

THE PENULTIMATE SYLLABLE VOWEL LENGTH AMONG SETSWANA-ENGLISH BILINGUAL CHILDREN

Boikanyego Sebina¹, Jane Setter² and Clare Wright³

¹University of Botswana, ²University of Reading and ³University of Leeds
sebinab@ub.ac.bw, j.e.setter@reading.ac.uk, c.e.m.wright@leeds.ac.uk

ABSTRACT

This study examines the relative duration of the penultimate syllable vowel (PSVL) in multisyllabic Setswana words in the speech of 20 Batswana (citizens) primary school children aged 6-7 years growing up in Botswana. Setswana phonology requires the lengthening of the vowel in the penultimate syllable of multisyllabic words. The participants are 10 privately educated English-medium early sequential Setswana-English bilingual children, taught full-time in English (L2) from the age of 3 years, for whom English has become dominant, and 10 Setswana monolingual children. The aim is to see whether the L2, which does not have the PSLV as a phonological pattern, has had an effect on the L1 of the bilinguals. The results show that the bilinguals do not lengthen the penultimate syllable vowel; rather, they lengthen the vowel of the final syllable. The results support the notion that extensive exposure to L2 can cause changes to the patterns of L1.

Keywords: bilingual phonology, penultimate syllable lengthening, Setswana, English.

1. INTRODUCTION

Penultimate syllable prominence in Bantu languages, often referred to as accent or stress, is mostly manifested in the lengthening of the penultimate syllable vowel (Hyman [9]) and may support lexical retrieval (Cutler & Clifton [5]; Cole [4]). Even though penultimate syllable vowel lengthening (PSVL) is widespread in Bantu languages, it differs from one language to another based on the utterance and the role it plays in discourse [9]. Hyman [9] distinguishes three different manifestations of PSLV in Bantu languages based on the domain, namely utterance penultimate, phrasal penultimate, and pre-pausal moraic penultimate lengthening. Setswana, the main language spoken in Botswana, falls under utterance penultimate. According to Cole [4], in Setswana, the full length of the penultimate syllable is achieved when the word is pronounced in isolation or when the word is in sentence final position; when the word is in non-sentence final position it still maintains the length and stress, but the penultimate lengthening is not as prominent as at sentence final position.

Hyman [9] argues that PSLV has a tonal effect in most of the Bantu languages. The implication of this is a correlation between PSLV and tone. In support, Hyman [8, p.14] states "...many Bantu languages have an H and L tone with a superimposed penultimate accent. This accent may cause vowel lengthening ... or it may affect the penultimate syllable." This is not surprising as most Bantu languages like Setswana are tone languages, i.e., those that use syllabic pitch to distinguish between the meanings of words at both lexical and grammatical level [1]. Example

1. Lexical level
 - a. *Kae* /kái/ 'where'
 - b. *Kae* /kaí/ 'how many'
2. Grammatical level
 - a. *O bua Setswana* /óbúasetswána/
'He/she speaks Setswana'
o-he/she, bua-speaks, Setswana-setswana
 - b. *O bua Setswana* /obúasetswána/
'You speak Setswana'
o-you, bua-speaks, Setswana-setswana

The word *kae* in example (1) is disyllabic, while the sentence *o bua Setswana* in example (2) is made up of six syllables. Syllabic pitch is used to distinguish between the meaning of words in examples 1 and 2. In example (1a), the high tone is drawn to the penult vowel whereas in (1b) it is attracted to the final vowel to distinguish between the meanings of these words. Similarly, the pronoun '*o*' which is the focal point in distinguishing the meaning of the sentences, has different levels of pitch with '*o*' in 2a receiving the H tone while in 2b is L tone. It is necessary to shift the H to the final vowel to create homographs. This is because to distinguish between the meanings of words the H tone cannot be attracted to the same vowel in both instances.

Even though penultimate syllable vowel lengthening plays a prominent feature in the phonology of Setswana, unlike other Bantu languages such as Swahili, it does not indicate a distinction in the lexical meaning of words.

1.1 THE IMPORTANCE OF PSVL IN SETSWANA

Since there is no difference in the meaning of words with lengthened or without lengthened penultimate syllable vowel, it is debatable that a change to the penultimate syllable vowel length is likely to result in misunderstanding in communication on the one hand. On the other hand, misplacement of the syllable length could result in changes to the tone necessary in discriminating between meanings of words because PSVL has an effect on the tone. Any changes to the tone could result in a situation where homographs such as in (1) above are pronounced in the same way, and so the meanings of these words will not be distinguishable. This could lead to communication breakdown.

In addition, misplacement of the syllable length could give rise to issues with lexical retrieval, as it is a predictable element of the Setswana word. This shows that PSVL is important in parsing language in Setswana and any disruption to the expected patterns may cause problems in this respect.

This argument is based on the finding that, like other Bantu languages, stress in Setswana is manifested in the lengthening of the penultimate vowel [9]. Word stress is an integral part of the phonological system of a language. Transferring of lexical stress from the penultimate syllable vowel to other vowels may affect the vowel quality and so there is a possibility that word recognition would be affected. This assumption is supported by Cutler and Clifton [5] findings of English that words with wrong stress placement were difficult to recognise, leading to the conclusion that correct placement of word stress is vital in word recognition.

1.2 ACQUISITION OF VOWEL LENGTH

Salidis & Johnson [16] found that, by the age of 14 months, infants are able to control vowel length in their speech. Equally, Kehoe and Stoel-Gammon [11] investigated vowel length errors in English children who were around two years of age. The results indicated that there was a low mean percentage of vowel length errors in the production of the children.

Where bilingual children are concerned, lack of the development of prosodic patterns in one or other language could indicate acquisition delay, as indicated by Kehoe [10] in a study of German-Spanish bilingual children. Kehoe [10] attributed acquisition delay in the acquisition of the German vowel length contrast relative to monolinguals to the more marked vowel system of German, which was a source of difficulty for the bilinguals to acquire,

whereas Spanish, which is less marked in terms of vowels, was easier to acquire.

1.3. The present study

This paper addresses the following research questions:

1. What is the pattern of penultimate syllable duration in Setswana multisyllabic words in the speech of Setswana-English bilingual children aged 6-7 years in comparison with Setswana monolingual peers?
2. In the bilingual Setswana-English population, to what extent will the children in Standard 1, aged 6 years, have a different pattern of penultimate syllable duration in Setswana in comparison with the children in Standard 2, aged 7 years, who will have had increased exposure to English, being older?

The following hypotheses were formulated:

1. The pattern of the penultimate syllable duration in Setswana multisyllabic words in the speech of Setswana-English bilingual children aged 6-7 years will be different from their monolingual peers with the bilinguals not lengthening the penultimate syllable.
2. The bilingual children in Standard 2, aged 7 years, will lengthen the penultimate syllable vowel in Setswana multisyllabic words **less** on average in comparison with bilingual children aged 6 years who are in Standard One, because of increased exposure to English by Standard 2.

3. METHOD

3.1. Participants

The study employed twenty 6-7-year-old Batswana children with no speech and language impairment, ten of whom were sequential bilingual Setswana-English speakers, and ten who were Setswana monolinguals. The monolinguals are considered as such because they were in the first and second year of public school primary where English is not the main medium of instruction. Therefore, they were exposed to minimal English. The Setswana-English bilinguals have been exposed to high English input through private English-medium schools from the age of three. All the children were born in Botswana and had never lived outside the country. The children were recruited from schools through consent letters that were given to the children to give to their parents. The children were also given The Language and Social

Background Questionnaire (LSBQ), adapted from Bialystok [2], to be completed by the parents. The questionnaire elicited the language use pattern of the participants as this determined their inclusion in the study. In addition, the Raven's Coloured Progressive Matrices (RCPM) ([15]) was administered to ensure that the bilingual and monolingual groups did not significantly differ cognitively ($t(18)=2.003$, $p=.060$).

The 6-7 years age group was chosen based on the results of previous studies, which reported that, by the age of 2, monolingual children have acquired the vowel length of their language ([11]; [16]), while bilinguals do so by the age of 3([10]). Therefore, at the age of 6-7 years the Setswana PSVL of these children should be in place.

3.2. Materials and procedure

The children's recordings of spontaneous speech based on the retelling of the picture story *Frog where are you?* ([13]) were used. The recording took place in a quiet room. A Roland EdirolR-09HR recording device was used to collect data in wave format sampled at a rate of 44.1kHz, 16 bit stereo.

Sixty seconds of the speech of each child that contained a number of utterances, none of which was less than five syllables long, were used in the analysis. Audacity software was used to edit out lengthy pauses. Praat software was then used to measure and label the duration in seconds of vocalic intervals. The measurement and segmentation criteria for vocalic intervals followed that of Grabe and Low [6]. 20% of the data (two randomly-selected monolingual and bilingual speakers' files) were independently labeled by another researcher with phonetic training to ensure reliability (Spearman's Rho: $rs = > .8$; $p < .001$) which indicates a significant positive relationship between the original measurement and the inter-rater reliability measurement.

4. RESULTS

4.1. Research question 1

A total of 947 words were analysed. The results of the means as indicated in Figure 1 shows that the bilingual group lengthen the final syllable vowel more than any other vowel in a word while the monolinguals lengthen the penultimate vowel. The independent samples t -test showed a statistical significant effect, [$t(18) = -11.646$, $p = .001$]. This was the expected result as indicated by Hypothesis 1.

4.2. Research question 2

The independent samples t -test showed a statistically

significant effect, $t(8) = -4.064$, $p = .004$. Therefore, the STD 2 bilingual group was associated with statistically significantly longer penultimate syllable vowel duration than the STD1 bilingual group as shown in figure 2. This was not the expected result and so it goes against hypothesis 2.

Figure 1: penultimate vowels and non-penultimate vowels means for monolinguals and bilinguals.

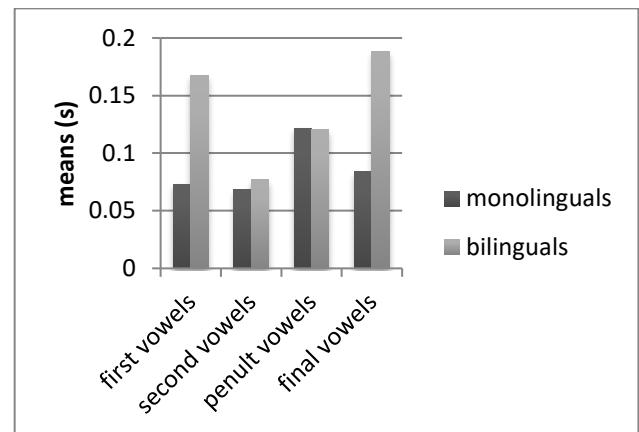
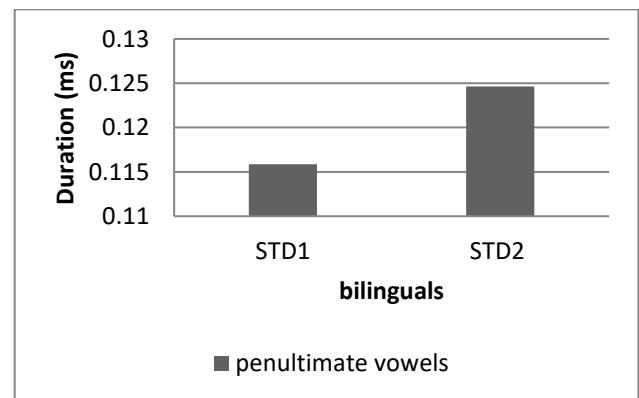


Figure 2: penultimate vowels means for STD 1 and STD 2 bilinguals.



5. DISCUSSION

The results show that the monolinguals lengthen the penultimate syllable vowel as per the phonological requirement of the Setswana phonological system, while the bilinguals do not; they lengthen the final syllable instead, an effect observed in English ([17, 18]). It is, therefore, likely that the dominant second language (L2), English, is having an effect on the production of the speakers' first language (L1), Setswana. By lengthening the final syllable vowel more than the penultimate syllable vowel the bilingual group is violating the requisite of the Setswana phonology while the monolingual group adheres to it.

What is interesting is that the bilinguals significantly lengthen the vowels of all the syllables more than monolinguals [$p < 0.05$, (Mann-Whitney $U = 40.000$, $p = .019$)] except for the penultimate vowel, even though the difference is small, and so not statistically significant [$t(18) = 214$, $p = .833$]. The bilinguals' mean penultimate syllable length is 0.12s, while that of the monolinguals is 0.11s. The findings of the present study are consistent with that of [7] and [12] who established that speaking rate has an effect on the duration of the vowels. Slow speaking rate resulted in longer vowels on average compared to normal and faster speaking rate. The utterance of the bilingual children in the present study was slow and was also accompanied by long pauses due to their lack of proficiency in Setswana. For example, the word *mosimane* (*boy*) was in some cases produced as *mo-si-ma-ne*, where the dashes at the end of a syllable represent the pauses. It took monolinguals 0.66 seconds on average to produce a four syllables word while it took bilinguals 0.93 seconds. It is possible that the pauses could also have contributed towards longer vowel durations in the syllables of the bilinguals' utterances compared to monolinguals. This assumption is based on the finding that phonetic components before a boundary such as at the end of a sentence or at the end of an intonational phrase attract lengthening [17] and [18]. It is plausible that the pauses in between the syllables could have been interpreted as signifying the end of a segment and thereby resulting in the lengthening of the syllables.

The results of the comparison between the STD 1 bilinguals and STD 2 bilinguals show that there is significantly more PSVL at STD 2 than at STD 1. This difference could be due to the fact that the STD 2 bilinguals' exposure to Setswana increases at the same time as their exposure to English, as they are introduced to more Setswana learning as a subject at STD 2 being a grade higher than STD 1. Nonetheless, the results indicated that the STD 2 bilinguals still lengthen the final syllable vowel more than they lengthen the penultimate syllable vowel. It is not surprising that the children in STD 2 still maintain the lengthening of the final syllable vowel because the English input they receive still surpasses that of Setswana, assuming English is having an effect on their prosodic patterns. The children only receive a one-hour lesson of Setswana a week. This finding mirrors that of [14], that high L2 input at the expense of L1 affects the development of L1.

The statistically significant difference in the penultimate syllable vowel length by STD 1 and STD 2 might mean that, although the vowel in the final syllable is still the most lengthened, the PSVL of the STD 2 children is developing in the expected direction. The findings suggest that the phonological

systems of the Setswana-English bilinguals have interacted, possibly due to acquisition delay, as concluded in Kehoe [10] study. However, it should be noted that acquisition delay in the German-Spanish bilinguals in Kehoe [10] was only found in the bilingual children's German but not in their Spanish. Kehoe [10] attributed acquisition delay in the acquisition of the German vowel length contrast relative to monolinguals to the more marked – and therefore more difficult – vowel system of German, whereas Spanish, which is less marked in terms of vowels, was easier to acquire. Setswana, like Spanish, is less marked in terms of vowels it being syllable-timed ([3]). Therefore, the expectation is that, at age 6-7 years, the Setswana-English bilinguals' PSVL in Setswana should be in place.

It is also possible that incomplete acquisition Montrul [14] could be responsible for the patterns observed among the bilinguals. However, the data of the present study cannot ascertain this. Inclusion, a younger monolingual control group or a longitudinal study might shed light on the problem.

6. CONCLUSION

The findings of this study have shown that the 6-7 years old Setswana-English bilingual children lengthen the final syllable vowel rather than the penultimate syllable, probably due to effects from the dominant L2 (English), thereby violating the requisite of Setswana phonology. This could possibly result in communication breakdown.

6. REFERENCES

- [1] Batibo, H., Mae, D. 1999. The tone pattern of Setswana nominal forms. *Malilime* 1, 1-21.
- [2] Bialystok, E. 2011. Coordination of executive functions in monolingual and bilingual children. *Journal of Experimental Child Psychology* 110/3, 461-468.
- [3] Coetzee, A. W., Wissing, D. P. 2007. Global and local durational properties in three varieties of South African English. *The Linguistic Review* 24/2-3, 263-289.
- [4] Cole, D. T. 1955. *An introduction to Tswana grammar*. London, Longman.
- [5] Cutler, A., Clifton Jr., C. 1984. The use of prosodic information in word recognition. In H. Bouma, D. G. Bouwhuis (eds.), *Attention and Performance X Control of language processes*. Hillsdale, NJ. Lawrence Erlbaum.
- [6] Grabe, E., Post, B., Watson, I. 1999. The acquisition of rhythmic patterns in English and French. In: Ohala, J. J., Hasegawa, Y., Ohala, M.,

- Granville, D., Bailey, A. C. (eds.), *Proceedings of the 14th ICPHS* San Francisco, 1201-1204.
- [7] Hirata, Y. 2004. Effects of speaking rate on the vowel length distinction in Japanese. *Journal of Phonetics* 32/4, 565-589.
- [8] Hyman, L.M. 1978. Tone and/or accent. In D. J. Napoli (ed.), *Elements of tone, stress and intonation*, 1-20. Washington: Georgetown University Press.
- [9] Hyman, L.M. 2009. *Penultimate lengthening in Bantu: Analysis and spread*. Paper presented at the UC Berkeley Phonology Lab Annual Report.
- [10] Kehoe, M. 2002. Developing vowel systems as a window to bilingual phonology. *The International Journal of Bilingualism* 6, 315-334.
- [11] Kehoe, M., Stoel-Gammon, C. 2001. Development of syllable structure in English-speaking children with particular reference to rhymes. *Journal of Child Language* 28/2, 393-432.
- [12] Magen, H.S., Blumstein, S. E. 1993. Effects of speaking rate on the vowel length distinction in Korean. *Journal of Phonetics* 21/4, 387-409.
- [13] Mayer, M. 1969. *Frog, where are you?* New York: Dial Press.
- [14] Montrul,, S.A. 2008. *Incomplete acquisition in bilingualism: Re-examining the age factor*. Amsterdam/ Philadelphia: John Benjamins.
- [15] Raven 1982. *Coloured Progressive Matrices*. London: Harcourt Publishers.
- [16] Salidis, J., Johnson, J. S. 1997. The production of minimal words: A longitudinal case study of phonological development. *Language Acquisition* 6/1, 1-36.
- [17] Turk, A., Shattuck-Hufnagel, S. 2007. Multiple targets of phrase-final lengthening in American English words. *Journal of Phonetics* 35/4, 445-472.
- [18] Yuen, I., Cox, F., Demuth, K. 2014. Three-year-olds' production of Australian English phonemic vowel length as a function of prosodic context. *The Journal of the Acoustical Society of America* 135/3, 1469-1479.