

Integration of the clicks and the non-clicks

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Introduction

This paper aims at exploring one of the important but little discussed theoretical issues concerning the classification of the consonantal segments of the world's languages, namely, the issue of integration of the clicks and the non-clicks. Clicks are known as consonants involving velaric ingressive airstream mechanism, whose geographic and linguistic distribution is restricted to Khoisan and other small number of languages in Africa. As pointed out by Traill (1997: 103), "...existing analyses of clicks and non-clicks are seldom integrated into a single coherent phonological system...", providing two separate consonantal inventories.

Based on the findings of G|ui (Kalahari Khoe West Group, Khoe Family, spoken in Botswana), this paper discusses the issue of how the clicks and the non-clicks should be cross-classified adequately in terms of the same set of features, in other words, how the two sub-classes of consonants should be integrated. G|ui materials have all been collected by me in field investigations in G|ui speaking communities in the CKGR, Gantsi District, Kweneng District, Botswana, since 1992.

There are two dimensions of the cross-classification between clicks and non-clicks. Table 1 presents the G|ui consonant system illustrating the two dimensions. The one dimension is related to the vertical axis of the table, and the other dimension is to the horizontal axis. In Nakagawa (2006: Chapter 3) I discussed in detail the former dimension, namely the classification in terms of the type and series of consonant. The discussion in this paper focuses on the latter dimension.

Below I first review all the important phonological features involved in this dimension described in detail in Nakagawa (2006), and then propose a set of features essential for the click and non-click integration of this dimension. The phonological features to be considered include (i) place-of-articulation (abbreviated to POA) features, (ii) two manner-of-articulation (abbreviated to MOA) features, i.e. [affricated] and [lateral], and (iii) one acoustic feature, i.e. [grave].

Table 1 The series parallelism of between non-clicks and clicks in Gjuí. Two non-click clusters in parenthesis are only attested in the Khute and the Thomelo dialects. The non-nasal sonorants are omitted because they are irrelevant to the parallelism.

Type	Series	Non-click	Click
Stop	<u>non-cluster</u>		
	plain	p k q	k k
	voiced	b dz j g	g g
	aspirated	p ^h t ^h ts ^h c ^h k ^h q ^h	k ^h k ^h k ^h
	ejective	t' ts' c' k' q'	k ' k '
	<u>cluster</u>		
	plain+	tʃ tsʃ (cʃ)	k ʃ k ʃ
	plain+	tqʃ tsqʃ (cqʃ)	k qʃ k qʃ
	plain+	/q/	k q k q
	plain+	/g/	k g k g
plain+	/q ^h /	k q ^h k q ^h	
plain+	/q'/	k q' k q'	
plain+	/ʒ/	k ʒ k ʒ	
plain+	/h/	k h k h	
Nasal	nasal	m n	ŋ ŋ
Fricative		s	ʃ ʃ
		ʒ	h

1 Place-of-articulation features

Let me first summarize important POA features involved in a cross-classification of the clicks and the non-clicks of G|ui. First, the feature [coronal] is necessary for grouping the three plain non-click stops /t ts c/ and the plain clicks /k| k! k+k||/ into a phonological class that is required to state the phonological constraint on the cluster onset. Second, the coronal stops are sub-classified in terms of the features [apical] and [palatal]. The feature [+apical] groups the clicks with the [! ||] influxes, i.e. /k! k|| g! g|| k!^h k||^h k!' k||'/, into a phonological class, which is necessary for stating the constraints on the vowel discussed in Nakagawa (2006: Chapter 4). The feature [palatal] is necessary to distinguish the [+palatal] subclass, i.e. /c ʒ c^h c' k† g† k†^h k†'/, from the [-palatal] subclass, i.e. /t ts d dz t^h ts^h t' ts' k| k! k|| g| g! g|| k^h k!^h k'| k!' k||'/. The feature of [coronal] and the two features for its sub-classification, [+/-apical] and [+/-palatal], all involve cross-classifications of the clicks and non-clicks in terms of place of articulation. Note here that interpreting the place of articulation of the clicks as [coronal] implies that the anterior closure of the clicks is primary, and that the posterior closure is phonologically less important if not irrelevant. This view is supported by the observation that the clicks phonologically pattern with the non-click coronal stops in terms of the constraint on the cluster onset in G|ui.

It should be noted here that this view is based on a cluster analysis of the clicks and their accompaniments which I proposed in Nakagawa (2006) as MCA (i.e. moderate cluster analysis as opposed to radical cluster analysis and unit analysis). The phonological interpretation employed MCA is presented in Table 1. In this analysis, the clicks of the first four series in Table 1, i.e. the plain, voiced, aspirated, and ejective, are interpreted as single phonemes, while the other clicks are all interpreted as consonant clusters. This view assumes that the posterior closure does not contrast in terms of POA features. See Nakagawa (2006: Chapter 5) for discussion about the problem of the alternative analysis.

2 Manner-of-articulation features

The MOA feature [affricated] also involves a cross-classification between the clicks and the non-clicks. A typical [+/- affricated] distinction is found between /ts dz ts^h ts' qʒ'/ and /t d t^h t' q'/, and the same feature classifies the [+affricated] clicks /k| k|| g| g|| k!^h k||^h k'| k!' k†' k||'/ and the [-affricated] clicks /k! k† g! g† k!^h k†^h k!' k†'/.

The phonological distinction in terms of another manner feature, i.e. [+/- lateral], is only found between /k! g! k!^h k!'/ and /k|| g|| k||^h k||'/. However, this feature is important for the interaction between the click and non-click. The liquid /r/ in the root-medial position assimilates to the lateral click in the root-initial position, thus /k||árà/ [k||álà] “*Acacia erioloba* E. Mey” vs. /k!àrà/ [k!àrà] “*Ochna pulchra*

Hook". (See Nakagawa (2006: Chapter 3) for detail.) In this sense, the feature [lateral] is relevant not only for the clicks but also for the non-clicks.

The two MOA features, [affricated] and [lateral], are therefore both important for the integration of the clicks and non-clicks.

3 The acoustic feature [grave]

In addition to the POA and MOA features, the acoustic feature [grave] must be introduced for the integration of the clicks and the non-clicks. This acoustic feature phonetically distinguishes the apical influxes [! ||] (i.e. [+grave]) from the laminal influxes [! †] (i.e. [-grave]) (Nakagawa 2006). Traill (1995, 1997) argues for the phonological importance of this acoustic feature, demonstrating that this feature facilitates naturally stateing two processes, i.e. click replacement attested in some Khoe languages, and vowel assimilation attested in !Xóó.

Concerning the former, there are two types of click replacement regularly attested in some Khoe languages, i.e. the "!" → k" type attested in G||ana (Nakagawa 2006: Chapter 3), and the "† → c" type attested in some Eastern Khoe languages (Traill 1980, Traill and Vossen 1997). In the former type, the alveolar clicks change to velar non-clicks, while in the latter type, the palatal clicks change to palatal non-clicks. If we assume that the alveolar clicks and the velar non-clicks belong to the [+grave] class, and the palatal clicks and the palatal non-clicks belong to the [-grave] class, then both types of click replacement can be expressed by using [grave] as below (Traill 1997: 107).

[+click, α grave] → [-click, α grave]

As he correctly states, "... in click replacement ... clicks turn into **cognate** non-clicks", and the phonetic "... basis of the cognation" can be accounted for in terms of the acoustic feature [grave], not in terms of articulatory features.

Regarding vowel assimilation attested in !Xóó, I discuss the feature [grave] in relation to its specification for the labial click in the next section.

4 The feature distinguishing the clicks from the non-clicks

The features presented in the previous three subsections are necessary but not sufficient for cross-classifying the clicks and the non-clicks. Notice that some contrasts between the clicks and the non-clicks cannot be captured only in terms of these features. Let us, for example, consider what feature involves the distinction between /ts/ and /k/, or the distinction between /c/ and /k†/. As shown in Table 2, in order to express the distinction between /ts c/ and /k/ k†/, another feature must be added to the six

phonological features mentioned above. This additional feature, tentatively labeled [“click”] in the table, corresponds to Chomsky and Halle’s (1968: 309) feature [suction] that signifies the velaric ingressive airstream mechanism involved in the clicks.

Table 2 Contrasts between /ts c/ and /k| kʰ/

	ts	k	c	kʰ
coronal	+	+	+	+
apical	-	-	-	-
palatal	-	-	+	+
affricated	+	+	-	-
lateral	-	-	-	-
grave	-	-	-	-
“click”	-	+	-	+

Traill (1985: 206) adopted the SPE feature [suction] in order to distinguish the clicks ([+suction]) from the non-clicks ([-suction]) in !Xóó. The feature referring to the velaric ingressive airstream mechanism is also used to specify the clicks in other more recent studies, such as Güldemann’s (ibid.) “ingressive” as opposed to “eggressive”, Miller-Ockhuizen’s (2003) “velaric” as opposed to “pulmonic”, and Ladefoged’s (1995) “Velaric” with “[+click]” as opposed to “Pulmonic”.

In his later work, Traill (1997: 115) proposed interpreting clicks as “enhanced versions” of non-click stops, demonstrating that clicks are perceptually salient. He stated that clicks “... exploit all the features of non-click stops but utilise a novel source for the production of these features, namely the noisebursts generated by the velaric suction. (ibid.)” This interpretation has more explanatory power than the SPE-type feature for clicks, because it not only refers to the articulatory property unique to clicks (i.e. velaric ingressive airstream mechanism), but also expresses the perceptual effect of this property. If we adopt this interpretation, the [+/- “click”] distinction between /k| kʰ/ and /ts c/ shown in Table 2 can be translated in terms of the enhancement of the same features in /k| kʰ/. For example, /kʰ/ and /c/ share the features, but /kʰ/ is distinct from /c/ in that it involves velaric suction enhancing the same features. Henceforth, I express the feature of enhancement by [+/-enhanced], assuming it is a binary feature distinguishing the two consonant classes.

If we adopt [+/-enhanced], the features for the click vs. non-click integration in G|ui are summarized as in Table 3.

Table 3 Important features for integration of clicks and non-clicks of G!ui, exemplifying with representative stops

	t	ts	c	k	q	qχ'	k	k‡	k!	k
coronal	+	+	+	-	-	-	+	+	+	+
apical	-	-	-				-	-	-	+
palatal	-	-	+				-	+	-	-
affricated	-	+	-	-	-	+	+	-	-	+
lateral	-	-	-	-	-	-	-	-	-	+
grave	-	-	-	+	+	+	-	-	+	+
enhanced	-	-	-	-	-	-	+	+	+	+

In order to adapt this cross-classification to a wider range of Khoisan consonant systems, we must extend it to include two classes that G!ui does not contain, namely the labial clicks, e.g. /k⊙/, attested in South Khoisan languages, such as !X6ḁ, and the affricated palatal non-click stops, e.g. /tʃ/, attested in Jul'hoansi.

Regarding the labial click, its POA and MOA features are obvious, namely [labial] and [+affricated, -lateral]. If we examine the labial click in terms of the feature [grave], we can find phonological evidence for specifying it as [+grave] in !X6ḁ. According to Traill (1995: 123-125), the labial click [⊙] behaves in the same way as [! ||] in terms of vowel assimilation in !X6ḁ: the assimilation affects the non-pharyngealized low vowel, i.e. /a ǁ a'/, which is immediately preceded by a click with the influx [! ‡] and immediately followed by /i/. The low vowel in this context assimilates completely to the following /i/, as exemplified below:

/kǁǁi/ > [kǁi] “aardwolf (*Proteles cristatus*)”

/k‡ǁi/ > [k‡i] “steenbok (*Raphicerus campestris*)”

(In Traill's (1995) transcription plain clicks “k| k‡” are “| ‡”.)

In contrast, the low vowel immediately preceded by a click with the influx [⊙ ! ||] does not completely assimilate to the following /i/, resulting in [ǁ ǁ ǁ'], as exemplified below:

/k⊙ǁi/ > [k⊙ǁi] “aardwolf (*Proteles cristatus*)”

/k!ǁi/ > [k!ǁi] “sp. of tree (*Ziziphus mucronata* Willd.)”

/k||ǁi/ > [k||ǁi] “old (Class 1)”

(In Traill's (1995) transcription plain clicks “k⊙ k! k||” are “⊙ ! ||”.)

He demonstrates that this assimilation rule is naturally stated by using the feature [grave], classifying the

vowel /i/ and the click consonants with [ɛ] as [-grave], the low vowel /a ɔ aʔ/ and the clicks with [ɔ ! ||] as [+grave]. The rule is stated as follows:

$$V[+grave] \rightarrow V[-grave]/C[-grave]_V[-grave]$$

As regards the non-click labial consonants, Traill (1995) does not provide examples, and in his !Xóó dictionary (Traill 1994), there are no words in which a non-click labial consonant is followed by underlying /a/ followed by /i/. However, the following two loan words found in the dictionary suggest the non-click labial consonants, at least /b/ and /p^h/, may not involve this assimilation, indicating that they may be [+grave].

bai bili “bible” (p.152) (not [bii bili])

phaipi “hosepipe” (p.153) (not [p^hiipi])

In terms of the feature [enhanced], the labial click is different from the other clicks, and should be specified as [-enhanced]. According to Traill (1997), unlike the other clicks, the labial click lacks saliency in all perceptual tests that he conducted. He interpreted its lack of saliency as being due to the articulatory nature of the labial click, which is “...unsuitable for the conversion of aerodynamic energy into a salient acoustic signal. (Traill 1997: 115)”

The feature [enhanced] can capture the two perceptually different classes within the clicks. However, since the labial click phonologically patterns with the other clicks, i.e. occurring with cluster offset of uvular and glottal obstruents in !Xóó (Traill 1985), there must be another feature stating the natural class of all the five clicks. This suggests that in order to describe a phonological system with five click influxes like !Xóó system, we may need both [enhanced] and the SPE-type feature (e.g. [suction], [click] or [ingressive], etc.) This topic must be explored in future research.

Finally, I should comment on the feature specification of [affricated] for non-click palatal stops. Non-click palatal stops do not exhibit a [+/-affricated] distinction in any Khoisan languages: a language like Gǀui containing unaffricated palatal stops, such as /c ʃ/ etc., does not have affricated palatal non-click stops, and a language like Jul’hoansi containing affricated palatal stops, such as /tʃ dʒ/ etc., does not have unaffricated non-click palatal stops. Therefore, the positive/negative value of [affricated] for the non-click palatal stops varies according to the specific language, although it is not distinctive in Khoisan languages.

5 Conclusion

Table 4 summarizes the discussion above, presenting the set of features for the click and non-click integration.

This set of features includes the seven POA features shown in bold in the table, the two MOA features [affricated] and [lateral], the acoustic feature [grave], and the acoustic-perceptual feature [enhanced]. This set does not include three covering features for (i) the class consisting of [labial] and [coronal], (ii) the class consisting of [uvular] and [glottal], and (iii) the class consisting of apical clicks and uvular consonants. The first feature states a natural class of consonants for the cluster onset, and the second states another natural class for the cluster offset. Traill (1985) referred to the first covering feature as “anterior” with a different sense from the SPE [anterior] feature, and this term is adopted by Güldemann (2001). For the second covering feature, the term [guttural] would be most appropriate, although the same term is used by Miller-Ockhuizen (2003) in a different sense. The final covering feature is necessary for stating the Back Vowel Constraint in Gǀui (see Nakagawa 2006: Chapter 4). A phonetic basis for this covering feature is unclear at this stage, and it will be an interesting topic for future research.

Table 4 The features for click and non-click integration

POA →	labial		coronal						velar	uvular	glottal		
			[-apical]				[+apical]						
			[-palatal]		[+palatal]								
[affricated]	-	+	-	+	+	+/-	-	-	+	-	-	+	-
[lateral]	-	-	-	-	-	-	-	-	+	-	-	-	-
[grave]	-	+	-	-	-	-	-	+	+	+	+	+	-
[enhanced]	-	-	-	-	+	-	+	+	+	-	-	-	-
Examples	p	k⊙	t	ts	k	tʃ/c	k‡	k!	k	k	q	qχ'	?

The proposal of this set of features is not intended for a final resolution of the issue of the click and non-click integration. It should rather be understood as a starting point of a further exploration of the issue, which will be conducted based on other Khoisan languages.

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クリック子音と非クリック子音の統合的解釈

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世界の言語の分節音全体を鳥瞰すると、子音音素には2つの大きな音類が認められる：つまり、クリック子音と非クリック子音である。これら2大音類は、前者の音類(クリック子音)が、地域的にも言語グループ的にもきわめて限定された分布を示すため、世界の言語の多くの音韻的記述では扱われずに済む。その結果、この音類を含む言語群以外の言語の記述において使われる音韻特徴理論が、2大音類の統合にも妥当か否かを検証されることはない。また、この音類を含む言語の分析においても、この2大音類がいったいどのような仕方で統合的に扱われるのかという理論的問題は、Traill (1997) が正しく指摘している通り、十分に考察されないままであった。本論文は、この問題に取り組み、コイサン諸語コエ語族カラハリ・コエ語群のガイ語の事例研究にもとづいて、これら2大音類を同一の音韻特徴セットによって通分類する解釈を提示する。提案する音韻特徴セットには、従来もっぱら用いられていた(そして現在も優勢な)調音音声学的な弁別の特徴に加えて、ガイ語だけでなく他のコイサン諸語にも通言語的に観察される音韻制限を記述する自然音類のための包括特徴、また、それをととも Traill が提案した音響的特徴、さらに音響・聴覚的特徴も導入することになる。また、これらの特徴セットの提案が、コエ語族以外のコイサン語であるコン語に適用される場合に浮かび上がる問題も指摘する。