

# Why are clicks so exclusive?

Olle Engstrand  
Department of Linguistics  
Stockholm University

## **Abstract**

*Clicks occur abundantly in the languages of southern Africa, but are not found anywhere else. This is unexpected since the clicks seem to be both auditorily salient and easy to produce. This paper suggests that the reason for the areal skewness of clicks lies in the African phonetic-typological environment rather than in production or perception constraints. In particular, clicks are limited to Africa because they are likely to emerge historically only in the presence of certain phonetic preconditions, which are rare from a world-wide perspective but characteristic of the African languages. In theory, once clicks have made their appearance, they should, by virtue of both their auditory saliency and ease of production, remain in the phonetic repertoire and be resistant to change.*

## **1 Introduction**

One of the most striking examples of areal skewness in the world's sound inventories is the limitation of clicks to the languages of southern Africa. In that part of the world, however, click systems are extremely common and are found both in Khoisan and non-Khoisan languages. Moreover, clicks are fundamental to the phonologies of many languages of the region, and click inventories can be amazingly complex (e.g., Ladefoged and Traill, 1994).

While clicks are quite salient from a perceptual point of view, their remarkable rarity in the world's languages has often been ascribed to a high degree of articulatory complexity. However, proposed complexity metrics (e.g., Willerman, 1994) do not automatically single out the basic click mechanism from relatively frequent mechanisms such as implosiveness, ejectives or plain voicing in stops. It has even been claimed that clicks should rightfully be counted as members of the set of basic sound elements which are rooted in primary vegetative functions (Kohler, 1996).

It is rather unusual that clicks should be absent from the overwhelming majority of the world's languages, but at the same time be so dominant in the remaining ones. One approach to this problem has been to propose that clicks are "primitive" in the sense of being survivors of some precursor of human speech, which may have developed on the African continent (Stopa, 1979). This statement, however, is doubtful in a number of ways. For example, there is no obvious reason why clicks would survive precisely in the part of the world where "the first language" may have emerged. Another view has been that the apparent articulatory and perceptual advantages of the clicks are outweighed by other, less favorable factors. For example, Kohler (1996) has suggested that the clicks may be limited in their ability to form an integral part of the syntagmatic organization of utterances, particularly in terms of coarticulation in syllabic units. While such factors may, in principle, constitute a reason for a sound type to occur sparsely, they do not explain the dominance of the type in a limited language area.

This paper discusses yet another approach to the mystery of the clicks. The point of departure is the fairly uncontroversial statement that "new sounds" develop from "old sounds" in a phonetically motivated progression; i.e., that the old sounds provide the phonetic preconditions needed for a historical change to take place (Ohala, 1993). (For the time being, we will avoid

the complexities introduced by language contact and other language-external factors; Janson, 1991/92.) Consider the well-known example of lexical tone contrasts which may develop on vowels which earlier had redundantly high and low pitches following voiceless and voiced obstruents, respectively (e.g., Hombert et al., 1979; Svantesson, 1983).

When a sound change has taken place, new sounds appear which provide new preconditions for further development. For example, by developing a voiced vs. voiceless stop contrast where it did not exist before, a language has set up a new basis for tonogenesis; i.e., the likelihood that a tone contrast will actually emerge in the language is increased. Thus, as a result of historical sound change, some further changes become more likely, and others become less likely.

It will be suggested here that clicks are limited to Africa because they are likely to develop only in the presence of certain phonetic preconditions, which are themselves rare, but happen to be amply represented in the African languages, and may have been so for a long time. And once the clicks have made their appearance, they will, by virtue of being both perceptually salient and easy to produce, turn out to be functionally superior.

## 2 A phonetic environment for clicks

What, then, are the phonetic preconditions for the emergence of clicks? We first note that consonants such as /kp/, /gb/ and /Nm/, which are clearly overrepresented in the African languages, have certain striking similarities with clicks; they have a double articulation in which the posterior component invariably involves the soft palate. In addition, it has been noticed by several authors that the labiovelars tend to exhibit a negative oral pressure and an audible click-like component associated with the labial release (e.g., Doke, 1931; Ladefoged, 1964). Ladefoged (p. 9) described the articulatory mechanism producing this effect in the following way: "After the two closures have been made, there is a downward movement of the jaw, and a backward movement of the point of contact of the back of the tongue and the soft palate; these movements cause a lowering of the pressure in the mouth. Thus from the point of view of the release of the closure at the lips, there is an ingressive velaric airstream."

As emphasized by Ladefoged and Maddieson (1996), these fortuitous click effects in labiovelars are less salient than those heard in the true clicks. However, doubly articulated stops and nasals constitute central elements in many African consonant paradigms. It is reasonable to assume that this favors the emergence of true clicks through historical sound change.

Questions that present themselves are then: Where do the labiovelars come from? Why are they, too, largely concentrated to Africa? An interesting possibility is that the labiovelars may have come about through extreme velarization used to enhance auditory effects associated with the implosives. The presence of implosives, too, constitutes a characteristic areal feature of the African languages. The prime articulatory characteristic of implosives is, of course, larynx lowering. Larynx lowering facilitates voicing during stop closures (Ohala, 1983), but it also affects the filter function of the vocal tract. Thus, at the release of the implosive, the increased distance between the glottis and the lips, which results from depressing the larynx, will lower all formant frequencies and amplify the transitions towards the vowel target. Velarization may enhance this effect in two ways: in addition to further pressing down the formant frequencies, it may contribute to spreading out the effect in time, thus making it audible both before and after the closure interval. In Ladefoged's (1964) cineradiographic recordings, velarization was shown to accompany labial implosives (see also Doke, 1931); and Ladefoged pointed out the acoustic and auditory similarities between implosive /ɓ/ and doubly articulated /gb/, the latter representing the extreme end of the velarization continuum.

It should be pointed out, in addition, that there is a clear auditory resemblance between implosives and prenasalized stops, another sound type with a high rate of occurrence in the African languages. Both sound types emphasize the auditory effect of voicing, but by different articulatory means. In the implosives, vocal fold vibrations are magnified by moving the glottis downwards, i.e., in the direction opposite to the egressive airstream. During the closure interval of the prenasalized stops, on the other hand, the supraglottal pressure is kept at a low level relative to the subglottal pressure by opening the velar passage. The resulting prenasalization abruptly attenuates the amplitude of the periodic pulses relative to that in preceding and following vowels and thus produces an auditory impression similar to (but generally somewhat louder than) regular stop voicing. Immediately prior to the stop release, the velar passage is closed, resulting in a non-nasal release burst which further enhances the auditory resemblance to the implosives. It has been pointed out by Ohala (1983) that this mechanism could easily lead to diachronical replacement of voiced by prenasalized stops. It should also be noted that the African languages as a group seem to stand out with respect to rate of occurrence of voiced stops in their inventories (Engstrand, 1997). In view of this areal preference, it is reasonable to assume that the frequent occurrence of implosives and prenasalized stops in the African languages reflects historical processes whereby stop voicing may have become auditorily enhanced.

Table 1 contrasts a language group in Africa, the Niger-Kordofanian languages, with a group of American languages (the North American languages except those belonging to the Eskimo-Aleut and Na-Dene families). The analysis is based on the updated version of the UCLA Phonological Segment Inventory Database (UPSID; Maddieson, 1984; Maddieson and Precoda, 1989). These roughly equally sized samples (55 and 58 languages in UPSID, respectively) are compared with regard to the incidence of plain voiced, plain voiceless, voiced implosive, voiced prenasalized, voiceless aspirated and voiceless ejective bilabial stops. In addition, the table displays the frequency of occurrence of voiced and voiceless labiovelars. The number of languages containing these stop consonants is expressed as a percentage of the total number of UPSID languages in the Niger-Kordofanian and North American groups, respectively; these totals are given in parentheses in the table.

*Table 1. Percentage of Niger-Kordofanian and North American languages containing the given bilabial and labiovelar stop consonant types. The figures in parentheses stand for the total number of UPSID languages pertaining to the respective groups.*

	b	ɓ	mb	gb	kp	p	p <sup>h</sup>	p'
Niger-Kordofanian (55)	96	36	16	62	58	78	15	2
North American (58)	47	5	3	0	0	83	26	38

Of the 55 Niger-Kordofanian languages represented in UPSID, 96 percent have /b/, while the corresponding proportion amounts to only 47 percent for the North American languages. The voiced implosive /ɓ/ occurs in 36 percent of the Niger-Kordofanian, but only in 5 percent of the North American stop inventories. The prenasalized voiced bilabial stop /mb/ is fairly common in the Niger-Kordofanian group (16 percent of the languages), while its occurrence is marginal in North America (3 percent). More than half of the Niger-Kordofanian languages have /gb/ or /kp/ (62 and 58 percent), whereas these sounds are completely absent from the North American inventories.

On the other hand, aspirated /p<sup>h</sup>/ is almost twice as common in North America as in the Niger-Kordofanian family (26 and 15 percent); and the ejective /p'/, which is almost absent from the Niger-Kordofanian inventories, occurs frequently in the languages of North America. (Of the 61 West African languages examined by Ladefoged, 1964, only Hausa, a Chadic language, had ejectives.) The only sound with approximately equal representation in the two families is /p/, a member of the near-universal class of voiceless unaspirated stop consonants.

These areal biases could also be expressed in the following way: Of the 49 UPSID languages containing the voiced implosive /ɓ/, 20 belong to the Niger-Kordofanian family; the doubly articulated /gb/ and /kp/ are extremely rare outside the Niger-Kordofanian family; and half of the 44 languages containing /p'/ are spoken in North America. Similar patterns can be observed for other places of articulation (except, of course, for the doubly articulated stops which are almost invariably labiovelars). These data thus reflect systematic areal drifts in stop paradigms; while there is a drift toward voicing and double articulation in the Niger-Kordofanian languages, the North American languages tend to avoid stop consonants with those properties, instead favoring voicelessness, aspiration and ejectivity.

### 3 Summary and conclusions

This paper has dealt with the well-known fact that clicks occur abundantly in the languages of southern Africa, but are not known to exist in any other part of the world. This presents a problem since the clicks seem to be both auditorily salient and easy to produce. In an attempt to solve this problem, the paper has suggested that the reason for the areal skewness of clicks lies in the African phonetic-typological environment rather than in production or perception constraints (cf. Engstrand, 1997). It was hypothesized that clicks are limited to Africa because they are likely to develop only in the presence of certain phonetic preconditions, which are themselves rare, but happen to be amply represented in the African languages. These preconditions include, in particular, the presence of labiovelar stops and nasals.

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#### References

- Doke C.M. 1931. *A comparative study in Shona phonetics*. Johannesburg: UW Press.
- Engstrand O. 1997. Areal biases in stop paradigms. *PHONUM*, this issue.
- Hombert J.-M., Ohala J. and Ewan W. 1979. Phonetic explanations for the development of tones. *Language* 55, 37-58.
- Janson T. 1991/92. Southern Bantu and Makua. *Sprache und Geschichte in Afrika* 12/13, 63-106.
- Kohler K.J. 1996. The development of sound systems in human language. *Paper given at the Evolution of Human Language Conference held in Edinburgh, April 1996*.
- Ladefoged P. 1964. *A phonetic study of West African languages: An auditory-instrumental survey*. Cambridge: CU Press.
- Ladefoged P. and Traill A. 1994. Clicks and their accompaniments. *J. Phonet.* 22, 33-64.
- Ladefoged P. and Maddieson I. 1996. *The sounds of the world's languages*. Oxford: Blackwell.
- Maddieson I. 1984. *Patterns of Sounds*. Cambridge: CU Press.

- Maddieson I. and Precoda K.. 1989. Updating UPSID. *J. Acoust. Soc. Am.* Suppl. 1, Vol. 86, S19.
- Ohala J.J. 1983. The origin of sound patterns in vocal tract constraints. In MacNeilage P.F. (ed) *The production of speech*, 189-216. New York: Springer.
- Ohala J.J. 1993. The phonetics of sound change. In Jones C. (ed) *Historical linguistics: Problems and perspectives*, 237-278. London: Longman.
- Stopa R. 1979. *Clicks, their form, function and their transformation*. Kraków: Universitas Jagellonica.
- Svantesson J.-O. 1983. *Kammu phonology and morphology*. Travaux de l'Institut de linguistique de Lund XVIII. Lund: Gleerup.
- Willerman R. 1994. *The phonetics of pronouns: articulatory bases of markedness*. PhD dissertation, University of Texas, Austin.