

# Click Consonants

*Edited by*

Bonny Sands



BRILL

LEIDEN | BOSTON

# Contents

	Editor's Preface	VII
	List of Illustrations	IX
1	Click Consonants: an Introduction	1
	<i>Bonny Sands</i>	
2	Click Phonology	74
	<i>Wm. G. Bennett</i>	
3	The Interaction between Click Consonants and Tone in Tsua	129
	<i>Timothy K. Mathes</i>	
4	Click Loss and Click Insertion in Fwe	156
	<i>Hilde Gunnink</i>	
5	Perception of Non-native Click Consonant Contrasts: Implications for Theories of Speech Perception	179
	<i>Catherine T. Best</i>	
6	Studying Clicks Using Real-Time MRI	210
	<i>Michael Proctor, Yinghua Zhu, Adam Lammert, Asterios Toutios, Bonny Sands, and Shrikanth Narayanan</i>	
7	Recording and Measuring Acoustic Attributes of Clicks	241
	<i>Sean Fulop and Richard Wright</i>	
8	Nasalized Accompaniments in Proto-Khoe and in Khwe	275
	<i>E.D. Elderkin</i>	
9	Click Loss in Khoe-Kwadi	291
	<i>Anne-Maria Fehn</i>	
10	Click Replacement and Loss in Ju	336
	<i>Anne-Maria Fehn</i>	

- 11 Production of Click Sounds in Acquired Apraxia of Speech: a View to  
the Motoric Nature of the Disorder 356  
*Anita van der Merwe and Mollie Steyn*
- 12 The ArtiVarK Click Study: Documenting Click Production and  
Substitution Strategies by Learners in a Large Phonetic Training and  
Vocal Tract Imaging Study 384  
*Scott Moisik and Dan Dediu*
- 13 Notes on Child Acquisition of Clicks in Hadza 418  
*Kirk Miller*
- 14 Paralinguistic Use of Clicks in Chad 422  
*Florian Lionnet*
- 15 False Alarms: Spurious Reports of Click Consonants 438  
*Kirk Miller*
- General Index 445
- Language Index 464

# Paralinguistic Use of Clicks in Chad

*Florian Lionnet*

## 1 Introduction

Many languages without phonemic click consonants use clicks for paralinguistic purposes, i.e. as verbal gestures, defined by Grenoble (2014) as a “set of sounds or segments which stand outside a language’s phonemic inventory but are still part of the communicative system of the language”. In his worldwide survey of clicks used as verbal gestures, Gil (2011) defines two main paralinguistic functions of clicks: affective (approval, disapproval) and logical (“yes”, “no”).

The present contribution focuses on the paralinguistic uses of clicks in southern Chad, with specific focus on Laal, a language isolate spoken by ca. 800 speakers in Gori and Damtar, two villages along the Chari River between the Moyen-Chari and Chari-Baguirmi regions of Chad. As can be seen from the inventories below, Laal does not have any phonemic click consonants.

### (1) a. Laal vowels

i   y   i   u  
e   yo   ə   o  
ia   ya   a   ua

### b. Laal consonants

p   t   c   k   [ʔ]  
b   d   ɟ   g  
<sup>m</sup>b   <sup>n</sup>d   ɲɟ   ŋ  
ɓ   ɗ   ʒɟ  
s   h  
m   n   ɲ   ŋ  
l  
r  
w   j

The Laal case is representative of many if not all the languages of the southern part of the country, and most probably beyond: the areal distribution of these clicks, which has yet to be mapped precisely, is very likely to encompass much of West and Central Africa, and perhaps more, as we will see in this chapter.

Four non-phonemic click-like articulations are used in Laal for paralinguistic purposes: a dental click, a lateral click, a back-released velar click, and a bilabial fricated click. Most of the limited acoustic data presented in this chapter

was recorded in Gori in January 2015, with two male consultants: Kalem Dakour (KD), in his late 50's, and his son Adoum Kalem (AK), 28 years old. The lateral (three tokens, by AK) and back-released velar clicks (six tokens by KD, two by AK) were recorded during a brief conversation about those clicks, while the dental (one token each) and bilabial-lateral (one token by KD) ones were extracted from recordings where they occurred spontaneously. One token each of a lateral and a dental click uttered by a third speaker, Idris Kanyour (ID), during a spontaneous conversation are also provided. Unless otherwise specified, the recordings were made using a Zoom H4n recorder set at a sample rate of 44.1 kHz and 16-bit quantization, and a mono Røde NTG2 condenser shotgun microphone. Waveforms and spectrograms were produced using Praat (Boersma and Weenink 2014, default settings). All waveforms and spectrograms show an interval of about 200 ms, so as to make a comparison of the relative length of the four clicks easier. Note that the articulatory descriptions given in the following lines are only impressionistic, mostly based on my own productions of these clicks as I tried to reproduce native speakers' productions. More generally, it will be clear to the reader that the present contribution is but a preliminary attempt at characterizing these paralinguistic clicks (acoustically, articulatorily, and pragmatically) in Chad, an attempt which I hope will pave the way to more detailed studies in the future.

## 2 Dental Click [l]

The dental click is used to express negation or disagreement, i.e. as a gestural<sup>1</sup> equivalent of “no” (logical use), or to express negative evaluation (affective). The latter is illustrated in the following spontaneous conversation, recorded in Gori:<sup>2</sup>

- (2) ID: **kàlité**            **mē**            **bàn**            'yá            nūŋ  
          kind            death            EMPH            thus            TOP  
          ‘Such a death ...’ (shaking head, expressing commiseration; NB: the  
          person being talked about died after a long agony)  
          (...)

1 In Grenoble's (2014) sense of “gesture”, cf. section 1 above.

2 Abbreviations used in this paper conform to the Leipzig glossing rules, with the following exceptions: BKCH = backchanneling; CON = connective; EMPH = emphatic; excl = exclusive; F = feminine; M = masculine.

B:    **pāyál**                      **ḑòòg**                      **wúlá**                      **ḑágàl**                      **'á**  
         suffering:CON    POSS.3F.SG                      finish                      here                      COMPL  
'Her suffering was over.'

ID:   **l**                      **kây!**  
         NO                      EXCL  
         "[dental click] really [what a horrible death it was]!"

The waveforms and spectrograms in Figure 14.1 (corresponding to speaker ID's dental click in example (2) above) and Figure 14.2 below show that the release burst of the dental click is somewhat delayed and produces noise that contributes to the fricative quality of the sound. The energy is concentrated in the higher part of the spectrum, in the 5~10 kHz range.

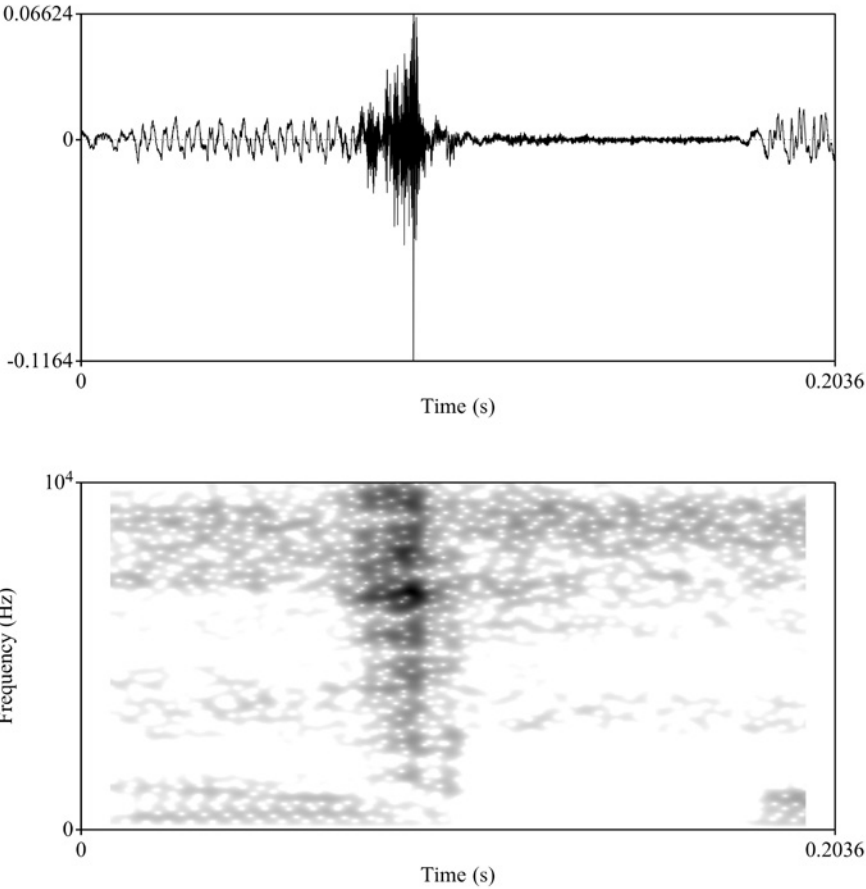


FIGURE 14.1    Dental click [l] (Speaker ID, natural speech, Zoom H4n built-in microphone)

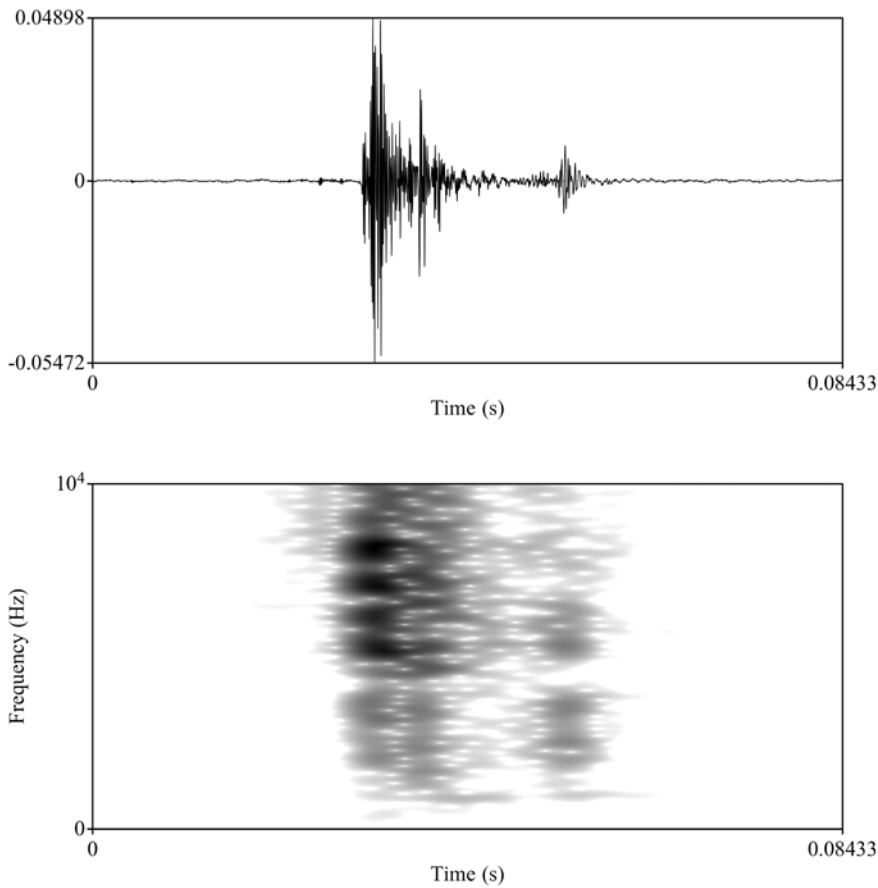


FIGURE 14.2 Dental click [l̥] (Speaker KD, natural speech)

3 Lateral Click [ll̥]

The lateral click is frequently used in linguistic interactions in Laal, with two main functions: to express approval or endorsement (“yes”), and as a back-channeling strategy (“yes, go on”, “I get it”). Both KD and his son AK describe this click, and its allophone the back-released velar click [ɣ̥] (see next section) as indicating strong agreement: “Si quelqu’un va parler, si c’est une bonne parole, tu vas faire [ɣ̥] (~[ll̥])” (if someone speaks, if what they say is good, you are going to go [ɣ̥] (~[ll̥]); KD, 20 Jan. 2015).

The example below, taken from natural conversations recorded in Gori illustrates the backchannel use of [ll̥] (the strong endorsement function cannot

be illustrated with naturalistic data, since it is not attested in the transcribed portion of my corpus).

- (3) A: ò                      kú        nàrgàɲ    bòkà    já        d̪aŋ  
          you.SG            see        Nargany   Boka    CON.M   DIST  
          náár                jí        d̪aŋ        àsyám   jí        d̪aŋ  
          his.mother        CON.F DIST        Asyam   CON.F DIST  
          ‘You see Nargany Boka, his mother, Asyam?’

B: m̩m̩  
      BKCH  
      ‘Uh huh.’

A: ùrú    bàn    ɪ̀ni    nùnú ùrú        gùr ɓìl    ùrú        ɓýýnú  
      we.EX EMPH sit.PL here    we.EX    dig    hole    we.EX    bury:her  
      ‘We here, we dug the hole, we buried her.’

B: ʔ  
      BKCH  
      ‘Uh huh.’

Note that two backchanneling strategies are used in (3): the lateral click, and *m̩m̩*, which appears to have exactly the same function (although, as far as I can tell from my corpus, it is only ever used for backchanneling, and never expresses approval or endorsement). The waveform and spectrogram in Figure 14.3 represent a lateral click realized by speaker ID in a natural conversation recorded in Gori.

In many cases, the closure for the lateral click appears to involve the side of the tongue against the upper gums rather than the teeth, and the release seems to be further back than the expected lateral release, close to the side of the velum. Note that this articulatory inference is purely impressionistic, and is mostly based on my own attempts to reproduce the sound as heard from native speakers as close as possible to the original. The waveform and spectrogram in Figure 14.4 illustrate such a lateral click, uttered in careful speech, showing a 30 ms interval of fricative noise accompanying the release.

As can be seen on the spectrograms in both Figure 14.3 and Figure 14.4, the lateral click release burst is characterized by two bands of high energy around 2 kHz and 4 kHz, as well as a wider band of high energy above 6 kHz, gradually fading away as frequency increases. It is also noteworthy that the burst has two to three successive peaks of amplitude.



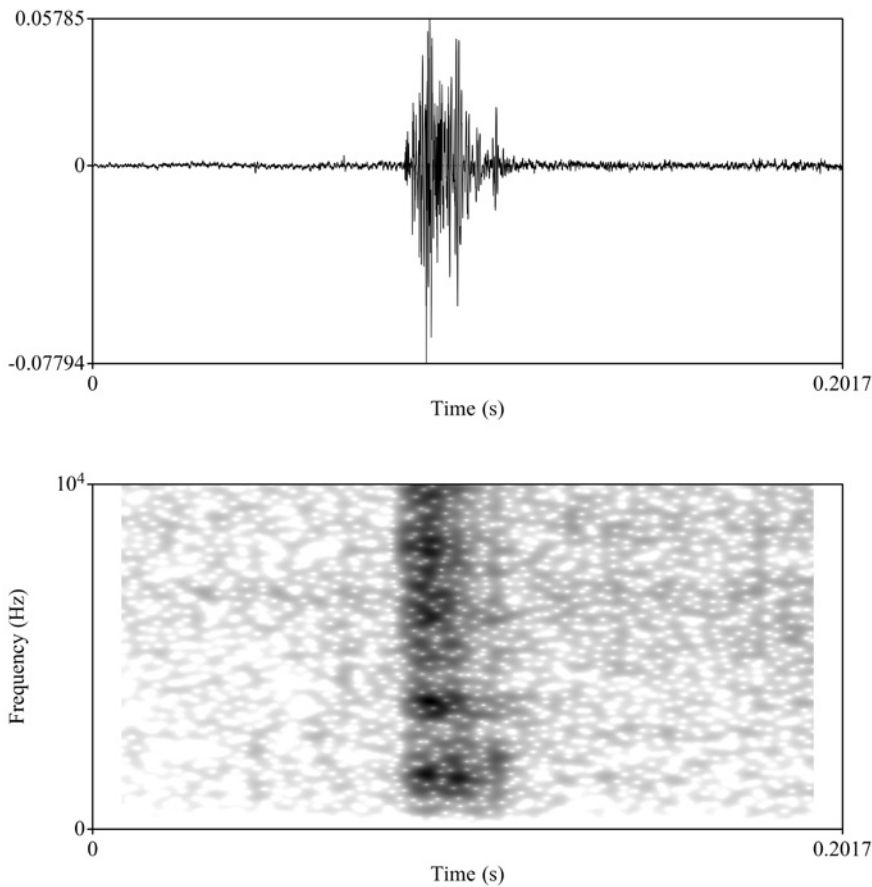


FIGURE 14.3 Lateral click [ɭ] (speaker ID, natural speech, Zoom H4n built-in microphone)

4 Back-Released Velar Click [ɰ]

The back-released velar click may be used as an equivalent of the lateral click, with the same functions: approval and backchannel. Both clicks are very frequent in Laal discourse, and appear to be allophones of each other, and both are explicitly described as strictly identical from a semantic and pragmatic point of view by speakers AK and KD. AK even insisted that he much prefers to use the lateral one.

Like any other click, [ɰ] is produced with an ingressive velaric (or lingual, cf. Miller et al. 2006; Miller et al. 2007) airstream. The oral cavity is closed in two places: at the back and at the front of the mouth. Air rarefaction in the intra-oral cavity is achieved mostly through tongue body lowering. However,

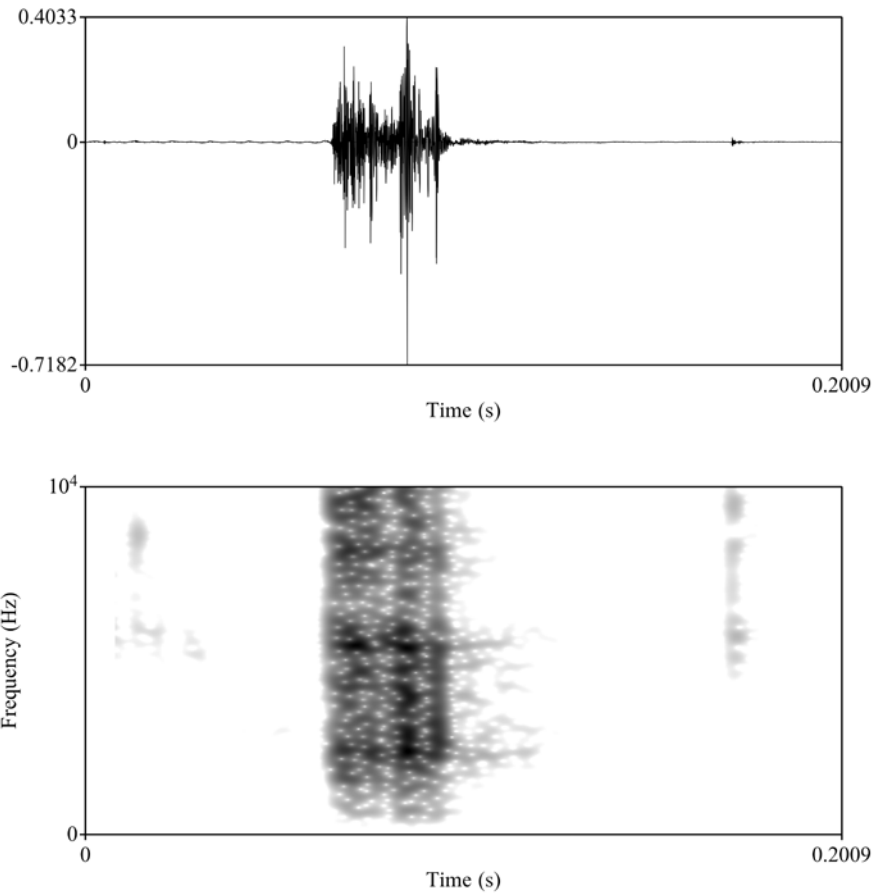


FIGURE 14.4 Lateral click [ɬ] (AK, elicited, careful speech)

instead of the front closure, it is the back closure that is released, allowing air to rush into the mouth from the back, either from the nasal cavity or from the post-velar cavity if the velopharyngeal port is closed. However, keeping the velopharyngeal port open seems to be important for the production of this click, since the nasal cavities appear to act as the main resonator (my own attempts at producing this click with a closed velopharyngeal port yields a muffled sound that is nothing like any of the recorded tokens I have of this click pronounced by native speakers). This might explain why Anonby (2011: 68–69), the first author to give a detailed articulatory and auditory description of this click in Mambay (Adamawa), qualifies it as “nasal”.

In the absence of articulatory measurements, it is difficult to determine where exactly the two closures are. Lukas (1937: 147) – the first linguist, to my knowledge, to ever describe this click – says it is a “post-velar click [with] lips closed” in Kanuri, suggesting a uvular rather than velar back closure in this language. Elders (2000: 586) also describes the back closure of this click as uvular in Mundang (“injectif uvulaire”, accordingly transcribed [q]). The back release sounds velar to me in all the Laal recordings at my disposal, but it is not unlikely that a uvular variant may also be possible. My own production of this click, which sounds very similar to what I hear from native speakers, and looks very similar on a spectrogram as well, involves a closure at the very edge of the hard palate, close to the velum. It also involves central airflow: the back of the tongue is still in contact with the gums and soft palate on both sides of the mouth after the release.

Most of the authors who have written about this click describe the front closure as bilabial, from visual evidence only (Lukas 1937: 147 for Kanuri; Anonby 2011: 69 for Mambay; Grenoble 2014: 198, fn. 1, and Grenoble et al. 2015: 116, fn. 3 for Wolof). Indeed, it is most of the time pronounced with full lip closure throughout in Laal as well, which is suggestive of a bilabial front closure. It is possible to surmise, however, that the front closure, hidden by the lips’ rest position, might actually be dental/alveolar instead, in which case lip activity would be irrelevant to the production of this click, since the position of the lips would have no acoustic/perceptual consequences. A dental/alveolar closure, by reducing the size and elasticity of the intra-oral cavity, actually makes the back-released click both articulatorily easier and perceptually more salient, which seems to suggest that the front closure is dental/alveolar, while the lips are most of the time left in their rest position, i.e. closed (note that this click is typically uttered by a listener in a conversation, i.e. someone whose mouth is not unlikely to actually be closed). Clearly, precise articulatory data is needed to determine the exact position of the front and back closures in these languages, and the degree of intra-speaker, inter-speaker, and cross-linguistic variation in the realization of this click type in its area of distribution.<sup>3</sup>

I propose that this click be transcribed with the turned k symbol ⟨ɿ⟩ originally recommended in the Principles of the International Phonetic Association (1949) to represent a (then purely hypothetical) velar click, i.e. a velar stop articulated with ingressive velaric airstream. This articulation was later said to be

3 Tuhuse and Traill (1999) describe the same articulation in East Ixóon as involving a coronal front closure, similar to that required for a palatal click [ɟ̺]. Note that this click also has an exclusively paralinguistic use in Ixóon (the imitation of a specific bird call), but interestingly very different from West and Central Africa.

physically impossible due to the necessity for a velaric ingressive stop to involve a front closure additionally to the velar one, and release of the front closure exclusively: “the two closures must be separated by at least a centimeter or two, so a velar click is a contradiction in terms” (Pullum and Ladusaw 1996: 101). However, a velar click is articulatorily possible if the back closure is released first, which is exactly how the back-released velar click of Laal is realized.<sup>4</sup>

Figure 14.5 and Figure 14.6 below present the waveform and spectrogram of two representative tokens of the back-released velar click, for both KD and AK. Both tokens were elicited, and correspond to careful speech. As can be seen, this click is characterized by a relatively short delayed release burst, making it sound somewhat fricated. The energy seems to be mostly concentrated in two bands, centered around 3–4 kHz and 9 kHz respectively. One can also see an additional low frequency peak, with less amplitude, at around 1–2 kHz.

The average overall intensity of KD’s six velar click tokens is around 60 dB, which is surprisingly high for a closed-mouth sound (compare with his son’s open-mouth lateral click’s 68 dB). This can be explained by the fact that, as said above, the nasal cavity acts as the main resonator. The intensity of the click is severely reduced when the velopharyngeal port is closed, as the sound may only escape the oropharyngeal cavity through the bones and tissues surrounding the vocal tract. This nasality could explain the lower frequency energy observed in the velar click, which is absent from all the other clicks used in Laal, none of which involve the nasal cavity. Note, however, that with a mean intensity of 43 dB, AK’s velar clicks are noticeably less loud than his father’s, but also than his own lateral click (mean intensity: 68 dB). Interestingly, this speaker also expressed a marked preference during our recording session for the latter, a preference which might be due to the sharp difference in loudness between his productions of both clicks.

Anonby (2011: 68–69), describing the back-released velar click in Mambay, an Adamawa language of Northern Cameroon and Southwestern Chad,

4 In 1949, turned ⟨ɿ⟩ was officially adopted by the IPA as the symbol for a velar click. It was then removed in 1979. Following Ball et al. (2004: 159), the symbol was reintroduced in the extIPA chart to represent a voiceless velo-dorsal stop. In 2015, after the first version of the present chapter was circulated, the extIPA symbol for the voiceless velo-dorsal stop was changed to a *reversed* k, to avoid any confusion with the use of turned [ɿ] for a back-released velar click (see Ball et al. 2018: 159, which cites a previous version of the present chapter). Note that turned ⟨ɿ⟩ also represents an unaspirated [k] in some early work by Dorsey on the Siouan language Ponca (mentioned in Pullum and Ladusaw 1996: 101). This is a little-known idiosyncratic choice that has not been widely adopted. Additionally, Bradfield (2014) uses a turned small capital K to refer to a generic click of any type, graphically different from turned ⟨ɿ⟩. Note that the first use of ⟨ɿ⟩ appears to be as a transcription of [ʃ] in John Yeomans’ spelling reform proposal for English (Yeomans 1759: 49, cited in MacMahon 1994).

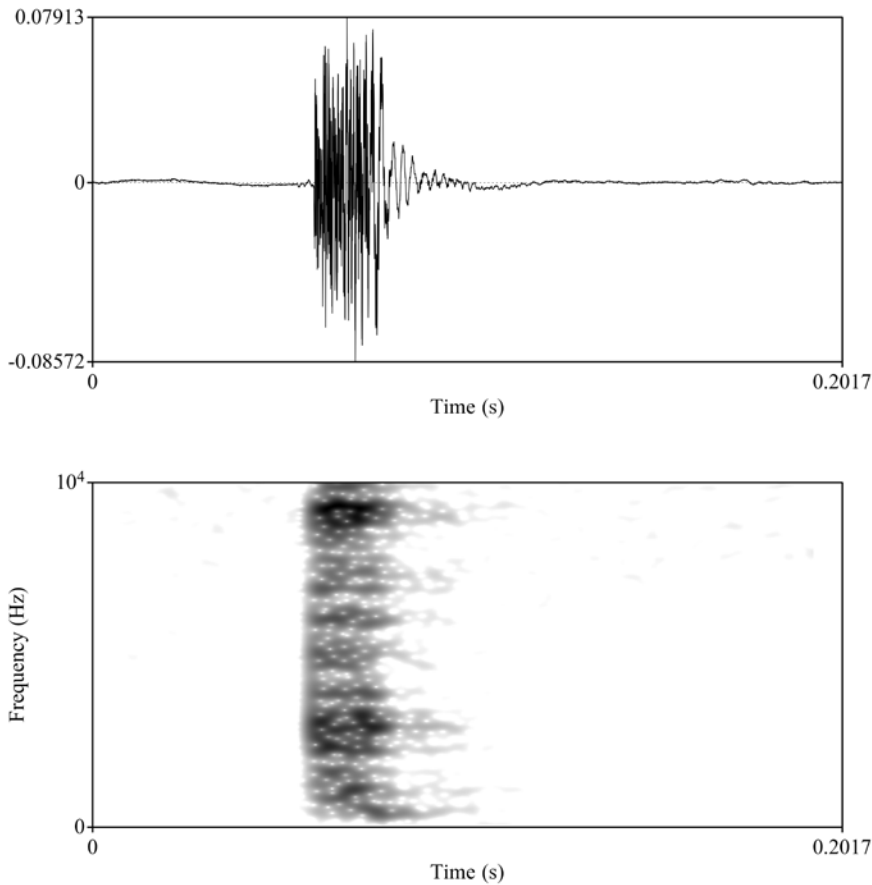


FIGURE 14.5 Velar click (speaker KD, elicited, careful speech)

notes that its areal distribution “extends to much of northern Cameroon, southern Chad and likely other adjacent regions”, and mentions Mundang (Elders 2000: 586), geographically and genealogically very close to Mambay, and the Saharan language Kanuri (Lukas 1937: 147) as two other languages of the Lake Chad Basin where this click is attested with similar functions. It is also attested in Mauritanian Pulaar (Gil 2011, cited in Grenoble 2014: 108, fn. 1), and in Wolof (Grenoble 2014; Grenoble et al. 2015) as we will see later, as well as in the Mambiloid language Wawa (Marieke Martin, p.c., August 2015). In all the languages in which it has been described so far, the back-released click seems to serve the same two functions as in Laal: backchannel and agreement/approval.

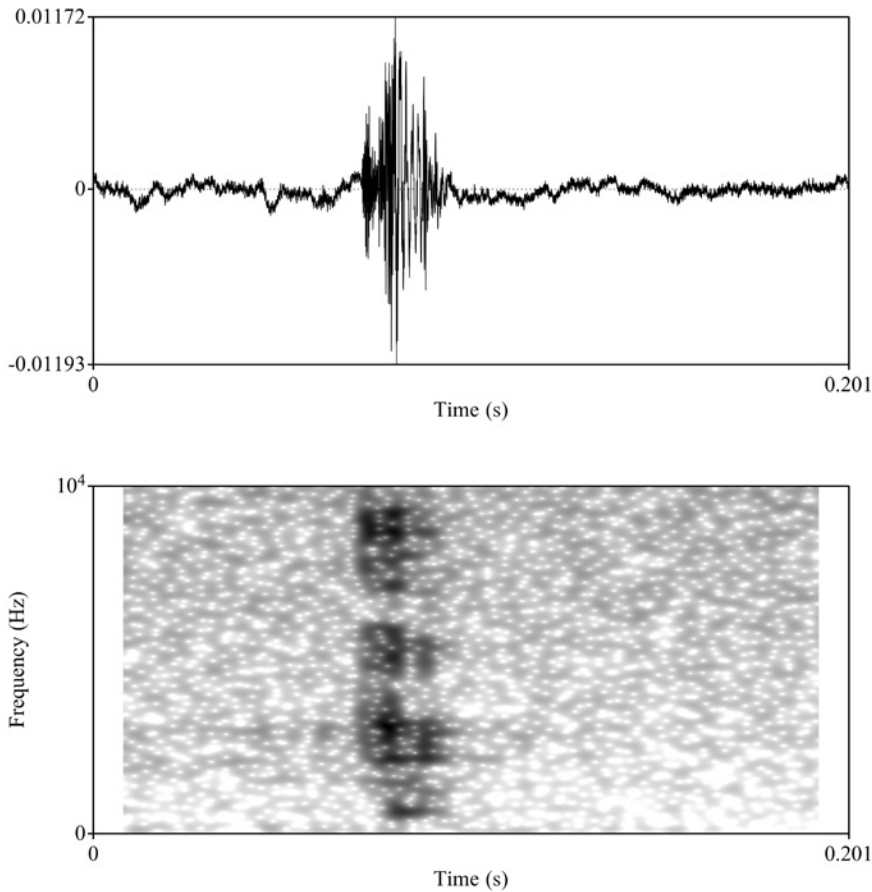


FIGURE 14.6 Velar click, (speaker AK, elicited, careful speech)

5 Bilabial Fricated Click: the “Tchip”

This ingressive sound can be described as a complex bilabial-alveolar or bilabial-lateral click: the initial bilabial release is immediately followed by a prolonged suction of air through the teeth onto the tongue, either at the alveolar ridge or on one or both side(s) of the mouth. This sound is always pronounced with pursed lips moving down to the side. The resulting sound can be defined as an “ingressive affricate”: its release burst starts with a high amplitude peak corresponding to the release of the lip closure, followed by a long (about 124 ms in Figure 14.7) period of noise with lower amplitude,

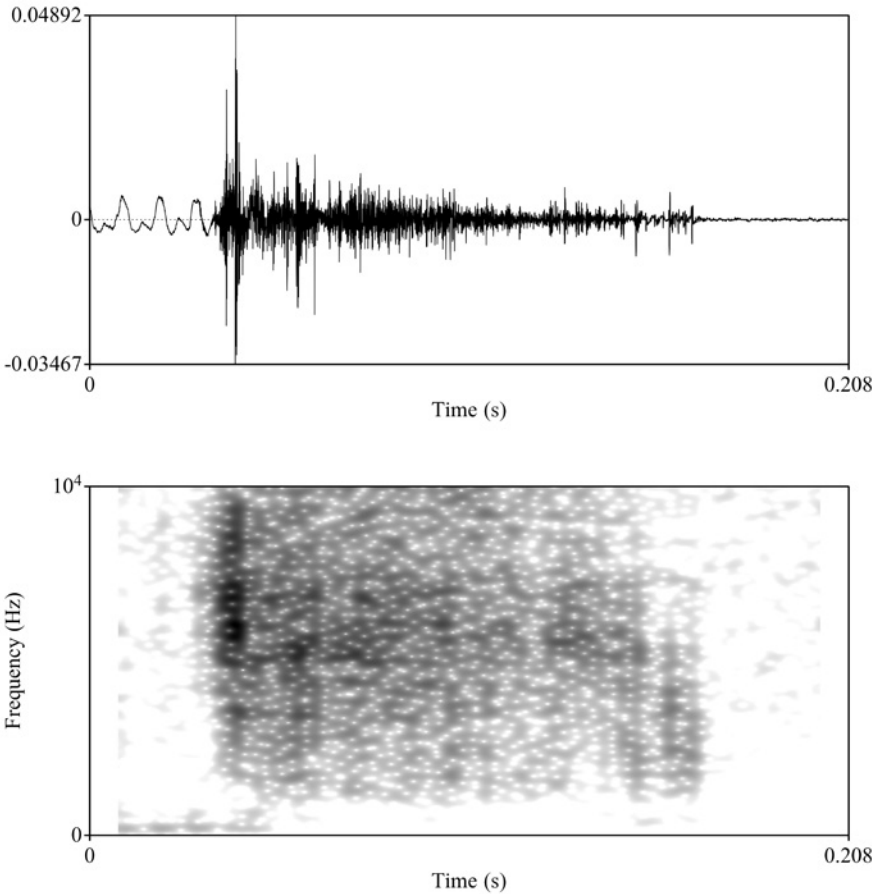


FIGURE 14.7 “Tchip” (speaker KD, natural speech)

gradually fading. The energy seems to be rather evenly distributed above 1.5 kHz, with a noticeable band of higher energy between 5 kHz and 7 kHz.

This verbal gesture expresses dissent, disapproval, or contempt, and is very widespread in (at least) West and Central Africa, as well as in African diaspora communities. Note that there seems to be cross-linguistic variation in the articulation of this gesture: Agwuele (2014: 90) does not mention lip closure as part of the articulation of this click in Yoruba, and describes the place of articulation of the ingressive fricative as being strictly alveolar, while Grenoble (2014), Grenoble et al. (2015) describe the Wolof version as involving an ingressive labio-dental fricative. All descriptions of similar clicks however mention the accompanying downward lip movement noted in Laal, and often an

additional frown and/or sideways head movement reinforcing the highly negative semantic and pragmatic value of this very complex gesture, both verbal and non-verbal.

Known as *suck-teeth* in African American communities (Rickford and Rickford 1976), and as *tchip* among the communities of African descent in the francophone world (from its Wolof name *ciip*<sup>5</sup>), this very salient verbal gesture is usually used as a strong marker of identity among communities of African descent outside of Africa.

## 6 Conclusion and Tentative Comparative Notes

As a conclusion to this chapter, I will sketch a brief comparison of the uses and values of the clicks used as verbal gestures in Laal and Wolof, which lie at opposite ends of the West and Central African zone (the Wolof data are taken from Grenoble 2014). As can be seen in Table 14.1 below, both languages make use of four clicks. The alveolar click is attested only in Wolof, where it is used for backchannel communication, while only Laal uses the dental click, as a synonym of “no” or sign of disapproval. The other three clicks (velar, lateral, *tchip*) are attested in both languages.

The clicks that Laal and Wolof have in common seem to share similar properties. In both languages, the lateral and back-released velar clicks are allophones of each other and systematically have a positive meaning, both logical (“yes”, backchannel) and affective (approval, endorsement), while the *tchip* is used to convey negation (logical) or disapproval (affective). This also holds for the other West and Central African languages that have been described as having these clicks.

However, there are interesting differences between the two systems. First, Wolof makes a distinction between single occurrence and repeated versions of each click: the lateral, velar and alveolar clicks, when articulated only once, are used for backchannel communication, and express approval only when repeated. Similarly, disapproval is conveyed through a single occurrence of the *tchip*, while a repeated *tchip* expresses simple negation. Interestingly, the distinction between single and repeated occurrence does not correlate with the difference between logical and affective functions: the non-repeated clicks used for backchanneling all express a logical function, but their repeated versions

5 According to Diouf (2003), *ciip* is the noun that refers to the click, from which the verb *ciipu* (~*ciipatu*) is derived.



TABLE 14.1 Paralinguistic clicks in Laal and Wolof

Laal		Wolof	
		<i>Single</i>	<i>Repeated</i>
Lateral	Backchannel, “yes”/approval	Backchannel	“yes”/approval
Velar	Backchannel, “yes”/approval	Backchannel	“yes”/approval
Alveolar	–	Backchannel	“yes”/approval
Dental	Negation, Negative evaluation	–	–
<i>Tchip</i>	Disapproval	Disapproval	Negation

have both a logical (“yes”) and affective function (approval). Conversely, it is the single version of the *tchip* that has an affective meaning (disapproval), while its repeated counterpart expresses a purely logical one (negation). Note that the same distinction between single and repeated occurrences exists in Mauritanian Pulaar: one occurrence of the dental click stands for “yes”, two for “no” (Gil 2011).

Laal on the other hand does not make this distinction: backchannel, approval, negation and disapproval may all be conveyed through one single occurrence of the relevant click; repetition is only used to express insistence or emphasis.

Finally, negation and disapproval are, like in Wolof, expressed (partly) separately, although not in exactly the same way: the *tchip* is used only for disapproval in Laal, while negation is expressed with a dental click (which also expresses negative evaluation), unattested in Wolof.

The clicks described in this paper are used as verbal gestures over a wide area of Western and Central Africa, at least from Senegal to southern Chad. Gil (2011) mentions 23 languages between Senegal and Cameroon known for their paralinguistic use of clicks. Pillion et al. (2019) also mention three clicks in three Narrow Bantu languages (Basaa, Bakoko, Bulu) and one Grassfields Bantu language (Ngoshie) of Cameroon: bilabial (dog call, “wolf whistle”), bilabial-lateral (i.e. *tchip*, with the same function as in Laal), and lateral (back channel, as in all other languages). Very little is known however about the exact distribution and cross-linguistic properties of these clicks, and of verbal gestures in general, unfortunately too often left out of descriptive grammars. Whether the use of clicks as verbal gestures constitutes an areal feature of that part of Africa (or of the whole continent, as suggested by Gil (2011)) thus remains an open question, for which further research is needed.

## Acknowledgements

For their very helpful comments on previous versions of this paper, I would like to thank Marieke Martin, Michael Proctor, Bonny Sands, and Kirk Miller. I would also like to thank the Laal speaking community, in particular Kalem Dakour and his son Adoum Kalem, for their warm welcome and invaluable help.

## References

- Agwuele, Augustine. 2014. "A repertoire of Yoruba hand and face gestures." *Gesture* 14(1): 70–96.
- Anonby, Erik J. 2011. *A Grammar of Mambay: An Adamawa Language of Chad and Cameroon*. Cologne: Rüdiger Köppe.
- Ball, Martin, Rachel Manuel, and Nicole Müller. 2004. "An atypical articulatory setting as learned behaviour: a videofluorographic study." *Child Language Teaching and Therapy* 20(2): 153–162.
- Boersma, Paul, and David Weenink. 2014. *Praat: doing phonetics by computer* [Computer program]. Version 5.4, retrieved 4 October 2014 from <http://www.praat.org/>.
- Bradfield, Julian. 2014. "Clicks, concurrency and Khoisan." *Phonology* 31: 1–49.
- Diouf, Jean-Léopold. 2003. *Dictionnaire wolof-français et français-wolof*. Paris: Karthala.
- Elders, Stefan. 2000. *Grammaire mundang*. Leiden: CNWS.
- Gil, David. 2011. "Paralinguistic usages of clicks." *The World Atlas of Language Structures online*, ed. Matthew S. Dryer and Martin Haspelmath. Munich: Max Planck Digital Library, chapter 142. Available online at <http://wals.info/chapter/142> (last accessed 15 April 2015).
- Grenoble, Lenore A. 2014. "Verbal gestures: toward a field-based approach to language description." *Язык. Константы. Переменные: памяти Александра Евгеньевича Кубрика* [*Language. Constants. Variables: In memory of A.E. Kibrik*], ed. Vladimir Plungian, Michael Daniel, Olga Fedorova, Ekaterina Lyutikova and Sergei Tatevoso. Saint Petersburg: Алетея [Aletheia], pp. 105–118.
- Grenoble, Lenore A., Rebekah Baglini, and Martina Martinović. 2015. "Verbal gestures in Wolof." *Selected Proceedings of the 44th Annual Conference on African Linguistics*, ed. Ruth Kramer, Elizabeth C. Zsiga and One Tlale Boyer. Somerville, MA: Cascadilla Proceedings Project, pp. 110–121.
- International Phonetic Association. 1949 (reprinted 1967). *Principles of the International Phonetic Association*. London: Department of Phonetics, University College (now Department of Phonetics and Linguistics, University College London).

- Lukas, Johannes. 1937. *Zentralsudanische Studien*. Abhandlungen aus dem Gebiet der Auslandskunde 45 / Reihe B. Völkerkunde, Kulturgeschichte und Sprachen 24. Hamburg: Friederichsen, de Gruyter and Co.
- MacMahon, Michael K.C. 1994. "A Mid-18th century use of [ə], [ɔ], and [ɣ] as phonetic symbols." *Journal of the International Phonetic Association* 24(1): 19–20.
- Miller, Amanda L., Johanna Brugman, Jonathan Howell, and Bonny Sands. 2006. "Tongue dorsum location and tongue root retraction in alveolar and palatal clicks in the endangered language Nluu." *Journal of the Acoustical Society of America* 120: 3377.
- Miller, Amanda L., Levi Namaseb, and Khalil Iskarous. 2007. "Tongue body constriction differences in click types." *Proceedings of Laboratory Phonology 9*, ed. Jennifer S. Cole and José Ignacio Hualde. Phonology and Phonetics Series 4.3. New York: Mouton de Gruyter.
- Pillion, Betsy, Lenore A. Grenoble, Emmanuel Ngué Um, and Sarah A. Kopper. 2019. "Verbal gestures in Cameroon." *Theory and Description in African Linguistics: Selected Papers from the 47th Annual Conference on African Linguistics*, ed. Emily Clem, Peter Jenks and Hannah Sande. Berlin: Language Science Press, pp. 303–322.
- Pullum, Geoffrey K., and William A. Ladusaw. 1996. *Phonetic Symbol Guide*. Second Edition. Chicago: The University of Chicago Press. First edition published in 1986.
- Rickford John R., and Angela E. Rickford. 1976. "Cut-eye and suck-teeth: African words and gestures in new world guise." *The Journal of American Folklore* 89: 294–309.
- Tuhuse, Bolo llXao and Anthony Traill. 1999. "Ḥán-ḥánsè, the desert Cisticola, implements an acoustic target." *The Proceedings of the 14th International Congress of Phonetic Sciences (ICPhS-14)*, pp. 1041–1042.
- Yeoman, John. 1759. *The Abecedarian, or, Philosophic Comment upon the English Alphabet, Setting Forth the Absurdities in the Present Custom of Spelling ...* London: J. Coote.