (47).

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[9] The number of recordings is low because we eliminated any subjects who had prior knowledge of the proverb.

[10] The exact difference in meaning between these two forms would make an interesting subject for future tone research.

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- seven subjects substituted the affirmative (48) influenced no doubt by the fact that this very word had occurred earlier in the sentence.

- one subject substituted the affirmative perfective of a completely different lexeme (49);

- four subjects substituted meaningless words (50 - 52);

- no readers substituted the immediative meaning of this homograph (53), which is relatively infrequent in natural texts.

				# readings
46	[máń-tí-tíná-∅]	SP1s-NEG-possess-BP	*I do not possess (H)*	*6 (correct)*
47	[man-tɪ-tɪná-∅]	SP1s-NEG-possess-BP	*I do not possess (LH)*	*1*
48	[mán-↓tíná-∅]	SP1s-possess-BP	*I possess*	*7*
49	[men-tî̃n-aa]	SP1s-take down-PER	*I took down*	*1*
50	*[mantíná]	-	-	*2*
51	*[máńtɪtɪná]	-	-	*1*
52	*[mantííná]	-	-	*1*
53	[man-tɪ-tína-∅]	SP1s-IMM-possess-BP	*I possessed straight away*	*0*

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This analysis suggests that multiple prefixation also contributes to making verbs difficult to identify, and that this may be a cause of confusion not only on homographic tonal minimal pairs, but on any prefixed verb phrase, since the morpheme boundary is not marked. There is nothing unusual in this. It occurs in any language in which derivational prefixation and compound stems generate long words. But the problem is less easily tolerated in an oral culture, because people are not exposed to the orthography regularly enough to become fully proficient in reading complex forms.

1.5.   Summary

Now let us summarize the findings from the two parts of the methodology. The first, theoretical part of the analysis revealed numerous isolated homographic tonal minimal pairs that may cause disruption to the reading process. Modal prefixes generate ambiguities with verb roots that begin with the same sequences. Subject pronoun prefixes generate ambiguities with nouns that begin with the same sequences.

The second, practical stage of the methodology, the miscue analysis, widened the perspective to investigate not just homographic tonal minimal pairs but any and all verb phrases. The experiment revealed numerous miscues on non-homographic verb phrases, the identity of the verb root being obscured by infrequent, alternating and multiple prefixes.

These findings suggest that any modification of the standard orthography would do well to highlight not the tone system but the morphology. Highlighting the tone system will only deal with a limited series of tonal minimal pairs that, as we have seen, prove to be infrequent in natural contexts. But if the modification were to highlight the morphology, it would disambiguate both tonal minimal pairs and other verb phrases that are difficult to identify.

5. Proposition: capital letters

Now let us examine possible solutions. The first idea proposed by participants during two regional orthography stakeholder consultations (Pidassa & Roberts, 2005, 2008), predictably perhaps, was to add a hyphen between the prefix and the verb root (cf. Van Dyken & Kutsch Lojenga, 1993: 16). However, findings from the literature corpus warn us that this proposal is unadvisable. A grapheme frequency count reveals that the hyphen is already ubiquitous in the standard orthography, its frequency (13,173) being considerably higher than even the full stop (11,537) and the comma (8,939). This is because it already serves a triple function: attaching the object pronoun suffix to the verb, attaching the possessive pronoun prefix to the noun, and marking word breaks at the end of lines. If the hyphen was assigned a fourth function, it would surely lose its effectiveness through overuse (Gudschinsky, 1970: 25).

A more promising solution might be to mark the beginning of each verb root with a capital letter. This would be a morphonographic representation (Catach, 1988),

that is, it would signal the morphology whilst still paying tribute to the phonology. It would disambiguate homographs caused by morphemic mismatch (54 - 59):

    Proposed orthography

54   <ɛTasɩ-m>   *He added to me*

55   <ɛtaSɩ-m>   *He did not accompany me*

56   <ɛTɩna-m>   *He possesses me*

57   <ɛtɩNa-m>   *He saw me straightaway*

58   <Taaɖɩ !>   *Stick!*

59   <taaÐɩ !>   *Do not tie up!*

It would also disambiguate homographic verb phrases and nouns (60 - 65):

    Proposed orthography

60   <ɖɩsɩ>   *houses*

61   <ɖɩSɩ>   *(and) we saw*

62   <afelaa>   *sorcerors*

63   <aFelaa>   *they are of medium build*

64   <ɛyaa>   *human beings*

65   <ɛYaa>   *he called*

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This would have the secondary effect, not discussed until now, of disambiguating homographic verb phrases from their corresponding associative noun phrases (66 - 69):

Proposed orthography

66   <pɩcaka kʊyaa>   *the scorpion killers*

67   <pɩcaka Kʊyaa>   *the scorpion got up*

68   <halʊ hazaɣ>   *the woman's shoulder*

69   <halʊ Hazaɣ>   *the woman was sweeping*

And the advantages do not stop there. Since the capital letter in verb root position would be not a tonal but a morphological solution, the aim would be to move beyond mere tonal minimal pairs to make all verb phrases easier to identify. Highlighting the morpheme boundary would enable easier identification of any preceding constituents, such as alternating and/or infrequent subject pronouns (70 - 73):

Proposed orthography

70   <kaPɪsɩɣ>   *(scorpion) returns*

71   <kɩPɩyɩɣ>   *(rain) pours*

72   <kaWɪzɩɣna>   *(scorpion) came close to*

73   <kiKpezi>   *(rain) washed away*

And in cases of multiple prefixation, the capital letter would draw the reader's eye to the root, which is the nucleus of the verb phrase (74 - 76):

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Proposed orthography

74	<tʊCɛlɪ>	*gave back even so*
75	<taatʊCɛlɪ>	*did not give back at all*
76	<ɛtaatʊCɛlɪ>	*He did not give back at all*

Here is the flood folktale rewritten with the proposed modification, to give an idea of the overall visual impact on the printed page (77):

	Proposed orthography
77	<Nakʊyʊ wiye pɪcaka Kʊyaa koWolo Ɛsɔ cɔlɔ se ɛHa-kɛ ɖoŋ nɛ weyi ɛTasɪɣ-kɛ Tʊʊ se kɛFɛyɪ ñʊʊ lɛ, ɛSɪ kpaagbaa. Ɛsɔ Ha-kɛ mbʊ kɔPɔzaa yɔ. Pɪcaka Kʊyɪ Ɛsɔ cɔlɔ se kaPɪsɪɣ tɛtʊ yɔɔ wondu lɛɛtʊ hɛkʊ taa lɛ, Ɛsɔ Cɔna tɔm ndʊ tɪ-taa nɛ ɛNa se pɪcaka Fɛyɪna toovenim. Peeye eTiya tɛʊ se kiLo pɪcaka wayɪ nɛ kɪPasɪ ko-ɖoŋ sɔtʊ. PɪTɛma nɛ tɛʊ Wɛɛ kiLoŋ nɛ kɪPɪyɪɣ yem waaa. KɔKɔmaa kaWɪzɪɣna tɛtʊ lɛ, kaNaɣ lɪm Wadɪ yem, pɪTɛma nɛ kɛKɛzɪ ka-tɪ nɛ kaSʊʊ ɛwaɣ nakɛyɛ tɛɛ. Tɛʊ Wɛɛ Hɔɔʊ yɔɔ nɛ kiKpezi pɪcaka yɔɔ sɔtʊ nɛ pɪSɛɣ ko-suu nɔɔ taa.>

This solution has the pedagogical advantage that capital letters are already known to readers and writers. And the use of capital letters to signal grammar has a several precedents in other languages (though admittedly not in the verb phrase, to the author's knowledge). It is already used word initially in German, an international language with a long literary tradition, to signal nouns (78):

German orthography

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78   Deutsche Wurst isst man entweder zum Frühstück oder zum Abendessen aber kaum zu

Mittag.

One eats German sausages either for breakfast or for supper, but seldom for lunch.

It is used in Irish to signal the roots of proper nouns (79 - 81). This has more in common with the Kabiye proposal, because the capital letters often appear word medially following genitive and definite article prefixes (cf. Daltún, 1970):[11]

Irish orthography

79   Oifig   na   dTabhartas   agus   na   *Office of charitable donations and bequests*
dTiomnachtaí Carthanúla

80   Clárlann na nGníomhas   *Registry of deeds*

81   An tAire Gnóthaí Eachtrachha   *The minister of external affairs*

[11] I would like to thank Dónall Ó Baoill for providing these examples.

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And on the African continent, some Tanzanian Bantu languages use capital letters for this same purpose, for example in Sangu (82 - 83), Kinga (84 - 85) and Vwanji (86 - 87):

82	<Nikhandi ku wuSango.>	*I was in the Sangu area.*
83	<AvaSafwa vasheefu viikhala ku Njombe.>	*Not many Safwa live in Njombe.*
84	<AvaBungu vitaama ndaku?>	*Where do the Bungu live?*
85	<ʉnSafwa mpamato akanale ʉkʉsika.>	*A certain Safwa has not arrived.*
86	<KʉvʉMalɨla kʉnono.>	*The Malila area is beautiful.*
87	<ʊmʉVwanji ʉjʉ ilonda pivʉka.>	*This Vwanji wants to leave.*

6. Evaluation: A quantitative experiment

Capital letters to mark the beginning of verb roots was one of ten modifications included in a grammar orthography developed for testing purposes. It was included in a experiment with 28 adult subjects, all volunteer literacy workers with prior knowledge of the standard orthography.[12] A trained mother-tongue research assistant taught the modifications in a series of fifteen lessons on three consecutive mornings. On the fourth morning, the same assistant tested skills acquired in a dictation task. The

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explanation that follows is limited to those parts of the experiment that are pertinent to the issue of capital letters (For a more complete description of the experiment see Roberts & Walter, 2012).

The dictation used eight sentences extracted from the literature corpus (Roberts, 2008: A172-180). The text required the addition of sixteen capital letters in verb root initial position. The test administrator read the whole text aloud first, then repeated each sentence three times, and finished by reading the whole text again.

With the help of Minitab software, the dependent variable CAPITAL recorded errors, defined as root initial capital letters that were either not written, wrongly written or included where not required. Figure *3* portrays the results in 10% error bands:

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Figure 3: Errors on verb root initial capital letters in the experimental orthography dictation task
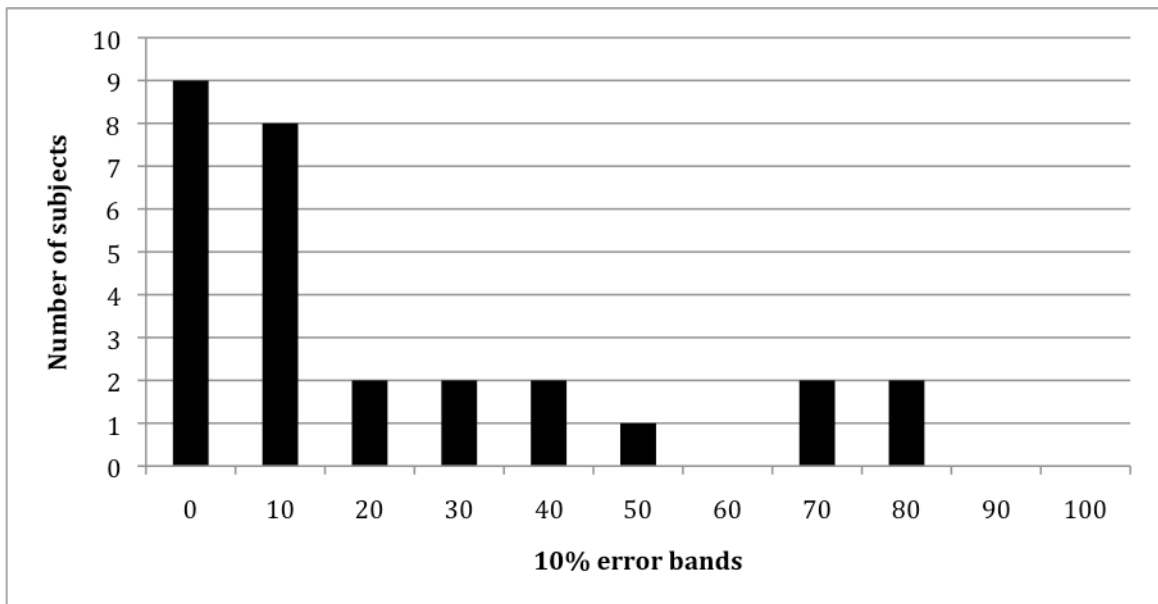
A third of the sample wrote all the required capital letters faultlessly or almost faultlessly. Another third are in the 10% error band. After that, in the 20% error range and beyond, there is a steep decline but only four subjects registered over 50% errors.

We tested the results against five independent variables. EDUCATION recorded length of formal education, measured in years. EXPERIENCE recorded length of experience in reading and writing Kabiye, measured in years. TRAINING recorded length of training as a volunteer literacy worker, measured in days. WRITEFREQ recorded how frequently a subject writes in Kabiye outside of the stimulating framework of a structured literacy program, measured in days per year. STANDARD recorded dictation

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performance in a standard orthography pre-test. Multiple regression delivered the following results (table 2):

Table 2: Multiple regression on verb root initial capital letters in the experimental meaning-based orthography dictation task

Variable	Constant (CAPITAL)	Coefficient	P	R^2
EDUCATION	13.560	- 1.211	0.000	54.4%
EXPERIENCE	5.626	- 0.193	0.056	13.4%
TRAINING	4.782	-0.039	0.491	1.8%
WRITEFREQ	5.078	- 0.010	0.110	9.9%
STANDARD	1.978	+0.030	0.208	6.0%

There is a strong correlation between CAPITAL and EDUCATION. From a constant of 13.56 errors if the variable is not taken into account, every year of formal schooling reduces the error rate by more than one (-1.211). The contribution of this variable represents more than half of the variance in the data (R^2 = 54.4%) and there is no probability that the result was due to an error in the sample composition (P = 0.000). The other variables are not particularly predictive of performance.

A possible interpretation of these results is that formal education hones analytical skills and exposes pupils to grammar (with its particularly strong emphasis in the francophone context). These skills are transferable to writing grammar in the mother tongue. Competence measured in any of the four other variables, on the other hand, only reflects the subject's familiarity with the unmodified standard orthography.

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The subjects' success in writing the capital letters suggests that they have a certain instinct for the morphology of their language. Writers, especially those with several years of formal schooling behind them, can learn this modification easily.

But there is another reason why subjects mastered writing the capital letters in verb root initial position. For two reasons, they had much more practice with this modification than any of the other modifications introduced in the experimental orthography. Firstly, it was taught in the opening lesson, so they had the maximum possible time to practice it. Secondly, every sentence requires at least one verb root, so this modification appeared much more frequently in classroom exercises than any others. This point serves to remind future experimenters of the importance of generous time for training and practice.

We complemented the results of the intervention by monitoring subject preferences using a written evaluation questionnaire on the final day of the experiment. Almost the entire class (93%) were positive about the capital letters, with 50% of them reporting that they found it the most interesting lesson in the course.

7. Conclusion

This article has largely been concerned with a linguistic evaluation of Kabiye verb phrase orthography. But this leaves an incomplete picture unless we return to the sociolinguistic context in conclusion.

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The CLNK has patiently heard the arguments in favour of this proposal, most recently in Lomé at an extraordinary meeting of the Kabiye National Language Committee in June 2010 (Roberts, 2010b). But it would be naïve to imagine that they are rushing to implement it. As the chairman warned the author, "You would do well to listen to what committee members are not saying, as well as what they are saying". Several decades of orthography development have naturally bred conservative attitudes. Committee members are also wary of reform because it means that the little exposure to print that readers do get will be in divergent orthographies. It may well be that this research ends up being more useful to languages other than Kabiye that are as yet unwritten (cf. Bird, 2001: 150).

Or perhaps compromise is called for in the Kabiye context. A more subdued option would be to mark the morpheme boundary with a full stop. But here, as so often in orthography matters, a tension between priorities would surface. From a psycholinguistic point of view, the most effective strategies are often those with greatest visual impact. But from a sociolinguistic point of view, these are the very strategies that are most difficult to introduce, especially in an orthography with the weight of eighty years of development behind it.

But in any case, the choice of modification itself is a secondary issue. The important point from a local perspective is that, by hook or by crook, the Kabiye orthography would do well to render visible the morpheme boundary between prefixes and verb roots. And from a wider perspective, this study demonstrates that an

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awareness of segmental morphology can be as significant for tone orthography considerations as an understanding of the tone system itself. [13]

Abbreviations

ADV	adversative
AOR	aorist
BP	bound perfective
CNJ	conjunction
DI	descriptive imperfective

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FOC	focalising subject pronoun
IMM	immediative
IMP	imperfective
IPF	imperative
N-1	noun of class 1 (and similarly for the other classes)
NEG	negative
OP	object pronoun
P	plural
PER	unbound perfective
PI	past imperfective
PP	possessive pronoun
RT	root
S	singular
SP	subject pronoun
1	first person
2	second person
3/1	third person, class 1 (and similarly for the other classes)
< >	orthographic data
[ ]	phonetic data
[∅]	zero morpheme
[á]	H tone
[a]	L tone
[↓á]	non-automatic downstep

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References

Batchati, Bawubadi (1997), *Culture kabiyè à travers ses proverbes, volume 1.* Kara: SIL-Togo.

Bird, Steven (1999), Strategies for representing tone in African writing systems, *Written Language and Literacy* **2**:1.1-44.

Bird, Steven (2001), Orthography and identity in Cameroon, *Written Language and Literacy* **4**:2.131-162. Reprinted in SIL Notes on Literacy 26(1-2): 3-44.

Cahill, Michael (2001), Avoiding tone marks : a remnant of English education?, *SIL Notes on Literacy* **27**:1.13-22.

Catach, Nina (ed.) (1988), *Pour une théorie de la langue écrite : actes de la table ronde internationale CNRS-HESO, 23-24 octobre 1986.* Paris: Editions du CNRS.

CLNK (1995a), *Ɛbɛ Laba ? (Qu'est-ce qui se passe ?) : la revue semestrielle du comité de langue nationale kabiyè, no. 18.* Lomé: CLNK.

CLNK (1995b), *Procès verbal de la deuxième session ordinaire annuelle du 6 au 10 novembre 1995 du comité de langue nationale kabiyè.* Lomé: CLNK.

CLNK (1998), *Ɛbɛ Laba ? (Qu'est-ce qui se passe ?) : la revue semestrielle du comité de langue nationale kabiyè, no. 23.* Lomé: CLNK.

Daltún, Séamas (1970), *Maidir le do litir.* Baile Átha Cliath: Oifig an tSoláthair.

Delord, Jacques (1976), *Le kabiyè.* Lomé: lnstitut national de la recherche scientifique.

Gudschinsky, Sarah C. (1970), More on formulating efficient orthographies, *The Bible translator* **21**:2.21-25.

Kassan, Balaïbaou Badameli (2000), De l'influence du ton consécutif dans les formes de l'aoriste en kabiyè, *Cahiers voltaïques / Gur Papers* **5**.13-22.

Lébikaza, Kézié (2003), Tones, syllables and consonants in Kabiyè: interaction of suprasegmental features on consonants. Paper presented at the 33rd International Colloquium on African Languages and Linguistics, Leiden, Pays-bas.

Lébikaza, Kézié Koyenzi (1994), Les tons des verbes kabiyè dans les formes de l'inaccompli in *Sprachen und sprachzeugnisse in Afrika: Eine Sammlung philologischer Beiträge, Wilhelm J.G. Möhlig zum 60. Geburtstag zugeeignet*, ed. T. Geider & R. Kastenholz, 263-279. Cologne: Rüdiger Köppe.

Lébikaza, Kézié Koyenzi (1999), *Grammaire kabiyè: une analyse systématique - phonologie, tonologie et morphosyntaxe.* Cologne: Rüdiger Köppe.

Pidassa, Emmanuel & David Roberts (2005), *Compte rendu d'une consultation régionale sur l'orthographe kabiyè au Centre Régional des Affaires Sociales de Kara.* Kara: SIL.

Pidassa, Emmanuel & David Roberts (2008), *Compte rendu d'une consultation régionale sur l'orthographe kabiyè au Collège Protestant de Lomé.* Kara: SIL.

Roberts, D. (2010). Hidden morpheme boundaries in Kabiye: a source of miscues in a toneless orthography. *Writing Systems Research, 2*(2), 139–153.

Roberts, David (2002), *Les classes tonales du verbe en kabiyè*: Université de la Sorbonne nouvelle, Paris III. Mémoire de maîtrise.

Roberts, David (2003a), *La tonologie des préfixes de modalité en kabiyè*: Université de la Sorbonne nouvelle, Paris III. Mémoire de DEA.

Roberts, David (2003b), Tone spreading in the Kabiye associative noun phrase, *Cahiers voltaïques / Gur Papers* **6**.95-100.

Roberts, David (2004), Tonal processes in the Kabiye verb phrase. Paper presented at the 24th West African Linguistics Congress, University of Ibadan, Nigeria. 1 - 6 August 2004.

Roberts, David (2006), Une idée capitale pour traiter les tons !, *Ɛbɛ Laba ? la revue sémestrielle du Comité de Langue Nationale Kabiyè* **26**.18-21.

Roberts, David (2008), *L'orthographe du ton en kabiyè au banc d'essai. Thèse de doctorat (INALCO, Paris).* Villeneuve d'Ascq: Atelier national de reproduction des thèses.

Roberts, David (2010a), Exploring written ambiguities can help assess where to mark tone, *Writing Systems Research* **2**:1.25-40.

Roberts, David (2010b), Vers une graphie tonale appropriée pour le kabiyè : une troisième voie. Paper presented at the extraordinary meeting of the Comité de Langue Nationale Kabiyè, Lomé, Togo. 28 June - 1 July 2010.

Roberts, David (2011a), The development of written Kabiye and its status as one of the "national" languages of Togo in *Language and politics In Africa: Contemporary issues and critical perspectives*, ed. O. Orwenjo & O. Ogone, 468-494. Newcastle-on-Tyne: Cambridge Scholars Publishing.

Roberts, David (2011b), A tone orthography typology, *Written Language & Literacy (special issue on the typology of writing systems)* **14**:2.82–108.

Roberts, David & Steven L. Walter (2012), Writing grammar rather than tone: an orthography experiment in Togo, *Written Language & Literacy* **15**:2.226-253.

Schreiner, Robert (1979), *Reading Tests and Teachers : a Practical Guide.* Newark, Delware: International Reading Association.

Sebba, Mark (2007), *Spelling and Society: the Culture and Politics of Orthography.* Cambridge: Cambridge University Press.

Togo-Presse (2004), Kara salaka tɔm. In *« Ɖe-Ejaɖe », Kemeɣa 7 Agoza fenaɣ 2004 (Friday 7 May 2004).* Lomé.

Van Dyken, Julia R. & Constance Kutsch Lojenga (1993), Word boundaries: Key factors in orthography development in *Alphabets of Africa*, ed. R.L. Hartell, 3-20. Dakar: UNESCO and SIL.

Roberts, D. (2010). Hidden morpheme boundaries in Kabiye: a source of miscues in a toneless orthography. *Writing Systems Research, 2*(2), 139–153.