
**Description and theory in the
voicing/tone interaction of Kera**
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Description and theory in the voicing/tone interaction of Kera

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1. INTRODUCTION

Early descriptions of the phonology of Kera (Ebert 1976, 1979; Pearce 1999) portrayed Kera as a language with voicing contrast in the obstruents. This was in keeping with the common view held for most Chadic languages. Some theoretical linguists built on this assumption and concluded that Kera demonstrates non-adjacent consonant-to-consonant voicing spread (Odden 1994, Rose and Walker 2004, Uffmann 2003). This paper proposes the view that both of these claims need reviewing because most dialects of Kera have no voicing contrast. It may well be that historically there was such a contrast, following the development of tone in a process of tonogenesis, but tone has now taken over the contrastive role, and any differences in voicing or Voice Onset Time (VOT) enhance the tone contrast. This paper demonstrates that without extensive data collection and careful analysis on the basis of acoustic measurements, the linguist is in danger of hearing a voicing contrast that doesn't exist and then developing a theory that does not apply. We need both the descriptive and theoretical approaches to linguistics in order to understand the Kera voicing/tone facts.

We will consider the evidence for a [voice] feature in Kera, and discuss how the VOT relates to the fundamental frequency, concluding that the VOT cues tonal contrasts. We will then consider the evidence put forward for long-distance voice spreading. We will also look at counter-evidence showing that the 'voice spreading' effect is really brought about by an interaction between VOT and tone. We will conclude that Kera cannot be used as evidence for the controversial theory of long-distance voice spreading. As Kera is one of the main languages used to support this claim (particularly because of apparent spreading across morpheme boundaries), it brings the theory into question.

This research also brings to light the interesting variation in the VOT/fundamental frequency relationship between dialects of Kera. The roles of VOT and F₀ are affected by gender and location. We will briefly discuss the implications of this.

The conclusion of this paper is that thorough data collection, careful measurement, and insightful analysis with the application of appropriate theory are all important tools for a good field linguist and that there are dangers in omitting any of these elements if we wish to have a comprehensive understanding of the phonology of a language.

1.1. Outline

In this paper, we will discuss the contributions of description, measurement and theory to the understanding of the phonology of a language. Examples will be taken from Kera, a Chadic language with 50,000 speakers. Kera was first described by Ebert (1976, 1979) with a descriptive grammar and lexicon. This

description was used by linguists as the key evidence for their theory of the existence of non-adjacent consonant to consonant voicing spread (Odden 1994, Rose and Walker 2004, Uffmann 2003, p.c.). Only a few languages show possible long-distance consonant to consonant spreading, so the Kera case is important. Some linguists question whether it takes place in any language (Gafos 1998).

I will give evidence that the Kera spreading is tonal, not voicing. And I will raise questions as to whether long-distance consonant to consonant effects exist. I will also demonstrate how careful measurement reveals interesting variations in the use of VOT and fundamental frequency for contrasts depending on the gender and location. These examples will highlight the dangers of theory without description or description without theory. For a good account we need description, measurement and theory combined.

2. KERA TONE AND VOICING FACTS

Kera has 3 tones: L, M, H (Pearce 2006). The language is usually shown as having a voicing contrast in obstruents with an apparent alternation in voicing in the affixes.

- | | | | |
|-----|---------------|------------|---------------|
| (1) | /k- b̥ɪrwá-ŋ/ | g̥ɪb̥ɪrwáŋ | ‘white (pl.)’ |
| | /k- mār̄wā-ŋ/ | k̄mār̄wāŋ | ‘new (pl)’ |

2.1. Summary of Voice Spreading Theory

Gafos (1998) claims that there are no long-distance C-C effects. But long-distance voicing spread is hard for Gafos to discount. Rose and Walker (2004) give examples of this spreading from Chaha, Ngizim, Ngbaka and Proto-Indo-European, but in these languages only agreement within the root is involved. These could be historical and non-productive. The strongest argument comes from Kera where the affixes are also involved. Kera is therefore a key example in their argument.

Hansson (2004) suggests in passing that Kera tones might be influencing voicing. My claim is that all of the apparent voicing spread in Kera can be accounted for by tone spreading, and resultant changes in VOT (Voice Onset Time). Kera does not have a distinctive feature [voice]. So it cannot have long-distance voicing spread. Instead of being contrastive in itself, the VOT enhances the F0 contrast (extensively demonstrated by phonetic studies in Pearce 2005, 2007). We will see cases where only the tonal spread can explain the apparent voice changes. When L tone spreads, obstruents get shorter VOT, and this is perceived as voicing.

3. BASIS OF VOICE SPREADING CLAIMS

3.1. *The voice-spreading claims based on two observations*

CLAIM 1: K- prefix ‘plural’ has two alternants: [k] and [g].

Claim: voicing spreads left onto the prefix

	sg.	pl.	
(2)	kúmná	k̄kámná	‘chief’
	tāatá	k̄tāatáw	‘big pot’
	táasā	k̄táasāw	‘cup’
(2)	b̄irwá	ḡb̄irwán̄	‘white’
	dàarà	ḡdàarà	‘friend’
	àzrà	ḡàzráw ¹	‘gazelle’

CLAIM 2: Within a word, the obstruents usually agree in voicing.

(3)	f̄r̄ɪŋka	‘old (f)’
	k̄up̄urki	‘billy goat’
	tépé	‘to gather’
(3)	agònòḡi	‘grudge’
	ḡùjùglùḡi	‘granary cover’
	bèzèrnèḡi	‘fox’
	ḍ̄ib̄irḡi	‘chicken’

3.2. *Counter-evidence for voice spreading claim from affixes*

The words below in (4) have voiced obstruents, so a C to C voice spreading account predicts voiced prefixes. This is not what we find. A tone account predicts that if the first syllable has high tone, the prefix will have a long VOT and will therefore be perceived as voiceless. This is what we find.

3.2.1. *K- prefix*

(4)	sg	pl		
	ágày	k-ágày	[kógày]	‘hoe’
	ágàmlà	k-ágàmlà	[kógàmlà]	‘bull’

¹ The claim by Rose and Walker (2004) that fricatives do not agree in voicing in Kera is false. They agree as much as stops.

Further examples come from Proto-Chadic (Jungrathmayr and Shimizu 1981, Stolbova 1996, 2005)

- (5) *With f. prefix:* *t-làarɪ [(dàa)(r̩:)] ‘friend’
With pl. prefix: *k-làarɪ [(gəl̀àa)(r̩:)] ‘children’

3.2.2. -Ki/Ka suffix

Rose and Walker also claim voicing spread in the –ki/ka (m./f.) suffix. Masculine words have the –ki/gi ending, while feminine words have the –ka/ga ending.

- (6) /kísírkí / ‘black (m.)’ /sárká/ ‘black (f.)’
 /āgèzègì/ ‘frog (m.)’ /dàygà/ ‘jug (f.)’

The voicing account suggests a 2-way contrast in voice, and VOT alternations. Whereas the tone account suggests a 3-way contrast in tone, with F0 and VOT co-varying in line with tones. The 3-way contrast below supports the tone account.

- (7)
 Tén ásánj pírkí ‘I saw a mountain’ k VOT=30 ms, final syllable F0=137 Hz
 Tén ásánj hàrkā ‘I saw a goat’ k VOT=21 ms, final syllable F0=119 Hz
 Tén ásánj dáygà ‘I saw a jug’ g VOT=8 ms, final syllable F0=104 Hz

Table 1
 Mean VOT of –K suffixes, tested on 50 words

32 ms	Preceding H tone.
22 ms	Preceding M tone.
9 ms	Preceding L tone.

(All significantly different, $p < 0.01$.)

3.2.3. –T habitual suffix

This prefix has two alternants [t] and [d]. Note that [d] appears with L tone (shaded).

Table 2
Comparison of minimal pairs for tone

		lǒbé ‘to convince’	lǒbé ‘to fatten’
1 sg	lǒb-T-n	lǒbtǒn M (23)	lǒbdǒn L (12)
2 sg m	lǒb-T-m	lǒbtǒm M (25)	lǒbdǒm L (16)
2 sg f	lǒb-T-i	lǒbtǐ M (35)	lǒbdǐ L (15)
2 pl	lǒb-T-ŋ	lǒbtǒŋ M (19)	lǒbdǒŋ L (17)
3 sg m	lǒb-T-ú	lǒbtú H (32)	lǒbtú H (30)
3 sg f	lǒb-T-á	lǒbtá H (29)	lǒbtá H (23)
3 pl	lǒb-T-óy	lǒbtóy H (33)	lǒbtóy H (38)

Table 3
Mean VOT of –T suffixes, tested on 240 words (3 speakers)

20 ms	Preceding H tone.
16 ms	Preceding M tone.
11 ms	Preceding L tone.

(All significantly different, $p < 0.01$.)

These examples suggest that the VOT/tone claim fits best. The change in –T cannot be voice spreading. Clearly VOT is co-varying with tone. These affixes alternate in voicing as the tone changes. Alternation is not caused by voicing of obstruents in the root.

3.3. Counter-evidence from French loans

In these examples, loans from French can carry a final accent which is perceived as H tone, and which spreads onto the final epenthetic vowel resulting in the devoicing of the preceding consonant.

- (8)
- | | | |
|--------|--------|-----------|
| French | Kera | |
| ʃmiz | šmísí | ‘shirt’ |
| vilaʒ | wǎlásí | ‘village’ |
| ʃεz | sésí | ‘chair’ |
| grεv | gǎrǎfi | ‘strike’ |

If the L tone is perceived, the obstruents in that syllable are perceived as voiced.

(9)	kɔʃɔ̃	gòzɔ̃ŋ	‘pig’
	mɔ̃tr	mɔ̃ndɔ̃r	‘wrist watch’
	petrɔ̃l	bɔ̃drɔ̃n	‘paraffin’
	kɔ̃tɔ̃	gòdɔ̃ŋ	‘cotton’
	ɔ̃yp	ʃìbì	‘skirt’
	bik	bìgì	‘pen’

3.4. Counter-evidence from statistical analysis of lexicon

We will not go through this argument in detail – but it is presented here to show that statistical analysis supports the argument for tone spreading rather than voicing spread. Uffmann (2003) cites several Kera words which agree in voicing. He acknowledges that there are exceptions, but he still claims that this shows voicing spread. In the present lexicon, 53 % of words have less than two obstruents, 20 % of words have voicing throughout, 18 % of words have just voiceless obstruents and 9 % of words have a voicing mismatch. Of these, 8 % have voiced obstruent + voiceless obstruent and 1 % have the opposite mismatch.

Kera appears to have a bias towards voicing agreement. The argument is that this bias is produced by long-distance voicing spread. My argument is that there is no voicing-spread. The effect is produced because VOT co-varies with tone. The tone patterns can account for the apparent agreement in voicing. Unlike the voice-spreading argument, tone patterns can also explain why the agreement is not 100 %.

3.4.1. Investigation

For L tone syllables, I claim that the onset obstruent will have a VOT of 0-20ms. This may be perceived as ‘voiced’. For M and H tone syllables, the VOT is longer. These are generally perceived as voiceless. The goal is to find the percentage of words with at least two obstruents and a tone pattern involving both L and H. According to my claims, these words should be perceived as having a change in voicing as well as tone.

3.4.2. Method

I examined 1132 nouns already classified for tone, dividing the 1132 nouns into tone patterns, number of syllables and foot structure. I noted the onset of each syllable as obstruent or non-obstruent. This is because only obstruents show changes in VOT which are interpreted as voicing. In words with greater than two syllables, I considered the onset of the first syllable in each foot. (Pearce 2007). The table below has been simplified, with rounded percentages replacing actual figures. Shaded cells indicate the categories where two obstruents occur with a change between H and L tone. These are the words where we would expect to see a voicing mismatch.

Table 4
Nouns classified according to tones, syllables and obstruents (as a percentage)

		H, M, or L	MH or HM	Apparent voicing change	
				LH	HL
1 syll		11			
2 syll	2 obst	15	5	4	2
	other	23	8	6	2
>2 syll	2 obst	4	4	2	1
	other	6	4	2	1

9% of all words would be expected to have voicing mismatch because of the combination of H and L

Table 5
Voicing predictions from tones compared to lexicon voicing

	<2 obstruents	voice agreement	voiceless agreement	voiced/ voiceless	voiceless/ voiced
voicing in lexicon (Kera orthog.)	53 %	20 %	18 %	8 %	1 %
prediction from tones	63 %	8 %	20 %	6 %	3 %

Both the lexicon and the prediction from the tones give a 9% mismatch in voicing. The voicing spread claim cannot account for the 9%. But the VOT/tone claim can account adequately for 9%.

3.4.3. Summary of argument

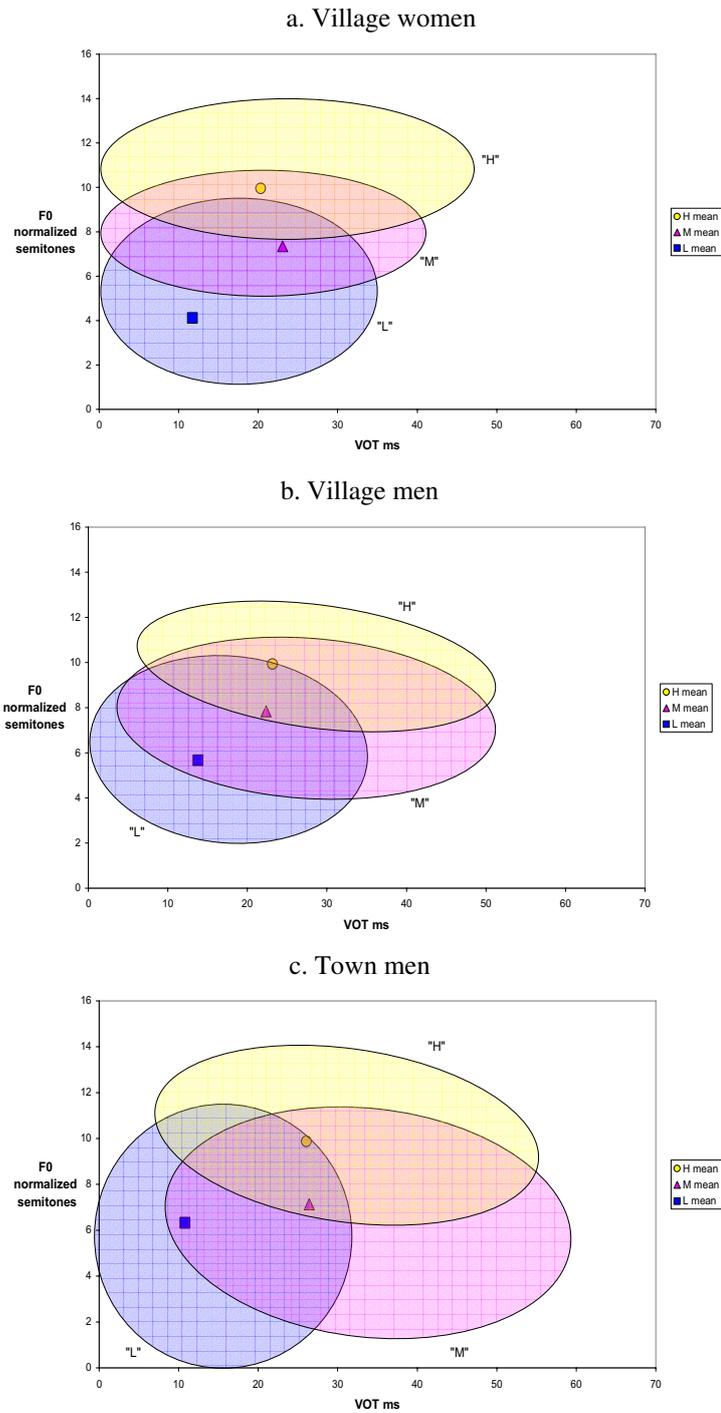
The voice spreading claim cannot explain all of the facts. It has difficulty explaining the affix alternates, and it cannot account for 9% of words with a voicing mismatch. Added to this, the voicing claim is controversial because it involves non-local spreading. In contrast to this, the VOT/tone claim does cope with the Kera voicing facts. [voice] is not a feature in Kera, so it cannot spread. When spreading takes place, it is the tone that spreads. This theory accounts for the VOT values in the K- prefix and the -T suffix. It also explains why 9% of words have a voicing mismatch. In addition, tone spreading is common in many languages and is not controversial. Therefore, Kera cannot be used as key evidence in favour of long-distance C to C voicing spread and this presentation raises serious questions about whether long-distance C to C effects do exist.

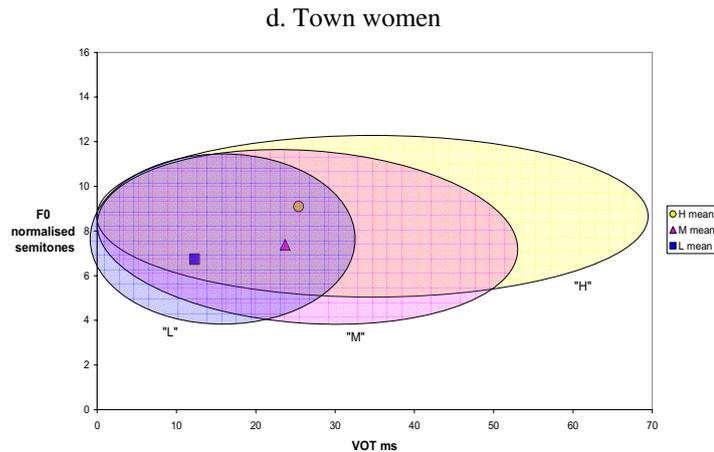
4. VARIATION IN VOT AND FO

This research also brings to light the interesting variation in the VOT/fundamental frequency relationship between dialects of Kera. The roles of VOT and F0 are affected by gender and location.

Figure 1

Contrasts in F0 and VOT of speakers according to gender and location





5. DISCUSSION AND CONCLUSION

We have seen that there are dangers in using theory plus second hand data. We don't know all the facts and can end up claiming unjustified support for theories. It is easy to make assumptions from the descriptions of fellow linguists, while ignoring important factors such as tone. In addition, if our grammars and dictionaries are based on a theory that goes out of fashion, they will be rendered useless.

On the other hand, there are dangers in producing a description with no accurate measurement and avoiding any theory. In the case of Kera, that would leave us believing that voicing is contrastive just because that is what we expect. It was only with acoustic analysis that I could show that for most Kera speakers, voicing is not contrastive. Measurement brings accuracy and a control on the theory. Theories bring insight and organize thought. They generate excitement and give a motivation for study. Theories can also build on other theories, so the fact that one theory goes out of favour may not mean that the work is obsolete.

A description with no analysis might be said to be safer, and if there is little theory, then we don't run the risk of the description becoming useless through the use of meaningless jargon. But this approach does nothing to help us understand what we are seeing. Atheoretical descriptions do not answer the question 'why?' We are left with facts about one language which have no connection to any other language.

But we don't have to have an either/or situation here. It should be possible to have analysis, measurement and theory in a good description. Theories can be drawn upon when they provide useful insights without the whole of the research being a slave to one theory. If each insight is explained, it should not make the research opaque.

The conclusion of this paper then is that thorough data collection, careful measurement, and insightful analysis with the application of appropriate theory are all important tools for a good field linguist and that there are dangers in

omitting any of these elements if we wish to have a comprehensive understanding of the phonology of a language.

REFERENCES

- Ebert, K. 1976. *Sprache und Tradition der Kera (Tschad). Teil II: Lexikon*. Berlin: Reimer.
- Ebert, K. 1979. *Sprache und Tradition der Kera (Tschad). Teil III: Grammatik*. Berlin: Reimer.
- Gafos, D. 1998. Eliminating Long-Distance Consonantal Spreading. *Natural Language and Linguistic Theory*. 223-278
- Hansson, G. 2004. Long-distance voicing agreement: An evolutionary perspective. *Proceedings of the 30th Annual Conference of the Berkeley Linguistics Society, Berkeley, CA. BLS*.
- Jungraithmayr, H. & K. Shimizu. 1981. *Chadic Lexical Roots. Vol II. Tentative Reconstruction, Grading and Distribution. Serie A: Afrika, Band 26*. Berlin: Verlag Von Dietrich Reimer.
- Odden, D. 1994. Adjacent parameters in Phonology. *Language*. 70 (2), 289-330
- Pearce, M. 1999. Consonants and Tone in Kera (Chadic). *Journal of West African Languages* 27 (1), 33-70.
- Pearce, M. 2005. Kera Tone and Voicing. In M. Pearce & N. Topintzi (eds.), *UCL Working Papers in Linguistics*. 17. Dept. of Phonetics and Linguistics, University College London.
- Pearce, M. 2006. The Interaction between metrical structure and tone in Kera. In Bert Remijsen & Vincent J. van Heuven (eds.), *Special Issue of Phonology. Between Stress and Tone*. 23 (2), 259-286.
- Pearce, M. 2007. The interaction of tone with voicing and foot structure: Evidence from Kera phonetics and phonology. PhD dissertation, Dept. of Phonetics and Linguistics, University College London.
- Rose, S. & R. Walker. 2004. A typology of consonant agreement as correspondence. *Language*. 80 (3), 475-531.
- Stolbova, O. 1996. *Studies in Chadic Compative Phonology*. Diaphragma, Moscow
- Stolbova, O. 2005. *Chadic Lexical Database. Issue 1*. L, N, NY, R. Kaluga: Poligrafiya.
- Uffmann, C. 2003. Optimal Geometries. In M. van Oostendoorp & J. van de Weijer (eds.), *The Internal Organization of Phonological Segments. Proceedings of Old World Conference in Phonology 1*. Berlin/New York: Mouton de Gruyter.