Extra-Short Vowels in West African Languages

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Abstract

This paper examines extra-short vowels in languages of four different groups from West Africa. Their phonetic characteristics and phonological behavior are remarkably uniform across these groups. In the languages where information is the most abundant, the evidence points to a phonological representation of extra-short vowels as full vowels.

This leads us to conjecture that extra-short vowels are phonetic phenomena rather than phonological ones. This would entail accounting for the key characteristics of extra-short vowels in phonetic implementation rather than in the phonology.

1. Introduction: What are “extra-short” vowels?

A number of the languages of West Africa have what we might call extra-short vowels. These are illustrated in section 2 for languages from the Kwa, Mande, Gur, and Kru groups. An example is Baule t(a)ra ‘catch,’ kp(o)lo ‘undo,’ with extra-short vowels in parentheses. In fast speech, these tiny vowels seem to disappear entirely, sometimes giving the impression of a syllable-initial consonant cluster, even though these languages generally permit only single consonant onsets. None of these languages tolerate CC clusters of the sort that are common in European languages. Clusters like [pr] and [kl], which so clearly function as onsets in many European languages, never occur in these West African languages, except as variants of CVC sequences with discernible vowels.

The analysis of extra-short vowels has stumped phonologists and phoneticians. Phonologists have differed as to whether these vowels are present in underlying forms or inserted by phonological rule, and phoneticians seem to have remained silent--a most awkward gesture for a phonetician.

Independently of whether extra-short vowels are epenthetic or underlyingly
present, there are important questions about how these vowels are to be represented phonologically and phonetically. These questions can be better addressed if we look into how these vowels behave when they are present and how they change under various prosodic conditions. How do extra-short vowels relate to their more familiar full vowel counterparts? If a regular vowel occupies the nuclear position in a phonological syllable with a single mora of weight, what is the corresponding position and mora value of a extra-short vowel? How do “syllables” containing extra-short vowels respond to traditional phonological tests of syllable-hood, in functioning as accent- or tone-bearing units, in serving as potential domains of emphasis, in ability to be transposed language games, and so on?

This paper will first summarize the literature on extra-short vowels and then sketch an analysis that answers as many of these questions as the available facts permit. Many of the answers require further study, particularly experimental studies that we hope will be guided by the theoretical treatment presented here.

2. Literature survey: Extra-Short Vowels in Kru, Mande, Gur, and Kwa

2.1. Kru

Marchese1989 surveys the Kru languages, spoken mainly in Liberia and Côte d'Ivoire. The majority have instances of what she terms CLV syllables, where L is an alveolar sonorant that is realized as a lateral, a rhotic, or a nasal depending on the preceding C. These “syllables” are reported to be longer than CV but shorter than CVCV. Marchese notes that a short transition vowel appears before the L and that it is usually identical to a centralized version of the full vowel. Some contrasts in the tone of the transition vowel exist in some languages, according to Marchese, but normally this tone is predictable.

2.2. Southern Mande

Le Saout 1974 lists commonalities among extra-short vowels in several dozen Kwa and Southern Mande languages of Côte d'Ivoire and Ghana. He includes measurements from one of the languages, Gban, a Southern Mande language of Côte d'Ivoire, from the detailed study of Le Saout 1973. Here are two sample words from
In an earlier work, Le Saout 1973 reports some duration measurements of extra-short vowels in Gban, and though we lack details of how these measurements were taken, the durations he provides are at least suggestive of how extra-short vowels compare to regular vowels. The average duration Le Saout 1973 gives for extra-short vowels in Gban is 4.02 centiseconds. By comparison, the average duration of the first vowel of a normal CVCV syllable in Gban is 10.90 centiseconds, about two and a half times as long as the extra-short vowel.

Le Saout comments further that the minimum duration of a Gban extra-short vowel is about 2.5 centiseconds, while the maximum is rarely more than 5 centiseconds. If so, then the extra-short vowel never totally disappears phonetically, even though it may be too short to be perceived reliably. Even when lengthened to its maximum of about 5 centiseconds, it still seems easily distinguishable from a regular vowel, which is about twice as long.

Le Saout adds that the extra-short vowel is usually a centralized version of the following full vowel.

2.3. Gur

Mensah and Tchagbalé 1983 survey the Gur group of Ghana, Burkina Faso, and Côte d'Ivoire. In Senufo they find a pattern that they characterize as rare for Gur as a whole. The pattern involves what they transcribe as a CCV sequence, where the second C is a liquid or nasal, in dialects that we will refer to as Dialect Group A. They do not discuss the pronunciation of these words, but they compare them to cases in related dialects where the cluster is broken up by a full vowel. Mensah and Tchagbalé comment that the clusters they observe in Dialect Group A probably developed out of the corresponding CVCV cases in what we here call Dialect Group B.

Here are two examples from the handful of cases they cite. In light of the full
vowel following the initial consonant in the Napié dialect of Senufo, the CC clusters transcribed in the Gbonzoro and Tafire dialects may represent either C(v)C sequences (where (v) is an extra-short vowel) or perhaps a further development, wherein the extra-short vowel has been lost entirely.

(2) Gur (Mensah and Tchagbalé 1983)

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Senufo (Gbonzoro, Tafire)</th>
<th>frè</th>
<th>‘excrement’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td></td>
<td>trata</td>
<td>‘land’</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Senufo (Napié)</th>
<th>firè</th>
<th>‘excrement’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group B</td>
<td></td>
<td>tari</td>
<td>‘land’ [tones not transcribed]</td>
</tr>
</tbody>
</table>

2.4. Kwa

2.4.1. Ga

In some Kwa languages, it is interesting to see that the high tone can be associated with an extra-short vowel. This shows that tone height is independent of syllable strength—a weak-sounding syllable does not necessarily carry a Low tone, or a neutral-sounding one. The first example, from Ga, demonstrates that even when a syllable onset is voiceless and the syllable lacks a perceptible vowel segment, a high tone can apparently be identified.

Ga is a Kwa language of Ghana. Berry and Kotei’s 1969 Ga textbook does not single out extra-short vowels for comment, yet it lists variant forms for words in which a syllable initial consonant is followed by [l] or [r]. The longer variant contains a vowel between the syllable initial consonant and the following liquid; the shorter variant does not transcribe a vowel in this position. However, even in cases where this vowel is not transcribed, sometimes a tone is put on the consonant, even when that consonant is voiceless.

Note the examples in (3) below, where corresponding to each phonological form on the left, two phonetic variants are given on the right. Berry and Kotei do not explain
their transcriptions, but the longer variant is likely to designate a pronunciation with an audible vowel in the first syllable, while the shorter one may designate a pronunciation in which this vowel is not audible or is much less so. In the last example, /f(a)la/, the variant with two full vowels, the longer variant has a High tone on the first syllable, while in the shorter one, where the vowel has been left out, a High tone mark is placed above [f]. Since it is difficult to imagine a voiceless consonant carrying a tone by itself, this seems to show that even in the shorter variant, enough of a syllable remains to bear a distinctive High tone. Thus, even the shorter forms are probably disyllabic but with nuclei in the initial syllable that were either inaudible to Berry and Kotei or deemed too short to be transcribed as vowels.

(3) Ga (Kwa group) (Berry and Kotei 1969)

<table>
<thead>
<tr>
<th>/m(u)lu/</th>
<th>[mulu] ~ [mlu]</th>
<th>‘dust’</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ab(e)lé/</td>
<td>[abelé] ~ [ablé]</td>
<td>‘corn’</td>
</tr>
<tr>
<td>/f(á)la/</td>
<td>[fála] ~ [fá]</td>
<td>‘sore’</td>
</tr>
</tbody>
</table>

2.4.2. Akan

Dolphyne 1988, a book of almost two hundred pages devoted to the sound system of the Akan group of Kwa by a linguist native speaker, is our major published source of information on extra-short vowels. Dolphyne analyzes CLV sequences as arising synchronically from CVLV. For the examples in (4) below and similar ones, in the Akuapem and Asante dialects, she comments that:

where the first vowel is a high front vowel, this vowel is only pronounced in slow and deliberate speech. In other words, it is deleted in normal speech, and this pronunciation is reflected in the spelling of some of these words, e.g. pra ‘sweep.’ [p. 103]

Deriving the missing vowel of pra synchronically would mean taking this form back to the phonological representation /pira/, as mentioned in the line below (4). We
use the IPA symbol [i] for the [-ATR] high vowel, in place of Dolphyne’s e, adopted
from Akan orthography. The symbol e in Akan orthography ambiguously represents the
[-ATR] high vowel and the [+ATR] mid vowel.

(4) Akan (Kwa group) (Dolphyne 1988)

/ dky(i)rē /  [ dky̍rē ] ~ [ dky̍r̥ ] ‘he/she shows’
/ d(IL)rī /  [ d I rī ] ~ [ d I r̥ ] ‘he/she buys on credit’

Correspondingly, she transcribes the word ‘sweep’ phonetically with two variants,
[ píra ] ~ [ pra ].

2.4.3. Baule

Ahoua and Leben 1998 discuss the following examples, transcribed
orthographically with a CC sequence, which they note is incorrect phonetically and
phonologically. Phonetically, the consonant sequence is interrupted by a vowel that is
normally very short, to the point of sometimes vanishing entirely. Phonologically, the
consonant sequence is broken up by a vowel, as motivated in detail in Leben and Ahoua
1997.

(5)  fla  ‘collect’
    kle  ‘show’
    kle  ‘toad’
    gble  ‘lie’
    plo  ‘paste’

    tra  ‘pass’
    tre  ‘span’
    sre  ‘fear’
    jra  ‘go down’
    jra  ‘stand up’

Some of the arguments for the CVLV phonological analysis are summarized in
section 3.2.

2.5. Distribution of extra-short vowels
The above survey brings up a number of properties shared by extra-short vowels across these languages:

(6) Common features of extra-short vowels.
(a) Extra-short vowels are never the only vowel of a word.
(b) Extra-short vowels appear only after a consonant onset.
(c) An extra-short vowel can be in the initial syllable but never the final syllable of a word.
(d) An extra-short vowel is not accepted as natural if pronounced with the length of normal vowels.

In all probability, the original source of the extra-short vowel was a real vowel, particularly since consonant clusters have not been convincingly reconstructed in Niger-Congo, or, to the best of our knowledge, in any of the groups descended from Niger-Congo represented here. We have seen that in a number of these cases, dialectal correspondences also support the association between extra-short v and full vowels.

In the next section, we deal with synchronic evidence for this association in the languages for which we have the most data.

3. Synchronic evidence concerning extra-short vowels
3.1. Akan

The Kwa languages Akan and Baule offer evidence for the full-vowel phonological status of extra-short vowels. Dolphyne’s 1988 phonological analysis of the three major Akan dialects Twi, Asante, and Akuapim treats extra-short vowels as arising synchronically from full vowels. Her discussion of palatalization and labialization offers synchronic support for this analysis.

Dolphyne maintains that what we have been describing as extra-short vowels are actually deleted in most cases in Akan. In words beginning with a consonant and an extra-short vowel whose source is [+ATR], she observes that the initial consonant is
palatalized when the following vowel is “not pronounced.” [p. 103]

She gives the following examples, which we have retranscribed in IPA notation:

(7)  \[ \text{/pira/ ‘show’ phonetically [pjra]\]  
     \[ /biri/ ‘be black’ phonetically [bri]\]

Thus, although Dolphyne regards the vowel itself as being deleted, its palatal character remains. This has a clear bearing on the synchronic status of the vowel. If we did not posit a vowel in the phonological representation, we would need to allow for phonologically contrastive palatalization, pre-consonantally. It is hard to imagine any independent support for such an analysis.

With back vowels, the situation is more interesting, and more revealing. The key observation of Dolphyne is that the degree of labialization depends on the articulatory characteristics of the conditioning vowel. Here are her words:

In Akuapem and Asante, if the first vowel is a high back vowel this vowel is often not be [sic] pronounced in normal non-deliberate speech, but the initial consonant is labialised, the labialisation being more pronounced where the high back vowel is advanced, that is [u]. The initial consonant in \textit{kura} below has a further forward articulation on the palate than the initial consonant of \textit{kora}, on account of the advanced tongue position of the following vowel [N.B. even though that vowel may not be heard--W.L, O.F.]. h in \textit{huru} also has the tongue in the position for [u] during its articulation.

Dophyne’s transcriptions are given below, with phonological transcriptions appearing to the left of the phonetic ones. Note that in Dolphyne’s phonetic system \[\text{Cw}\] vs. \[\text{Cwu}\] is just a device to distinguish between lesser vs. greater amounts of labialization on the C. No audible vowel need be present.
In other words, there is a direct articulatory connection between the degree of lip rounding on a consonant and the following vowel, even though that vowel is said to be present phonologically and not phonetically. The articulatory basis for the connection becomes clearer if we speculate on the likely degree of lip rounding on the vowel. Although Dolphyne associates the degree of labialization with the tongue root advancement of the following vowel, the advanced high back vowel perhaps also has a lower tongue position than the corresponding nonadvanced high vowel. This would explain the choice of $u$ for the advanced version and $o$ for the nonadvanced version. The lower of the two, $o$, is likely to have less lip rounding. In that case, a connection is established between the degree of rounding on the consonant and the degree of rounding on the following vowel, this despite the fact that the vowel is said to be phonetically absent.

Dolphyne’s use of [kw] vs [kwu] to represent lesser vs. greater lip rounding on consonants may cause some confusion, since it uses the vowel symbol [u] to denote a consonant articulation. Also, her use of [o] for the [-ATR] high vowel, though it corresponds to the standard Akan orthography, is phonetically unconventional. Accordingly, we would propose to retranscribe phonological and phonetic representations in (8) as shown in (8’). The inverted breve under the vowel symbols is intended to express these sounds as glides and not vowels, and the superscript notation is intended to express them as secondary articulations on the preceding consonants, as with the more usual [kʷ] and [kʲ].

(8')  
\[
\begin{align*}
\text{kura} & \quad [\text{k}^{\text{3}}\text{ra}] \quad \text{‘store’} \\
\text{kura} & \quad [k^{\text{3}}\text{ra}] \quad \text{‘hold’} \\
\text{huru} & \quad [h^{\text{3}}\text{ru}] \quad \text{‘jump’}
\end{align*}
\]

Detailed phonetic study may help to determine whether the vowel is literally absent or phonetically present but imperceptible. But whichever turns out to be closer to
the truth, the phonological consequences of this phenomenon are clear. If the phonological representation did not contain the conditioning vowel, with its ATR and rounding features specified, the phonology would need to posit an independent system of tongue root advancement for consonants.

3.2. Baule

A different type of evidence for the nature of extra-short vowels comes from Baule, a Kwa language of Côte d'Ivoire, where the language game Asabesin [Ahoua and Leben 1998] suggests that extra-short vowels derive directly from normal vowels. In Asabesin, each syllable of a word gives rise to a new syllable to its right containing the vowel of the original syllable and a new onset [t].

(9) \textit{Asabesin} (Baule)

<table>
<thead>
<tr>
<th>Original form</th>
<th>Derived form</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. \textit{we}</td>
<td>‘rib’ \textit{wete}</td>
</tr>
<tr>
<td>b. \textit{wu0}</td>
<td>‘husband’ \textit{wu0tu0}</td>
</tr>
<tr>
<td>c. \textit{kaga} [\textit{k\amount{a}s\text{\text{\text{a}}}}]</td>
<td>‘read’ \textit{k\amount{a}tag\text{\text{\text{a}}}tag\text{\text{\text{a}}}}</td>
</tr>
</tbody>
</table>

Where a extra-short vowel (symbolized with parentheses) appears, as in the examples directly below, Asabesin treats it as a normal vowel. Its copy has all the characteristics of a normal vowel, and the source vowel, having been separated from the following [r, l, n] which provided a crucial part of the context, itself becomes a normal vowel.

(10) \begin{tabular}{ll}
Original form & Derived form \\
\textit{t(\(\text{\text{\text{a}}}\)r\(\text{\text{\text{a}}}\)} & \textit{tatarata} \\
\end{tabular}
b. kp(Ø)lo ‘undo’ kpotoloto
c. t(Ø)rø ‘sauce’ totoroto
d. p(Ø)lø ‘corn paste’ potoloto

Ahoua and Leben 1998 present several other independent tests of the syllabic status of extra-short vowels in Baule. The most conclusive involves the fact that verb tones in Baule are predictable based on the number of syllables they contain. Monosyllabic verbs, on the left, have a High tone in citation forms. Disyllabic verbs, in the middle, have a Low-High pattern. On the right are verbs that are transcribed as monosyllabic in the standard orthography but contain either an extra-short vowel in the first syllable (the first four lines) or have a glide where the first vowel would be (the last three lines). All of these have a Low-High tone pattern, showing that even though they might be perceived as monosyllabic, they clearly group with the second, disyllabic, class.

(11) High Low-High Low-High
    CV CVCV CVCV
    fa ‘take’ nəti ‘walk’ fla ‘collect’
    ko ‘go’ kpaja ‘lighten’ kplo ‘undo’
    tə ‘burst’ kpiti ‘be scared’ kla ‘cover’
    ka ‘bite’ kpata ‘forgive’ tra ‘catch’
    ti ‘collect’ məta ‘near’ swa ‘bear’
    su ‘cry’ ko’do ‘roll’ fjə ‘hide’
    sj ‘pass by’ ku’de ‘search’ fwa ‘chase’


All of the evidence examined here is consistent with the conclusion that extra-short vowels have the status of full vowels in underlying representations. The next question to ask is whether extra-short vowels are phonological entities at all, i.e.
represented as distinct from regular vowels in the lexicon. If in some language some phonological rule crucially refers to whether a vowel is extra-short or not, then clearly the extra-short vowel must be a phonological entity in that language. We are not aware of such cases, but our survey of languages and our knowledge of the ones surveyed are both very incomplete.

The amount of information we do possess, however, makes it plausible to conjecture that extra-short vowels are phonetic phenomena rather than phonological ones. The degree of similarity among extra-short vowels across the different language groups surveyed is striking. They never contrast with full vowels, and their distribution appears to be predictable in each of the languages surveyed. What is more, the cross-linguistic similarities in the actual conditions on their distribution are surprisingly uniform: they only appear in syllables with a consonant onset; they never appear in final syllables; they are always followed by liquid or a nasal. In all cases where their length has been described, their length has been described as variable.

Languages can and clearly do differ phonetically. Still, the patterns of predictability, cross-linguistic uniformity, and intra-language variability that we have discovered in extra-short vowels look more like the sorts of pattern that arise in phonetic implementation than in phonology per se. While a phonetic account is beyond the scope of this paper, we have begun to examine these phenomena in the C/D model (see Fujimura & Williams 1999, Fujimura 2000; also Leben 1999). Preliminary investigation suggests that whatever the correct phonetic account, it will probably have phonological repercussions. This is the case even for phenomena which, as argued here, are more properly phonetic than phonological.

For the sake of concreteness, let us assume the C/D phonetic framework, which takes as input a surface phonological representation. The C/D model, which differs substantially from segment-based models of phonetic implementation, takes as input syllabic features rather than segmental ones. Current phonological feature frameworks specify distinctive features that are common to both consonantal and vocalic roots but that may be specified separately for onset elements and for nuclear. In the C/D model, this is impossible. In a language like Akan, ATR and rounding features will be assigned to the syllable as a whole, as vocalic-type syllable features. At the input for the phonetic
implementation process, consonantal features and vocalic features receive entirely
distinct labels. For example, \{rounded\} is a vocalic feature phonetically implemented by
lip rounding and protrusion, while \{labial, stop\} is a consonantal feature implemented as
a vertical approximation of the lips to form a complete closure (without rounding of the
mouth orifice or labial protrusion). Whether the rounding/protrusion gesture or the
tongue-root advancing gesture is observed in the acoustic vowel segment (if there is any)
or during the onset articulatory closure, it is a gesture due to the vocalic feature
specification \{rounded\}. This of course would completely alter the transcriptions given in
(7) and (8’), where superscripts [\textsuperscript{\textipa{i}}] and [\textsuperscript{\textipa{u}}] may give the impression of being secondary
articulations on the preceding consonant. In actuality, the features in question are vocalic
by their nature, and so we expect them to be manifested in the vowel segment. This in
turn would lead us to alter the terminology in our phonological analysis of Akan but not,
as far as we can see, our conclusion.

In light of this, we can conclude that one of the interesting findings of this study
of extra-short vowels is that vowel features can be realized even there is not always an
acoustically observed time segment for the vowel as such.
References


