

FRONT VOWEL VARIATION IN TSWANA

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This article focuses on a type of variation in vowel quality in Tswana which has up to now not been recognised in descriptive studies nor has it been reflected in the practical orthography. An auditory investigation into the phonetic realisation of the mid low front vowel /e/ in different morpho-syntactic environments suggests phonetic realisations of respectively [e] and [i]. These impressionistic judgements are subjected to a systematic acoustic analysis and the results seem to indicate that underlying /e/ may indeed have two phonetic realisations without any phonetic or phonological conditioning.

In hierdie artikel word gefokus op 'n verskynsel in Tswana waar 'n vokaal 'n duidelike kwaliteitsverandering ondergaan wat nie in die beskrywende literatuur erken word of as sodanig in die praktiese ortografie aangedui word nie. 'n Ouditiewe ondersoek na die fonetiese realisasie van die middellae voorvokaal /e/ suggereer dat dit in verskillende morfotaktiese omgewings as respektiewelik [e] en as 'n hoë voorvokaal [i] gerealiseer word. Hierdie impressionistiese oordele is aan 'n sistematiese akoestiese analise onderwerp en die resultate dui inderdaad daarop dat onderliggende /e/ twee fonetiese realisasies het wat nie tweegebring word deur enige fonetiese of fonologiese kondisionering nie.

1 INTRODUCTION

It is well known that quite a number of views exist on the phonetic status of mid high and high vowels (front and back) in the Sotho languages in general as well as in Tswana in particular (Roux, 1983). In short, the point of contention may be related to the phonetic-phonemic status of these vowels and subsequently to the question whether the Sotho languages display an eleven vowel system (Cole, 1949), a ten vowel system (Jones and Plaatje, 1916) or a nine vowel system (Tucker, 1929).

In this article attention is focused on two seemingly different phonetic realisations of an orthographic -ê (mid low front vowel) which implicitly has been

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viewed as the same element in positive and negative forms of respectively the hortative, imperative and subjunctive modes in Tswana. Consider the following examples:

(1) Imperative

| | | |
|-----------|--------------|-----------------------|
| Positive: | Mo thusê! | (Help him/her!) |
| Negative: | Se mo thusê! | (Don't help him/her!) |

Hortative

| | | |
|-----------|-------------------|---------------------|
| Positive: | Anke re tsenê. | (Let us enter.) |
| Negative: | Anke re se tsenê. | (Let us not enter.) |

Subjunctive

| | | |
|-----------|--|--|
| Positive: | Thisa madi gore re rekê dijo. | |
| | (Bring money that we may buy food.) | |
| Negative: | Tlogela madi gore re se rekê dijo. | |
| | (Leave the money that we need not buy food.) | |

In pre-generative descriptions the impression is created that the formative se- is merely "added" to the positive cases to indicate the negative version: "The present tense of the subjunctive mood is characterized by the change of the terminative vowel -a of the verb stem to -ê, ... (...) The monoverbal form (of the present tense negative) employs the negative formative -se-, while the negative stem is -ê" (Cole, 1975:269). Cole does however make an extremely important observation at this point when referring to the negative -ê in a footnote: "There are a few speakers who change the final vowel to -e, e.g. *keserêke*. Note by comparison that in Northern Sotho the final vowel in this tense is typically -ê, whereas in Southern Sotho it is -e." (Cole, 1975:269 n2). The important point to be made here is that there seems to be some indication of variation in the quality of the "negative" /e/, i.e. that it may be pronounced as a mid high vowel [e], although it is consistently represented in the orthography as a mid low -ê.

It is however important to view the underlying representations of respectively, the positive and negative forms in more detail from which it will become clear that the "positive" /e/ and the "negative /e/" are not the same elements as are implicitly suggested in descriptive studies.

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(2)

| Mood | | Underlying representation | |
|-----------------------|---------------------------------------|-------------------------------|--|
| Infinitive (positive) | Go thusa "To help" | /t ^h us + a/ | Where /-a/ is a terminal suffix denoting the infinitive mood, positive |
| Infinitive (negative) | Go se thusê | /se + t ^h us + ε/ | Where the negative is indicated by both /se/ and /-ε/ |
| Imperative (positive) | Mo thusa "Help him/her" | /t ^h us + ε/ | Where /ε/ marks imperative mood, positive |
| Imperative (negative) | Se (mo) thusa "Don't help him/her" | /se+...+ t ^h us+ε/ | Where the negative is indicated by both /se/ and /-ε/ |

The fact that Cole has observed variation in quality in this negative /-ε/ therefore comes as no real surprise. The question to be answered is rather what are the phonetic qualities of this negative morpheme, and should it indeed be viewed (and represented) as a mid low vowel?

Informal auditory observations by mother tongue speakers of Tswana as well as by non mother tongue speakers of renditions of the sentences in (1) above suggested a rather extensive change in vowel quality, i.e. /-ε/ being realised as a high front vowel [i]!

2 EMPIRICAL STUDY

In view of the fact that it is well known that the perception and description of vowels are subject to a number of influencing factors (cf. Roux, 1983), it was decided to embark on a limited empirical study as a possible precursor to a more detailed study of this phenomenon. A test battery was designed and a limited number of mother tongue speakers of Tswana took part in an auditory and acoustic analysis of vowel quality.

2.1 Auditory analysis

Three mother tongue speakers of Tswana (two females respectively, 31 and 33 years of age, as well as one male aged 36) acted as subjects in this investigation. A test battery of 68 sentences was created, although only 34 sentences were eventually used. These sentences comprised 14 hortative, 10 subjunctive and 10 imperative forms with an equal number of stimuli in positive and negative forms. The following Tswana verbs were used: *reke, thusa, ile, arabe, supetse, reetse, dule* (in the hortative); *kwale, tsene, kgone, obole, ile* (in the subjunctive), and *thusa, ilise, leleke, pege* and *bese* (in the imperative).

The test material was constructed in such a fashion that the focal word always appeared in the same phonetic context, e.g. *Anke ba rekê sekere*. "Let them buy a scissors" as opposed to *Nyaa anke ba se rekê sekere* "No don't let them buy a scissors". Care was taken that these vowels never occurred in sentence final position so as to counter possible devoicing of the vowel. At the same time the following consonant was kept unaltered to avoid any possible co-articulatory influence.

The participants were asked to read the positive stimuli aloud and then to present the negative forms in an impromptu fashion. High quality speech recordings were made and these recordings were used in the auditory as well as acoustic analyses. Two phonetically trained listeners were asked to classify the vowels in question as either an [ε] or an [i]. The results of their responses are presented in Table 1 below.

Table 1: Classification of the final vowel of the verbs as either [ε] or [i]. Percentages are presented for the negative forms classified as [i]. (n = 204; representing 3 speakers x 2 adjudicators x 34 stimuli.)

| | Positive | Negative |
|----------------------------------|-------------------|----------------------------|
| Imperatives: (30 x 2) | [ε] (30) [i] (0) | [ε] (7) [i] (23) (77%) |
| Hortatives: (42 x 2) | [ε] (42) [i] (0) | [ε] (9) [i] (33) (79%) |
| Subjunctives: (30 x 2) | [ε] (28) [i] (2) | [ε] (11) [i] (19) (63%) |
| Total (204) | [ε] (100) [i] (2) | [ε] (27) [i] (75) (74%) |

It is quite clear that in the majority of cases the negative morpheme was regarded to be the high front vowel [i]. The question however was, how reliable could these judgements be, given the subjective nature of human perception. Earlier researchers in the field have emphasised the problematic nature of vowel perception and description in the Sotho languages: "It requires much practice on the part of the English learner to distinguish it (i.e. [i]) from i and e ... (and [u]) from o and from u" (Jones and Plaatje, 1916:xxii). Moloto (1964:3) in his reference to mid high and high front and back vowels come to the conclusion that

"...difficulty with vowels ... persists to this day." Within the context of African languages this situation has not really changed due to a lack of experimental phonetic research. There are indications that the segmental identification of vowels at perceptual level may be influenced by suprasegmental phenomena. This is pointed out by Tucker (1929:23) when he claims that "Sometimes a high tone on a syllable containing *e* will also produce this effect (i.e. sounding like [i] – authors), and it is implicitly echoed by Cole (1949:115) when he states that "It seems possible therefore that slight variations in tone, stress and length may influence the quality of a vowel sound, although it has not yet been possible to make a detailed study of these prosodic factors". Experimental studies of Roux (1983) have shown that mid low vowels with a relatively high fundamental frequency (pitch) could indeed easily be confused with mid high vowels with a relatively low pitch.

2.2 Acoustic analysis

The vowels occurring in negative constructions above were analysed acoustically by means of a CSL system with focus on pitch, energy and vowel quality. Some of the basic findings will be reported on below.

Pitch

The vowels that were identified as [i] in the negative were checked against the [ε] in the positive forms with respect to the F_0 values in order to determine whether any significant difference did exist at this level. No significant difference could be found. It is well known that vowels do differ in terms of inherent fundamental pitch (Kent & Read, 1992: 95-97) and that it may be expected that [i] will display a higher value for this parameter than [ε]. This was indeed the case as the F_0 values for [i] were in fact 10% higher than those for [ε], which in any case are comparable to the values presented by Lehiste & Peterson (1961). The tonal contours were also found to be the same in each comparable cases which effectively rules out a pitch conditioned perceptual difference (cf. Roux, 1983). Figure 1 below illustrates this point very clearly.

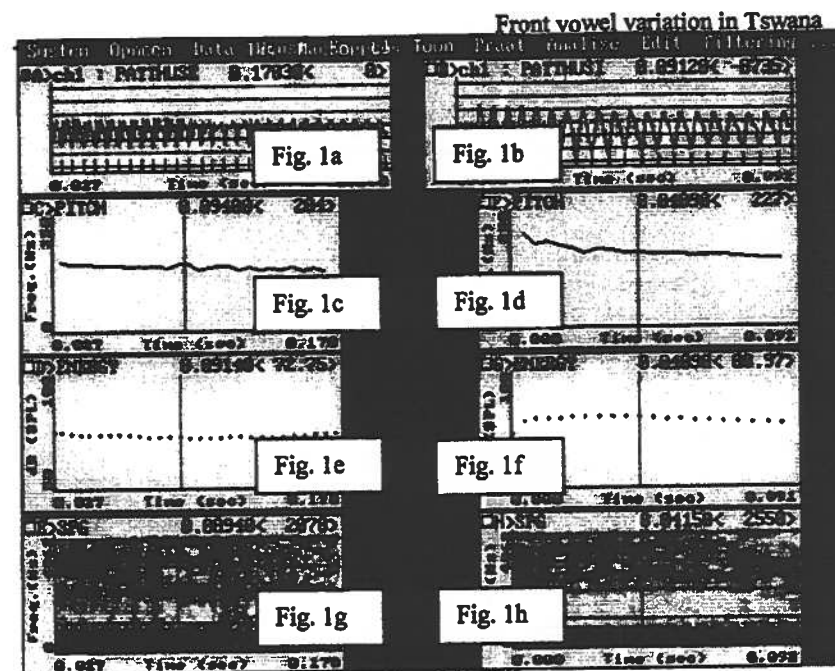


Figure 1 Sound waves (1a and 1b), F_0 (1c and 1d), energy contours (1e and 1f) and spectrograms (1g and 1h) of the verb *thusê* (imperative: positive to the left and negative to the right) as produced by one female speaker of Tswana.

For illustration purposes some more detail on the comparative pitch values of the two female speakers are presented in Table 2 below.

Table 2 Mean pitch values (F_0 in Hz) of two females' renditions of the final vowel of the (imperative) verb *thusê* (positive and negative).

| | [ε] in <i>thusê</i> (imp., positive) | [i] in <i>thusê</i> (imp., negative) |
|-----------|---|---|
| Speaker 1 | 200 | 210 |
| Speaker 2 | 198 | 220 |
| Mean | 199 | 215 |

This single example demonstrates the 8% difference in F_0 values for the two vowel qualities which is well within the generally accepted limits (Lehiste & Peterson, 1961).

Formant structure

In Figure 2 an LPC analysis is presented of respectively, [i] en [ɛ] as produced by one female speaker. In window A waveforms of [i] en [ɛ] of the positive version of (e) *tlisê* "bring it" are presented whilst the corresponding vowels in the negative (*Se e*) *tlisê* "don't bring it" are presented in window B. The solid arrows refer to respectively the spectra of [i] (window C) and [ɛ] (window D). In this case two clearly different formant structures are identifiable and hence two different vowel qualities are to be recognised. The two dotted arrows refer to respectively, the first and second vowels of the negative form. Hence window E reflects the typical spectrum of [i] (as in window C) whilst window F contains the spectrum of the final vowel. It is quite clear that the spectrum of this final vowel in F resembles those of the typical [i] (in E and C) rather than that of [ɛ] in D. The actual acoustic values of the examples in Figure 2 are presented in Table 3.

Table 3: Formant frequencies (in Hertz) of the phonetic realisation of respectively [i] and [ɛ] in *-tlisê* (positive and negative of the imperative) by one female speaker of Tswana. Values for the corresponding vowels in American English are presented for comparison (cf. Kent en Read, 1992: 95).

| FOR-MANTS | Tswana | | | | American English ¹ | |
|-----------|---------------|---------------|---------------|----------------|-------------------------------|------|
| | [i] (pos.) | [ɛ] (pos.) | [i] (neg.) | [ɛ?] (neg.) | [i] | [ɛ] |
| F1 | 270 | 500 | 269 | 255 | 300 | 600 |
| F2 | 2368 | 2100 | 2397 | 2455 | 2800 | 2350 |
| F3 | 3205 | 2737 | 3180 | 3100 | 3300 | 3000 |

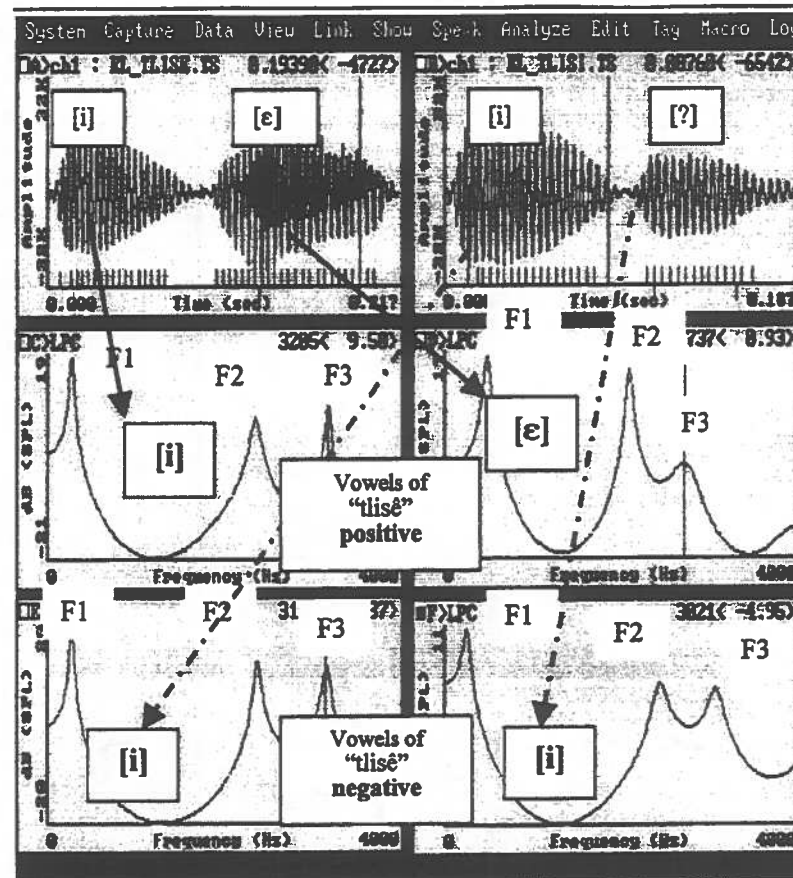


Figure 2: LPC-analysis of [i] en [ɛ] in *tlisê*, as pronounced by one female speaker in respectively, the positive and negative of the imperative in Tswana.

The following deductions may be made:

The formant frequency values of [i] and [ɛ] of the verb *-tlisê* differ considerably with respect to all three formants. On the other hand there are some clear similarities between the formant frequencies of [i] and the final vowel of the negative final vowel in *tlisê*. This supports the impressionistic observation

that the negative morpheme has a quality similar to that of a high vowel and that it is not a mid low vowel although it has been presented as such in the orthography of Tswana. The acoustic evidence support this perceptual observation. A comparison of the formant frequency data of Tswana with that of corresponding vowels in American English also support this observation although the last values are 10% to 20% higher. The formant structures can furthermore be presented in the following stylised format.

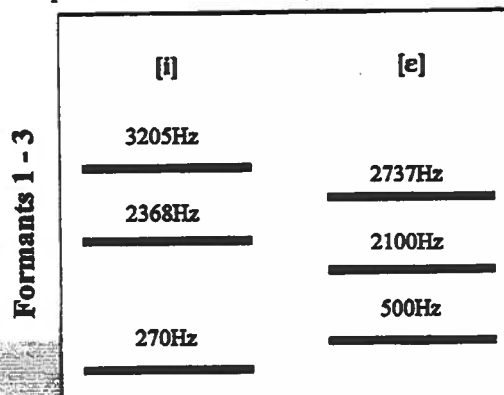


Figure 3: Stylised formant structure of secondary [i] (as found in the final vowel of the negative of the imperative of *-lile*) versus [e] of the positive counterpart.

3 CONCLUSION

Although this study is very limited in scope in the sense that only a limited number of speakers were involved, care was taken to control for a number of factors, especially for possible co-articulation. The results of the acoustic analysis clearly lend support to the impressionistic observations that the negative formative in the imperative, hortative and subjunctive moods is phonetically realised as a high front vowel [i] and not as [e] as is traditionally represented in the orthography. It is however also obvious that more research need to be conducted on this topic as factors such as age, sex, speaker style, dialect etc may also play a role in this process. The impressionistic observations of Cole (1975) in this regard are thus supported by this experimental phonetic data.

NOTE

1. Peterson and Barney (1952) as adapted by Kent and Read (1992:95). (F2 and F3 values are presented to the nearest 50 Hz and are applicable to women.)

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