

Realization of F0 on vocalic and consonantal nuclei in Slovak

Lia Saki Bučar Shigemori, Marianne Pouplier

Institut für Phonetik und Sprachverarbeitung, Ludwig-Maximilians-Universität München, Germany

Syllable nucleus and nuclear pitch accent

Several studies support the idea that vowels and consonants differ not only in their physiological form but also in their functional role: vowels = prosodic information, consonants = lexical processing [2, 1]

To what extent can consonantal nuclei act as carriers of prosody?

- ▷ In German or English syllabic consonants are restricted to unstressed syllables, which never carry a pitch accent.
- ▷ In Tashliht Berber F0 peak can shift from a syllable occupied by consonantal nucleus to a syllable with a vocalic nucleus [5].

Untangling physiological form and grammatical function

- ▷ In Slovak /l/ and /r/ can occupy the nucleus of stressed syllables.
- ▷ Only in nucleus position they can be phonologically short or long (like other vowels).
- ▷ Word stress is fixed on the first syllable.
- ▷ Nuclear pitch accent is usually marked by raised F0 [8].

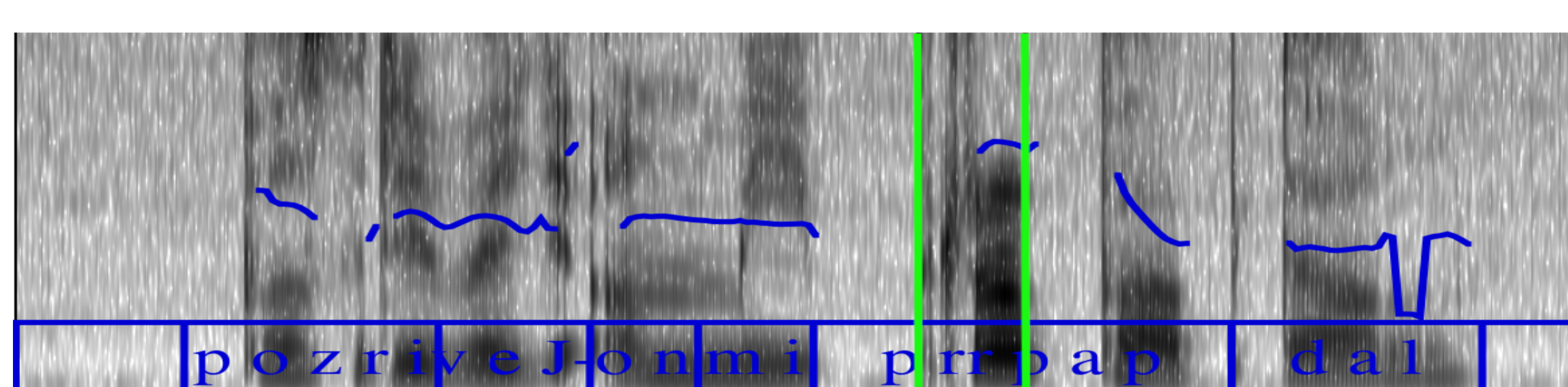


Fig. 1: Example of an utterance with accented target word *přpap*. The F0 contour is shown in blue. For the analysis F0 during the target nucleus was used, shown with green vertical lines.

Data and Methods

targetwords:

Nucleus	short	long
vocalic	pepap	pépap
consonantal	plpap	přpap
	prpap	přpap

carrier phrases:

accented target:
Pozri, ved' on mi **pepap** dal.
(Look, in the end he gave me pepap.)
unaccented target:
Pozri, aj **Ron** mi *pepap* dal.
(Look, also Ron gave me pepap.)

- ▷ Six native speakers of Slovak recorded in a soundproof booth.
- ▷ F0 extracted for the acoustically defined target nucleus.
- ▷ Only for time points with F0 $\neq 0$. \rightarrow irregular data.
- ▷ Main interest: interaction effect of PITCH ACCENT and NUCLEUS TYPE.
- ▷ Statistical analysis using functional linear mixed models [3, 4], separately for short and long nuclei:
 - Dependent variable: F0 contour mapped on a 0 to 1 time interval.
 - 2 covariates: (NUCLEAR) PITCH ACCENT, NUCLEUS TYPE,
 - interaction effect of PITCH ACCENT and NUCLEUS TYPE,
 - reference mean: F0 curve of unaccented vocalic nucleus.

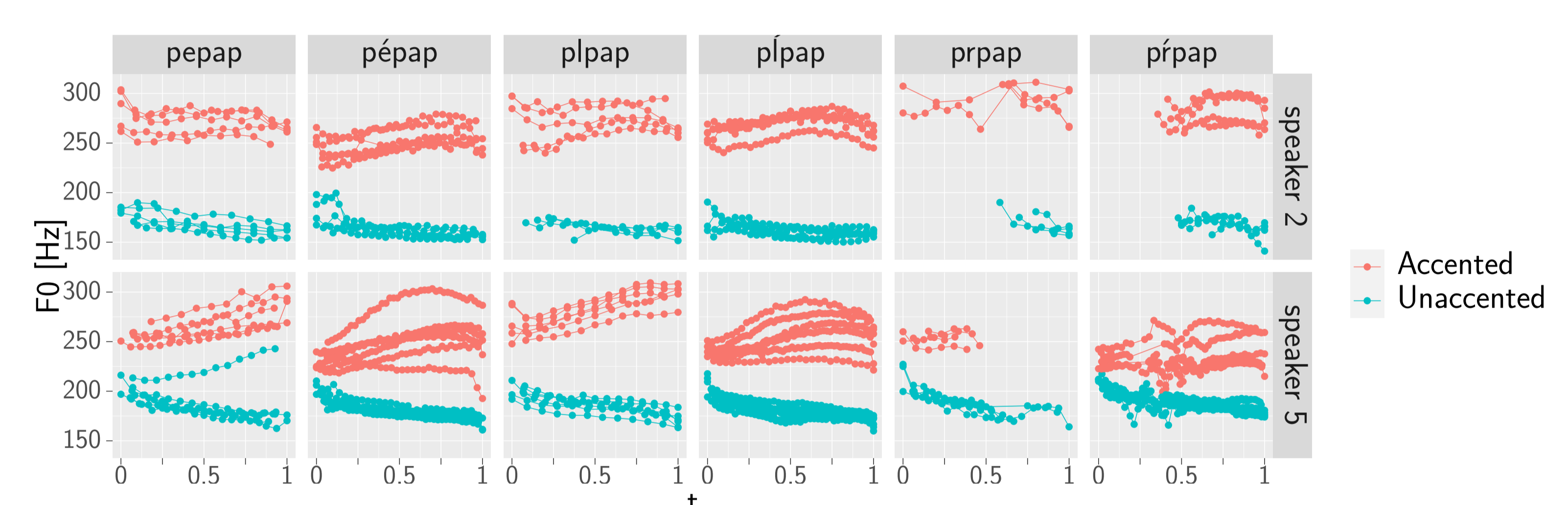


Fig. 2: Example of F0 data used for the statistical analysis.

Results

- ▷ Covariate and interaction effects (Fig. 3, 4) are significant where confidence bands do not overlap with zero.
- ▷ Summed effect curves (Fig. 5, 6) are calculated by adding the covariate (and interaction) effect curves of the effect in question to the reference mean (baseline red dashed line in Fig. 5, 6).

Phonologically short nuclei

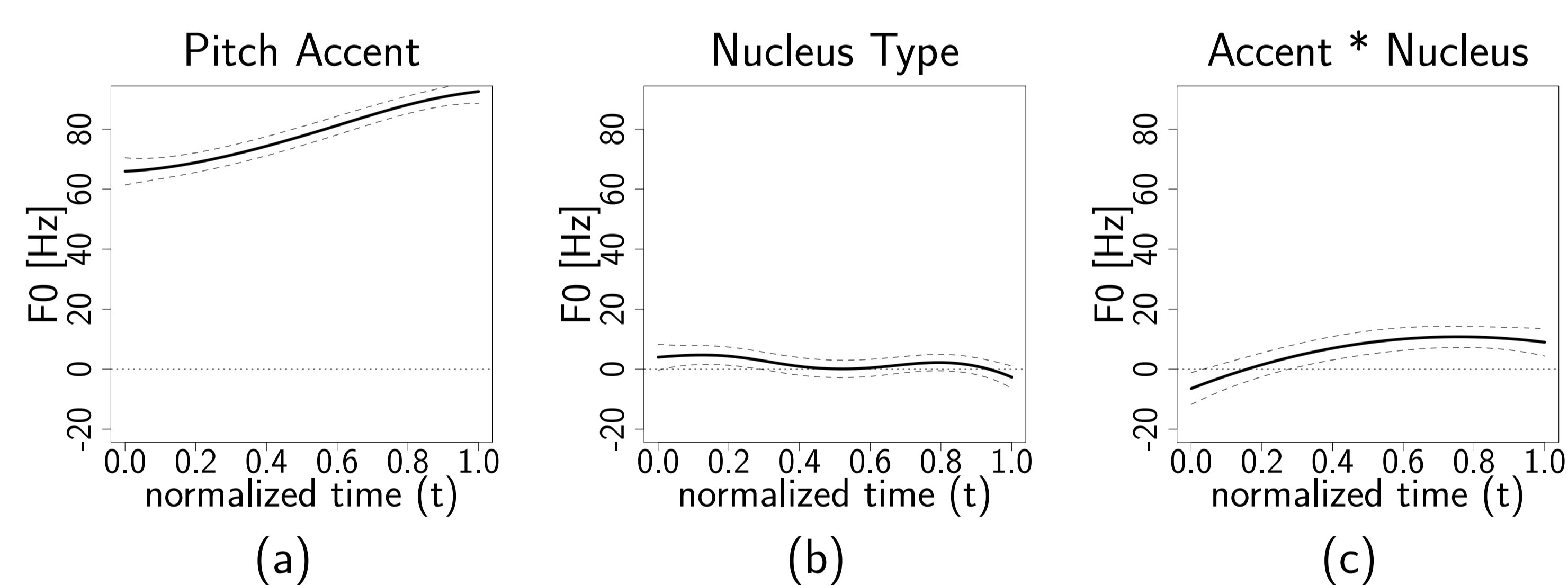


Fig. 3: Covariate and interaction effects for phonologically short nuclei.

Phonologically long nuclei

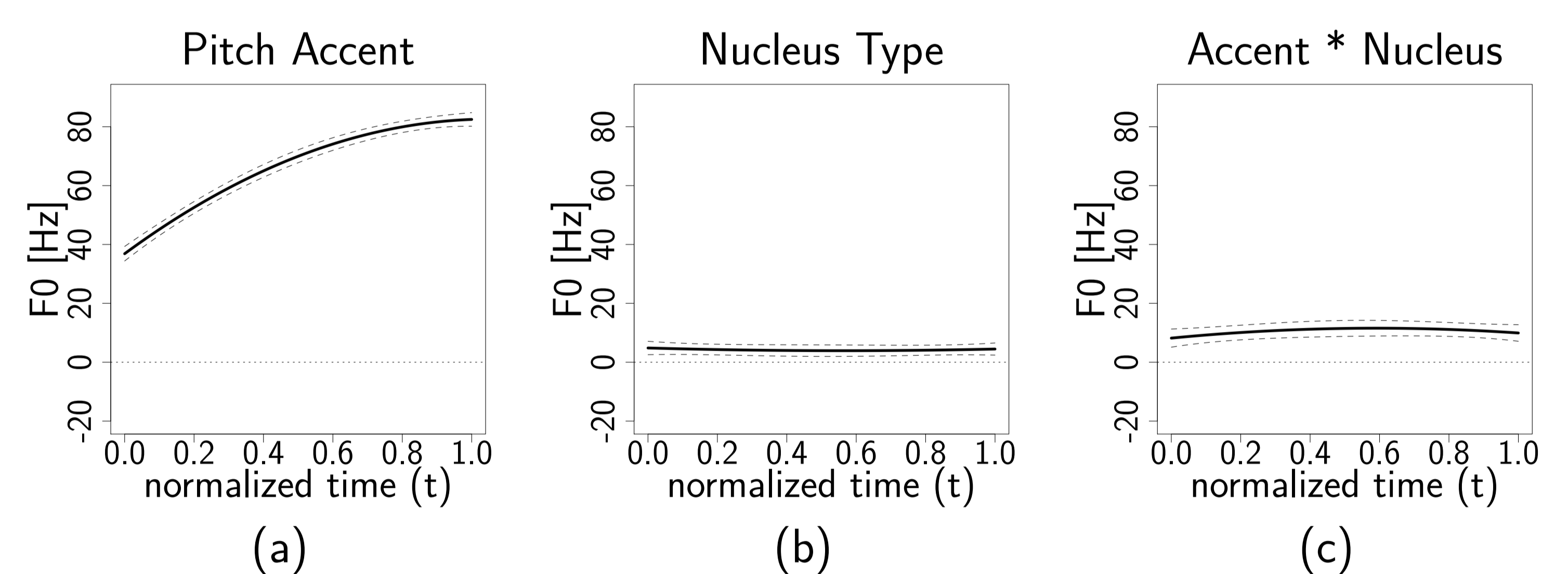


Fig. 4: Covariate and interaction effects for phonologically long nuclei.

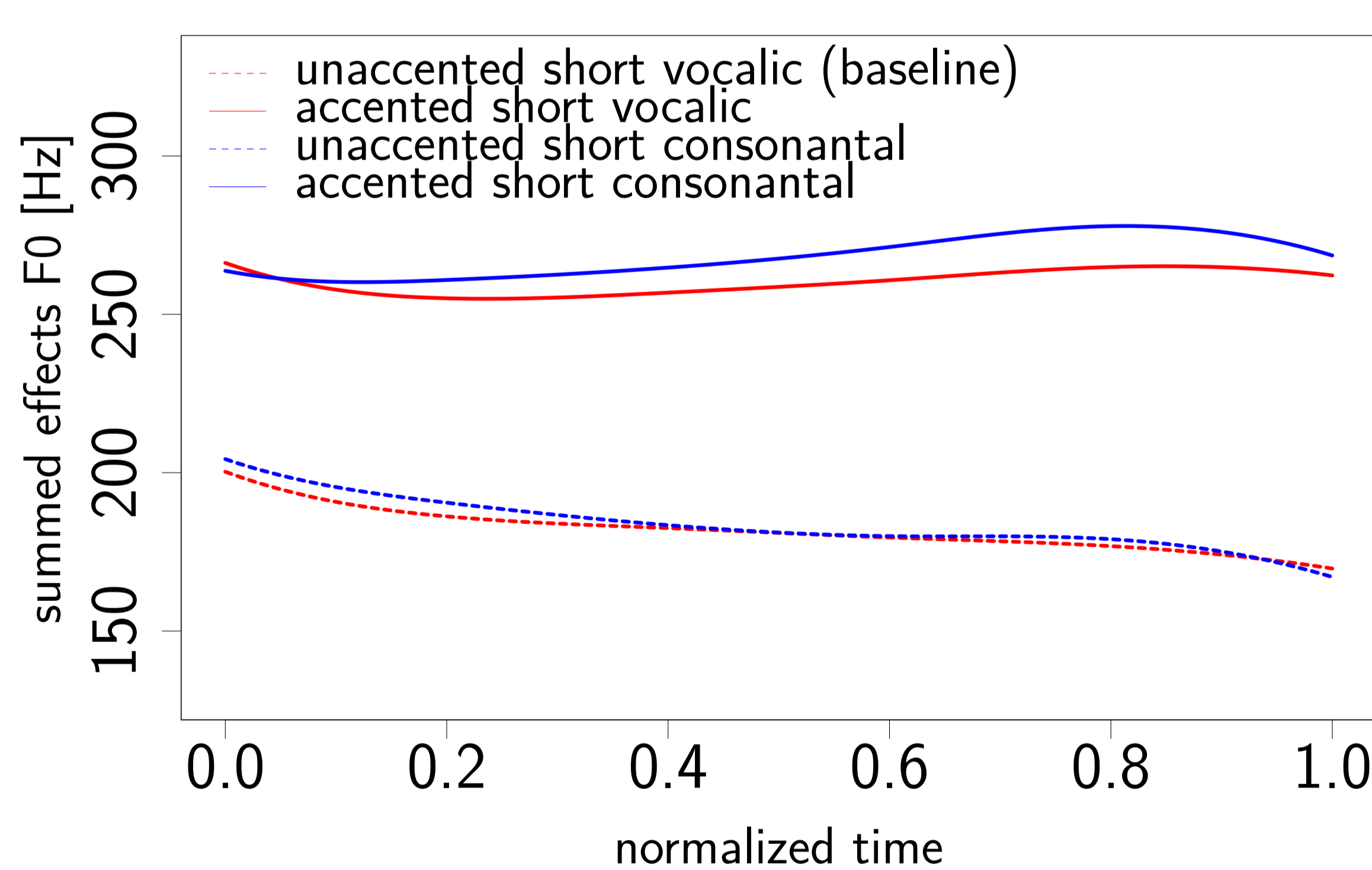


Fig. 5: Summed effect curves for phonologically short nuclei.

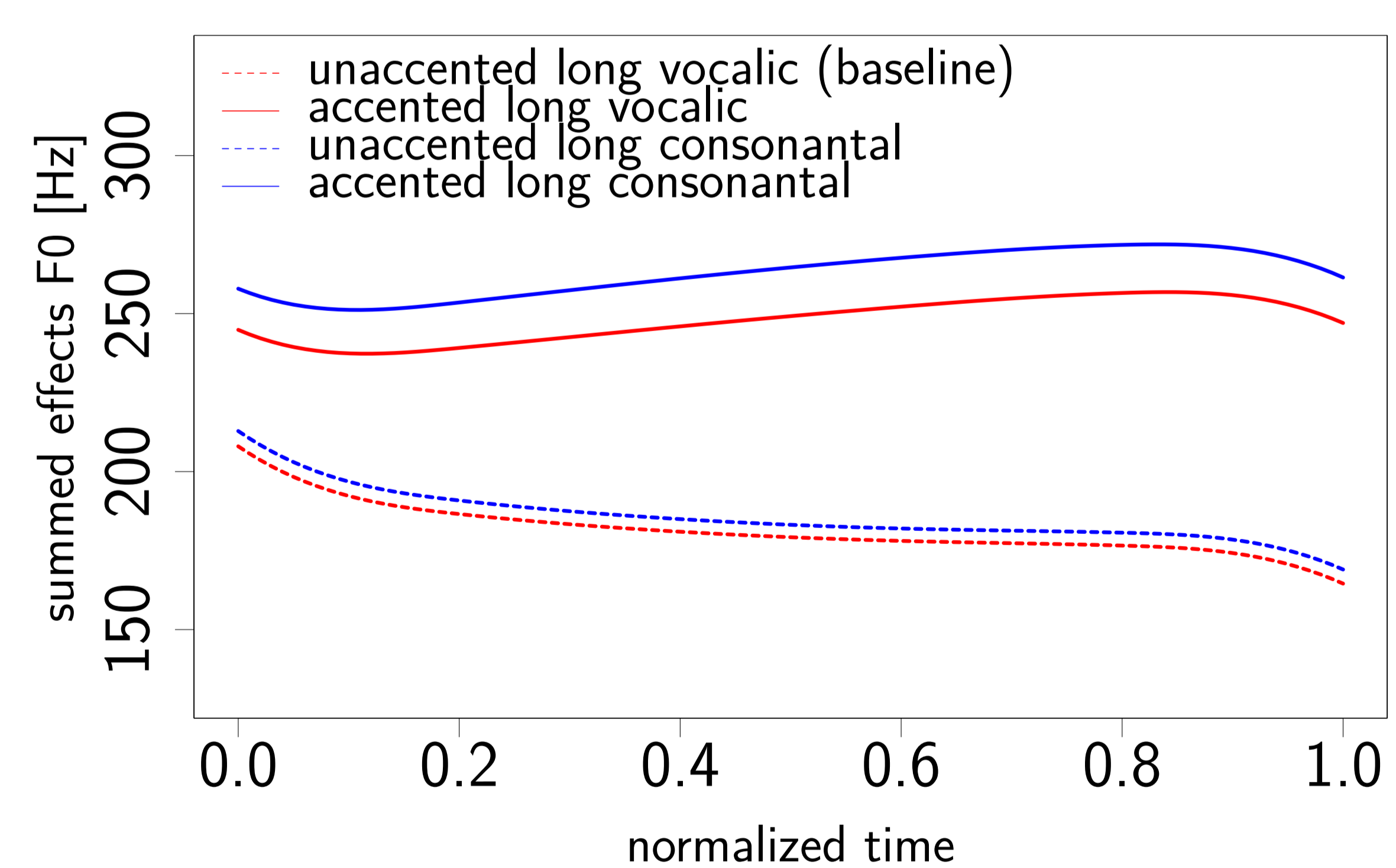


Fig. 6: Summed effect curves for phonologically long nuclei.

- ▷ Pitch accent has the greatest effect on F0:
When accented, F0 is higher. (Figures 3a, 4a)
- ▷ F0 is slightly higher for consonantal nuclei. (Fig. 3b, 4b)

- ▷ The interaction effect is significant for short and long nuclei (Fig. 3c, 4c):
The effect of pitch accent is greater on consonantal nuclei than on vocalic nuclei.

Discussion

The F0 contour, which is the main correlate of nuclear pitch accent, is produced robustly on syllables with consonantal nuclei.

- ▷ The difference between the accented and unaccented condition is greater for consonantal nuclei than for vocalic nuclei.
- ▷ This pattern is similar to intrinsic F0: when accented, closed vowels are produced with higher F0 than open vowels.
- ▷ Intrinsic F0 for vowels can be at least partially explained by physiological circumstances (tongue pull hypothesis) [6, 7].
- ▷ Both, /l/ and /r/ are produced with a retracted tongue dorsum in Slovak.
- ▷ To assess whether /l/ and /r/ have lower intrinsic pitch and whether the higher F0 can be interpreted as a necessary auditory enhancement, a perception study is needed.

References

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