Imperatives in European Portuguese: a perception approach

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Abstract

In European Portuguese (EP), intonation has a grammatical function. In the available research in EP intonation, production imperatives are said to have an F0 rising-falling contour of large amplitude and are described as having an intonation contour similar to wh-questions, although they present rhythmic differences (Viana, 1987). A possible increase in pitch span was also reported. Two perception experiments were developed to identify sound-sequence features of imperative intonation prototype. The results showed that the major intonation distinction between declaratives and imperatives in EP was related both with local events, that determine utterance contour shape, namely F0 movements, and global events that locate F0 levels.

Key words: speech prosody, intonation, imperatives, speech perception

Introduction

The available research on European Portuguese (EP) intonation has not so far systematically addressed the issue of imperatives. Imperatives were said to have an F0 rising-falling contour of large amplitude and were described as having an intonation contour similar to wh-questions, although they presented rhythmic differences (Mateus et al. 1983, Viana 1987). A possible increase in pitch span was also reported.

Imperative sentences are syntactically and morphologically marked in EP. In general, these grammatical features may be sufficient to distinguish imperatives from other sentence types. However, the intonation features of imperatives seem to be quite prominent and play an important role in EP perception and processing.

Two perception experiments were developed to identify sound-sequence features of imperative intonation prototype. All sound sequences were recorded by two EP native speakers: a female (NA) and a male (LL).

Experiment I

Experiment material was composed by 195 sound sequences (sentences) of different sentence types: declaratives, questions, wh-questions, imperatives and exclamations. Several variables such as segmental constituency, primary stress location, syllable structure, sentence syntactic constituency and

illocutionary strength were controlled. Experiment I task consisted in listening to sound sequences and immediately categorizing them in four sentence types previously defined. This task recruited *top-down* linguistic data processing and linguistic explicit knowledge. 40 EP native speakers, aged between 19 and 50, with no history of hearing or language deficits or disorders, participated in the experiments.

Results I

The inclusion criterion of a sound sequence in one of the available categories was a recognition result equal or higher than 75%.

85.3% of the 35 imperatives present in the *corpus* were categorized as imperatives. An acoustic and phonetic analysis using *Praat* software was performed on these sequences. Based on earlier studies on EP (Viana 1987, Frota 1998, Mata 1999), all of the sentences were labelled according to specific phonetic points believed to be the most informative ones for intonation analysis: onset of the sentence (O); first stressed vowel (FSV); F0 peak (FP); final pre-stressed vowel (FPSV); last stressed vowel (LSV); last vowel or voiced consonant (LVC) and data were collected.

For local events analysis, all F0 movements were categorized according to their direction (rising, falling, rising-falling, falling-rising, flattened), movement amplitude and segmental alignment. Tonal events alignment with segmental structure in EP is directly related with stressed vowel/syllable location (Frota 1998, Mata 1999, Grønnum and Viana 1999). For global intonation events study, pitch register (Patterson and Ladd 1999) pitch level (Rietveld and Vermillion 2003) and pitch span were considered.

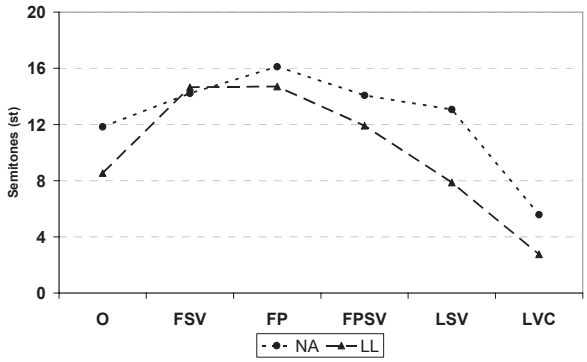

Figure 1. Representation of F0 average topline values in imperative sentences produced by two speakers (NA) and (LL), in semitones.

The analysed imperatives contour shape showed an initial rise from the onset (O) to the F0 peak (FP). In these sentences, FSV occurs in the verb. After FP, begins a falling movement of large amplitude, that is more visible from the final pre-stressed vowel (FPSV) or the last stressed vowel (LSV) to the last vowel or voiced consonant (LVC) (see Figure 1).

The major intonation distinction between declaratives and imperatives is related both with local events, that determine utterance contour shape, namely F0 movements, and global events that locate F0 levels (see Tables 1 and 2). A Principal Component Analysis of imperatives data revealed that variance in imperative sentences is due to FSV, FP, LSV, FPSV, Pitch Register and Pitch Span variables. This result was also corroborated by a Classificatory Analysis that joined these variables in the same cluster.

Table 1 and Table 2. Average F0 values and respective standard deviations of Pitch Level, Pitch Register and Pitch Span in imperative (*Imper.*) and declarative sentences (*Declar.*), produced by the female speaker (NA) and the male speaker (LL), in semitones.

NA	Pitch Level		Pitch Register		Pitch Span	
	A	SD	A	SD	A	SD
Imper.	3	1,3	12	2,3	14	2,8
Declar.	3	1,0	9	0,6	10	1,7
LL	Pitch Level		Pitch Register		Pitch Span	
	A	SD	A	SD	A	SD
Imper.	2	0,32	11	2,68	13	2,62
Declar.	2	0,27	7	1,02	9	1,73

Experiment II

A categorical perception experiment with *hummed* sentences was developed. From two natural sentences, one produced by a male speaker and another by a female, two multi-step *continua* from each sentence were created, from declarative to imperative contour, through acoustic manipulation (PSOLA) and submitted to 20 EP native speakers that performed two tasks: an identification and a discrimination task. For the identification test, subjects had to categorize each presented stimulus either as a declarative or as an imperative sentence. Each of the 14 stimuli was repeated eight times in random order. In addition to response data, reaction times were also collected. For the discrimination task subjects had to decide whether the stimuli in each pair (13 pairs repeated five times) were equal or different. Experimental design and procedures were developed with *E-Prime*.

Results II

Identification test results revealed a uniform evolution that is dependent on the F0 value of the Last Stressed Vowel: sentences that were classified as imperatives presented high F0 values in this variable. When the value of this variable decreases, the identification as imperative also diminishes. However, general results of this test were not very clear as far as imperative intonation category is concerned. The use of *hummed* sentences may have contributed to this situation.

Conclusions

The prototype of imperative category in EP is clearly related to high F0 global values and to a particular intonation shape described earlier. Acoustic and phonetic analyses of both perception experiments point to the high probability of the Final Pre-Stressed Vowel and the Last Stressed Vowel variables being the most informative and prototypical to define imperative sentence category in EP.

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