Representation of the prosody of Ladin chanted calls:
A phonological representation of postlexical duration

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1. An unsolved question

While in several languages **duration** is distinctive at the lexical level (e.g., Friulian /lat/ 'milk' ~ /laːt/ 'gone' or Italian /kane/ 'dog' ~ /kanːe/ reeds), in a few languages it is **distinctive at the postlexical level**. For example, in Western Greenlandic, Asturian, and Extremaduran Spanish questions show a final lengthening, while statements do not. If it is distinctive, it should be represented phonologically. The question is "what kind of **formal representation** should be attributed to durationally-specified contours to distinguish them from ordinary intonation contours?" (Hayes & Lahiri,1991, p. 78).

2. The objective

In order to answer Hayes & Lahiri's (1991) question, we aim at putting forward a **formal representation of postlexical duration.** To this aim, we analyze data of chanted calls in Ladin.

3. The object of the study: chanted calls

- Vocatives are often characterized by specific **intonation** contours. These tunes, referred to as *vocative chants*, *stylized falls*, or *chanted calls*, usually consist of a rising pitch movement, followed by a sustained mid to high plateau (Sóskuthy & Roettger, 2020; Arvaniti et al., 2016).
- In addition, chanted calls typically display a **lengthening** in some position (usually in the –stressed or unstressed– final syllable), and such lengthening has been argued to be phonological (Hayes & Lahiri, 1991; Frota, 2014).

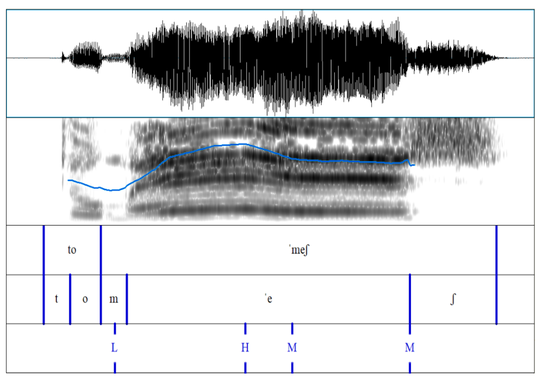
4. The case study: Ladin

Ladin is a **Rhaeto-Romance** language spoken by approximately 40,000 people on the North-Eastern Alps. We analyzed data from the Badiot dialect (that has lexically contrastive vowel length, e.g., /ˈmyʃ/ 'donkey' ~ /ˈmyːʃ/ 'face$_{PL}$').

5. Methodology

- By means of a Discourse Completion Task, we collected **216 utterances** produced by 6 speakers: 108 chanted calls and 108 broad focus statements (which served as a baseline for the analysis of duration).
- Each utterance consisted in a name. The items were 9 traditional Ladin names with different stress position, syllable structures and –for oxytone words– different features of the final elements.
- *Praat* was used to annotate the position of f0 inflection points and to extract the relevant f0 and duration values.

Name	Phonetic transcription	Stressed syllable	Last syllable	
			Nucleus	Coda
Berbora	[ˈber.bo.ra]	antepenultimate	vowel	none
Madalena	[ma.da.ˈle.na]	penultimate	vowel	none
Fridl	[ˈfri.dl]	penultimate	sonorant	none
Matì	[ma.ˈtiː]	last	vowel	none
Micurá	[mi.ku.ˈra]	last	vowel	none
Martin	[mar.ˈtiŋ]	last	vowel	nasal
Michil	[mi.ˈkil]	last	vowel	liquid
Tomèsc	[to.ˈmeʃ]	last	vowel	fricative
Ujöp	[u.ˈʒøp]	last	vowel	stop



- We then performed two-tailed Wilcoxon signed-rank tests with *Social Science Statistics* to check whether there were **statistically significant differences in duration** between statements and calls in several units (whole word, stressed syllable, final unstressed syllable, rest of unstressed syllables, nucleus of the stressed syllable, nucleus of the final unstressed syllable, onset of the final syllable, coda of the final syllable, sum of the onset and coda (if present) of the stressed syllable).
- We also checked whether there were **psychoacoustically significant differences in duration** between the same elements. In order to do so, we followed Pamies & Fernández Planas (2004) who determined that any difference in length below the threshold of 1/3 of the duration of the shortest interval is not perceivable.

6. Results for intonation

- **Phonetically**, the contour observed in proparoxytone names (Figure 1) displays a rise in the stressed syllable, a high plateau in the posttonic syllable, and a mid plateau on the last syllable. In words with other accentual positions (like the paroxytone name in Figure 2), there is only a rise in the stressed syllable and a mid plateau in the last syllable. The average rise is of +8.5 st, and the fall is of -3.2 st.
- **Phonologically**, this contour can be described in terms of a **L+H* !H%** nuclear configuration, which is common in Romance. The primary association of the pitch accent (represented with a solid red line in Figure 3) is with the stressed syllable, while the secondary associations (Pierrehumbert & Beckmann, 1988; Prieto et al. 2005) of its constituent tones are with the left and right edges of the same syllable (in Figure 3, the square brackets represent the edges of the constituents, and the dashed red lines represent secondary associations). The primary association of !H% is with the IP, and its secondary association is with the right edge of the last syllable.
- The two plateaus are the effect of **tonal spreading**, as observed in chanted calls of other languages (Frota et al., 2015; Prieto et al., 2015, i.a.). Specifically, the mid plateau is the result of the left-spreading of the final !H% tone, while the high plateau observed only in proparoxytones is the result of right-spreading of the H target of the pitch accent.

7. Results for duration

- **Phonetically**, the only statistically and perceptually significant difference between the vocatives and the corresponding statements lies in the **nucleus of the final syllable**, which is approximately twice as long in calls, independently from other factors like accentual position, syllable structure, or the nucleus being vocalic (like in [ma.da.ˈle.na]) or consonantal (like in [ˈfri.dl̩]).
- The prosodic lengthening in calls overrides distinctions of segmental length defined at the segmental level: the difference between lexically short and lexically long vowels found in statements ([mi.ˈkil] *~ [ma.ˈtiː]) is lost in calls.
- **Phonologically**, a way to account for the lengthening of calls in Ladin is postulating that the prosody of this sentence-type is not the result of the interplay between two tiers only (a segmental one and a tonal one), but among **three tiers**: a segmental (lexical) tier that contains vowels and consonants, and two suprasegmental strings (one that contains tones, and another one that contains what we tentatively call **durational phonemes**).
- We suggest that such durational phonemes can be thought of as **prosodic morae (μ^p)** that, in certain sentence-types like chanted calls, are associated with certain positions of the prosodic hierarchy. In this case, the prosodic mora is associated with the nucleus of the final syllable (the blue line in Figure 3 represents this association).

8. Figures

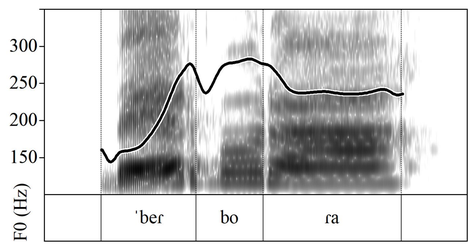


Figure 1. Call "Berbora!".

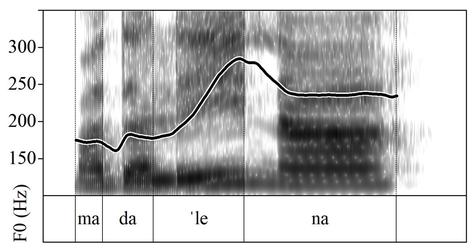


Figure 2. Call "Madalena!".

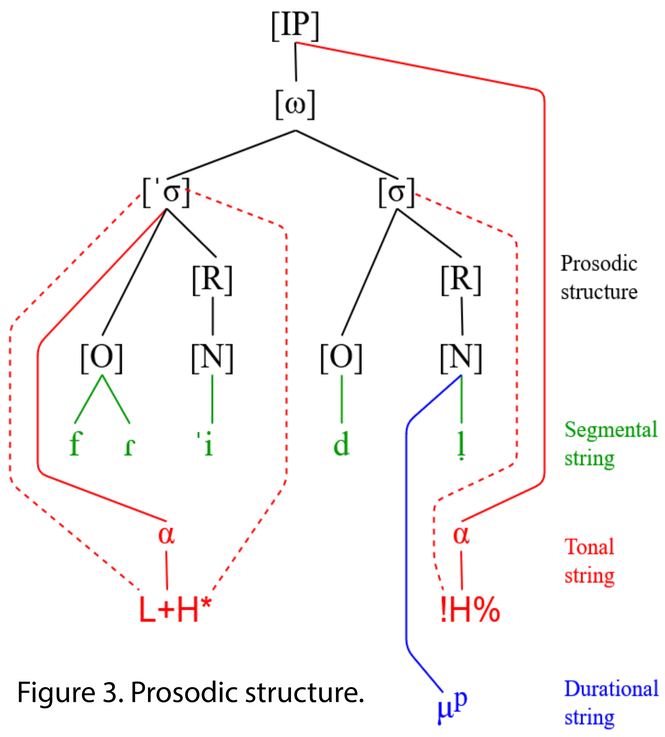


Figure 3. Prosodic structure.

9. Selected references

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