

Word accent and intonation in Baltic

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Abstract

We examine the realization of word accent contrasts in Standard Latvian and East Aukštaitian Lithuanian across intonational contexts. In our Latvian data the contrast is manifested as level vs. falling pitch in most contexts, in addition to a durational difference. In Aukštaitian Lithuanian, instead, differences in vowel quality and duration cue the lexical contrast in the nuclei that we examine. While Latvian retains a tonal contrast, in Aukštaitian Lithuanian it has been replaced with a combined segmental/quantitative contrast, where the so-called circumflex tone corresponds to relatively shorter duration and, in the case of diphthongs, centralized quality in the first half. We discuss the implications of these findings for further typological work.

Index Terms: Lithuanian, Latvian, word accent, prosody

1. Introduction

The Baltic languages, Latvian and Lithuanian, are traditionally described as possessing lexical tone in some syllables, although the nature of the lexical contrast, as being based on tone or other features remains controversial. We will use the more phonetically neutral term ‘word accent’. Here we investigate the realization of word accent in Latvian and Lithuanian in different intonational contexts, going beyond previous work in this respect. To the extent that existing phonological analyses [1] [7] may be based on an incomplete understanding of the phonetic facts, they may be in need of revision.

Our data are based on utterances elicited from educated native speakers by means of a questionnaire and containing minimal or near minimal pairs. Given the controversies regarding the nature or even the existence of the contrasts that we are investigating, we decided that using a maximally explicit methodology for data elicitation was appropriate. Naturally, this methodology will tend to produce somewhat hyperarticulated realizations of any existing phonological contrasts. All participants were either faculty or students at Stockholm University at the time of the experiment.

2. Latvian

2.1. Status Quaestionis

In Latvian, stress generally falls on the initial syllable of the word. If the stressed syllable is heavy (that is, if it contains a long rhyme: long vowel, diphthong or a postvocalic consonant), in some dialects, a three-way contrast in accent type in syllables is said to obtain. The three accents have been described as level (also known as “even” or “circumflex”), falling (or “acute”) and glottalized (or “broken”). In linguistic work the level accent is represented with a tilde, e.g. [ā], the falling accent with a grave accent mark, [ǎ] and the glottalized

accent with a circumflex accent mark, [â]. An acoustic characterization of these three accents in words obtained in medial position in a carrier phrase is found in [5] [6]. In this context, in terms of tonal contour, the level accent has a high level, slightly rising F0 throughout the stress syllable, whereas the other two accents, falling and broken, are characterized by an F0 peak towards the middle of the syllable, followed by a sharp drop in F0 in the second mora. The broken accent is distinguished from the falling accent in showing glottalization in the second mora. There are no accentual contrasts in light syllables.

In most dialects, however, there is only a two-way word-accent distinction. In particular, contemporary Standard Latvian, the variety that we examine here, distinguishes only “even” from “non-even” accent (the latter having resulted from the historical merger of the falling and broken accents, [7]).

2.2. Methods

We constructed a list of 15 mini-dialogues in order to elicit the same target word in different intonational contexts (e.g. Contrastive focus: Did Peter say apple? No, Peter say TARGET; Postfocus: So, Peter wrote TARGET? No Peter said TARGET; etc.). Target words were members of minimal pairs. Here we report on one of these pairs: *zāle* [zāle] (even, E) ‘hall’ vs. *zāle* [zāle] (non-even, N) ‘grass’. Participants were asked to read the dialogues (both the context and the sentence containing the target word) naturally and at a comfortable speed. To avoid confusion between members of each minimal pair, all 15 mini-dialogues involving the same target word were presented together. Participants were three speakers of Standard Latvian, from the central dialectal area: one male from Riga and two females, from Seldus and Valmiera.

2.3. Results

Consistent with previous description, the even accent was realized as relatively flat high pitch over the heavy stressed syllable in contexts where the test word is under focus (Fig. 1, left). In postfocal and prefocal position, however, the even accent was realized as flat *low* pitch (Fig. 2). It thus appears that what characterizes the even accent across contexts is the absence of tonal differences between the beginning and the end of the syllable, with a relatively flat pitch throughout. The crucial aspect appears to be that both morae in the heavy stressed syllable receive the same tone, be it high or low.

In contrast, the non-even accent is produced in most contexts with a pitch fall from the first to the second mora (Fig. 1, right). This is except in final position in questions, where there may be a final rise.

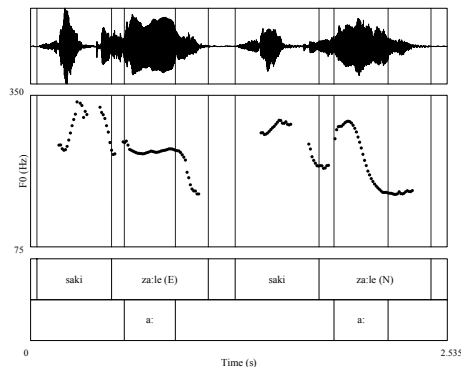


Fig. 1. *saki zāle* [zāle] (E) ‘say hall’ vs. *saki zāle* [zāle] (N) ‘say grass’. Female speaker from Saldus.

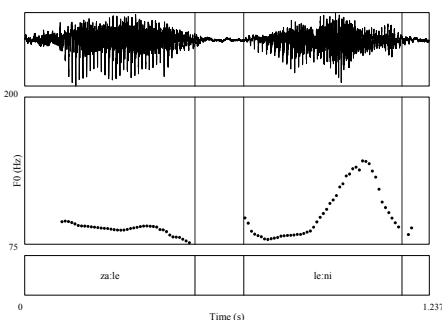


Fig. 2 (*Vai Peteris teica zāle LEN?* ‘Did Peter say hall SLOWLY?’ Even accent realized as low flat low pitch. Male speaker from Riga.

The contrast between the F0 contours can be captured numerically as the difference between F0 maximum and minimum during the stressed nucleus. For our two female speakers, average values including all contexts were 83 Hz under E accent and 123 Hz under N accent (t-test: $t = -2.6895$, $df = 63.269$, $p = 0.009138$). For our male speaker this value could not be accurately calculated for a large number of tokens because of the presence of glottalization during the second half of the stressed nucleus under non-even accent. Glottalization was realized either as a glottal stop (Fig. 3) or as irregular pulsation.

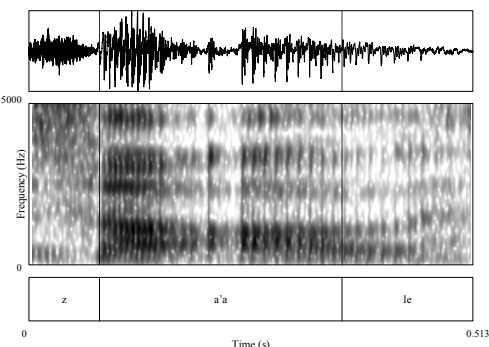


Fig. 3. *zāle* (N) ‘grass’. Example of non-even accent accompanied by glottal stop. Male speaker from Riga.

For this speaker we have analyzed a second minimal pair, *loks* [luōks] ‘spring onion’ vs. *logs* [luōks] ‘window’. A measure of the presence of glottalization can be obtained by calculating the percentage of the stressed nucleus with regular pulsation. This is shown in Fig. 4, with the results returned by the function `VoicedFrames` in PRAAT [2] for the stressed nucleus of E and N words. For both N words (*logs-N*, *zale-N*) glottalization is common, but not systematic. That is, for this speaker the neutralization of the falling and broken or glottalized accent in Standard Latvian (see [7]) appears to have resulted in an allophonic range that includes different degrees of glottal constriction. Our female speakers did not produce glottalization.

A significant difference in duration was also found for all speakers, with E words being realized with a longer vowel (means, *zāle* E = 335 ms, *zāle* N = 288 ms, $t = 5.7486$, $df = 97.287$, $p = 1.035e-07$)

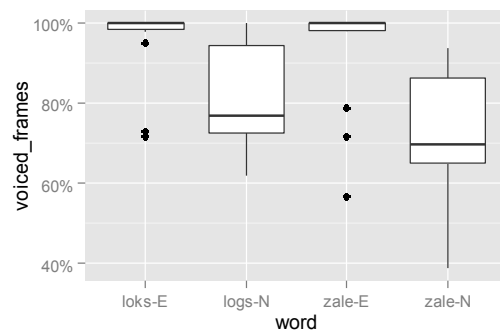


Fig. 4. ‘Voiced Frames’ in stressed nucleus for E and N words, male speaker from Riga.

2.4. Discussion

Kariņš [6] proposes a phonological lexical tone analysis of the Latvian accentual contrast, based on the F0 contours of words within a carrier phrase. In his analysis, the E accent is phonetically unspecified and receives a phrasal H tone that attaches to the second mora of the stressed syllable. In words with a falling, N, accent, on the other hand, there is a lexical L on the second mora and the phrasal H attaches to the first mora. (Kariņš assigns a more complex tonal specification, LH to words with a broken accent.) The contours that we have obtained in declarative sentences where the target word is under focus are similar to those described in [6], except that our speakers do not have a lexical contrast between non-even accents with and without glottalization (“falling” and “broken”). By expanding the elicitation to other phrasal and intonational contexts, we notice that there is no consistent tonal contour across all contexts. The E accent may be H or L. In final position in questions, this accent may show up without the fall, perhaps because a final H% boundary tone pushes the lexical L from the second mora to the first, under crowding. No phrasal H is then assigned to the accented syllable. Glottalization in the speech of our male speaker (from Riga), appears to be a secondary correlate of N accent.

3. Lithuanian

3.1. Status questionis

Lithuanian has a complex stress system, reminiscent of that of Russian, where some nouns have stress on the stem in some declensional cases and stress on the suffix in other cases, other nouns have stress on the suffix in all cases, etc.

A further complication with respect to Russian is that if the stressed syllable is heavy it may bear one of two lexical accents, traditionally known as “acute” (A) and “circumflex” (C). Although traditionally described as a contrast in lexical tone, the nature of this contrast in present-day Lithuanian has been disputed and may differ according to geographical variety. In the standard variety, the contrast is manifested not by pitch, but by differences in spectral structure and duration [3] [4] [9] [11]. Dogil & Möhler [3] report that, regarding pitch, in words pronounced in carrier phrases, A has a clear rise-fall pattern within the stressed syllable, whereas C has a very variable realization and its F0 shape cannot be defined.

3.2. Methods

We selected three near-minimal pairs, stressed on the same syllable and contrasting in word accent: *láužq* A ‘bonfire’ vs. *laūmę* C ‘pixie’, *laimę* A ‘happiness’ vs. *laivq* C ‘ship’ and *výrq* A ‘man’ vs. *výnq* C ‘wine’). Two of our minimal pairs illustrate the falling diphthongs /ai/ and /au/ and the third one is used to test the contrast with a long vowel, /i:/ (orthographical <y>). To elicit the data we used a questionnaire that included the same 15 pragmatic contexts as for Latvian: broad focus, all new, contrastive, prefocal, narrow focus final, narrow focus non-final, obviousness, postfocus, yes-no question, confirmation question, surprise, suggestion, command, vocative and continuation. Our two subjects are both college-educated female speakers of Lithuanian, from the Highland Lithuanian or Aukštaitian area: one of them is from Utena and the other one is from Panevėžys. They were asked to read both the context and the target sentence with natural intonation.

3.3. Results

Regarding pitch contours, we find no consistent difference between words with A and C accent in the same sentential and intonational context. Both speakers produced very similar F0 contours in each of the contexts tested. Under focus, words of both accent classes show a rise in pitch throughout the stressed syllable with a peak towards the middle or end of this syllable, see Fig. 5 (although, the alignment within the syllable nucleus is different given the longer duration of the first element of the diphthong in A words, see below).

For both classes of words, quite different contours were obtained under other contextual conditions, including a later rise with a peak after the stressed syllable in prenuclear position (Fig. 6) and a low flat contour in phrase-final position under broad focus (Fig. 7).

For words with the diphthongs orthographically represented as <au> and <ai>, we find, however, considerable spectral and durational differences according to etymological class. In particular, in C words, the first element in the diphthong is considerably reduced in duration and centralized in quality, cf. [9]. For all three pairs of words, the stressed nucleus is significantly longer in A than in C words: *laimę* A ‘happiness’ vs. *laivq* C ‘ship’, $t=2.2$, $df=57.8$, $p=0.028$; *láužq* A ‘bonfire’

vs. *laūmę* C ‘pixie’, $t=4.2$, $df=57.57$, $p<0.0001$; *výrq* A ‘man’ vs. *výnq* C ‘wine’, $t=2.9153$, $df=57.668$, $p=0.005$.

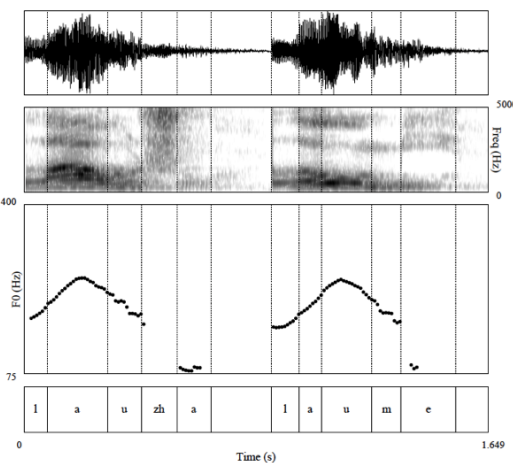


Fig. 5 *láužq* ‘bonfire’ vs. *laūmę* ‘pixie’, narrow focus. Female speaker from Utena.

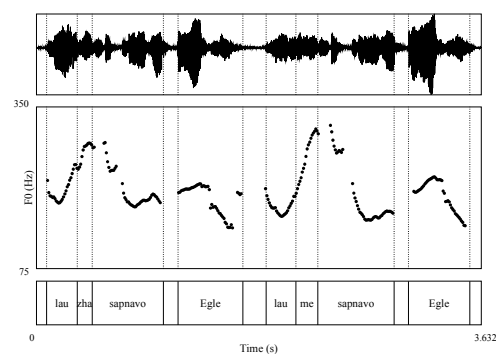


Fig. 6 Late rise on *láužq* vs. *laūmę* in prefocal position: *láužq/laūmę sapnavo Eglė*, lit. ‘about bonfire/about a pixie dreamt Eglė’. Female speaker from Panevėžys.

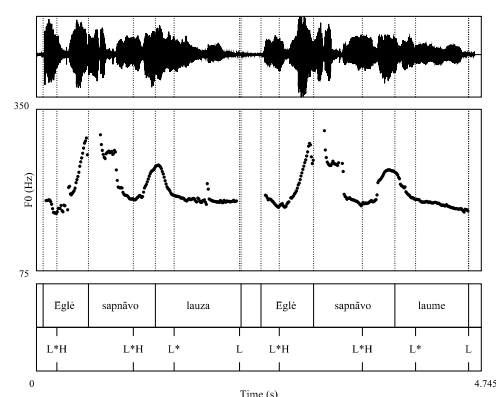


Fig. 7 Flat low pitch on *láužq* and *laūmę* in phrase-final position, broad focus: *Eglė sapnavo láužq/laūmę* ‘Eglė dreamt about a bonfire/a pixie’. Female speaker from Panevėžys.

For words with the diphthongs orthographically represented as <au> and <ai>, we find, however, considerable spectral and durational differences according to etymological class. In particular, in C words, the first element in the diphthong is considerably reduced in duration and centralized in quality, cf. [9]. For all three pairs of words, the stressed nucleus is significantly longer in A than in C words: *lāimė* A ‘happiness’ vs. *laĩvą* C ‘ship’, $t=2.2$, $df=57.8$, $p=0.02856$; *lāužą* A ‘bonfire’ vs. *laũmė* C ‘pixie’, $t=4.2$, $df=57.5$, $p<0.0001$; *výrą* A ‘man’ vs. *výną* C ‘wine’, $t=2.9$, $df=57.6$, $p=0.005$.

In Fig. 8, F1 maxima in stressed nuclei are compared. It is apparent that the A diphthong words *lāimė* and *lāužą* have a much higher F1 maximum than their C counterparts *laĩvą* and *laũmė*, indicating a considerably lower first element. (t-tests: *lāimė* vs. *laĩvą*, $t=21.6$, $df=40.5$, $p<0.0001$; *lāužą* vs. *laũmė*, $t=28.5$, $df=50.9$, $p<0.0001$). There is no significant difference between the two items containing a long monophthong /i:/.

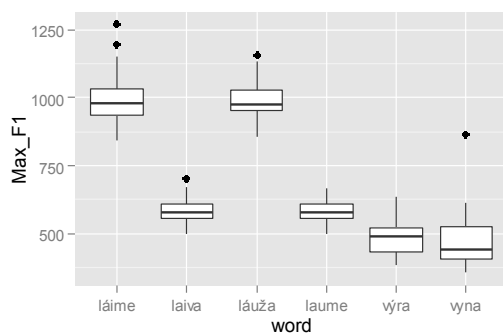


Fig. 8. F1 maximum in Hz. The C words, *laĩvą*, *laũmė* have a significantly lower maximum F1 than their A counterparts.

In Fig. 9 we plot the means of formant values at F1 maximum and minimum for <ai> and <au> diphthongs. The graph shows that the A words *lāimė* and *lāužą* have a low vowel as first element of the diphthong, whereas in the circumflex words, *laĩvą* and *laũmė* this element is a mid vowel. On the other hand, the glide has more extreme values for the C words: higher for <ai> and higher and more posterior for <au>.

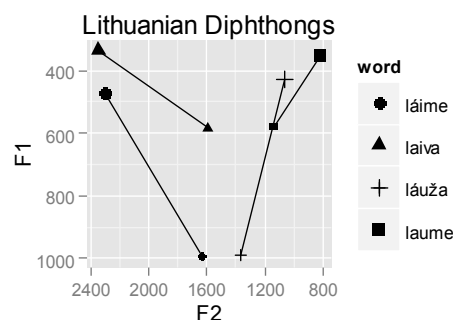


Fig. 9. Plot of F1 maxima and minima and F2 values at those two points for each of the four diphthong items: *lāimė*, *laĩvą*, *lāužą* and *laũmė*. (Diacritics are missing in the figure for typographical reasons.)

3.4. Discussion

In our East Aukštaitian Lithuanian data, vowel quality and relative duration cue the A vs. C contrast. In particular, the diphthongs <ai>, <au> have a shorter, raised nucleus and a more extreme glide in circumflex words. The long vowel <y> is also slightly shorter in circumflex words. Other heavy syllables, including those closed by a sonorant consonant remain to be investigated. As in other recent acoustic work, we have not found a difference in tonal contours between the two lexical classes.

4. General discussion

The two systems that we have examined are at some typological distance from each other. The stress systems are different, Latvian having developed fixed initial stress, and Lithuanian retaining mobile stress. Whereas for Latvian we find a consistent tonal contrasts in stressed syllables (enhanced by duration), in Lithuanian the etymological accentual contrast is cued by durational and vowel quality differences. For both languages an analysis of the word accent contrast in terms of domain of prominence (syllable vs. mora, [3]) seems possible. However, such an analysis has implications for phonology (e.g. metrical theory), as well as for typology, where intermediate varieties (e.g. mobile stress combined with a tonal contrast) would need to be examined, before an adequate phonological analysis could be determined.

From a diachronic perspective an important question that arises is how a contrast in lexical tonal accent develops into a vowel-quality/durational contrast.

We end with a cautionary note. Given the small number of speakers and test items, the results of this paper must be taken as provisional and awaiting further confirmation.

5. Acknowledgements

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