

Prosody and Syntax in Spontaneous Speech: Evidence from Czech and French

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ABSTRACT

Phonosyntactic behaviour of spontaneous Czech and French is tested at stress unit level. While the ‘syntactic’ length of stress units (in terms of words) varies considerably in the two languages, the ‘phonetic’ length tends to remain stable and obey grammar-independent rhythmic laws. Only a small number of stress units correspond to a syntagma in Czech, whereas in French, this type of stress unit is the prevailing one. The proportion of stress units covering more than one syntactic node is almost equal in both cases. However, the frequency of these apparently ‘asyntactic’ stress units is the main factor that differentiates spontaneous and read speech.

1. INTRODUCTION

The evolution of prosodic parameters throughout the utterance may be seen as the resultant of syntactic and non-syntactic aspects, of which the latter ones can be determined either biologically or cognitively [4, 11]. These ‘two sides of the coin’ are present in each of the three basic functions of prosody:

a) The distinctive, paradigmatic function, allows us e. g. to distinguish an assertion from a question in languages where the word order in these two types of sentences may remain the same. A rising final intonation contour, more energy-consuming, less common, and thus more marked, is universally identified with question, which is more pragmatically loaded than the assertion [1, 8].

b) The segmentative, syntagmatic function accounts for prosodic rendering of words and grammatical relations between them. At the same time, prosody constructs a hierarchy of its own, which may not correspond to the syntactic structure: the paradigm described in Grosjean & Dommergues [6] represents a successful tentative to formalize this asymmetry. In their article, the authors identify underlying rhythmic constraints affecting the projection of syntax on prosody, and engendering autonomous ‘performance structures’. For French, the final lengthening (duration of the last syllable including the following pause) is used as an index of hierarchical propinquity. This index, proportional to the depth of prosodic boundary between the adjacent constituents, makes it possible to construct a prosodic tree, not necessarily identical to the syntactic one.

c) The paralinguistic function of prosody permits the speaker to characterize himself, his attitudes and emotions [9].

The central concern of this article is the second of the three mentioned functions. We claim that the linearity of speech inhibits a one-to-one mapping between syntax and prosody, which would certainly have a positive impact on speech perception. The way in which the string of segments is divided into prosodic constituents is strongly influenced – but not completely determined – by syntax. Therefore, the term ‘phonosyntax’ should not be defined as a systematic reflection of grammatical syntax onto prosody, but rather as a more or less autonomous syntax of prosodic units between them [2].

2. OBJECTIVE AND HYPOTHESES

We attempt to provide a descriptive insight into the relation of syntax and phonosyntax in two languages whose morphological and prosodic properties are in sharp contrast:

	Czech	French
Genealogy	Indo-European, Western Slavonic	Indo-European, Western Romance
Morphology	more synthetic than in French	more analytic than in Czech
Word order	more free than in French	less free than in Czech
Phonological function of vowel length	yes	no
Segment reduction in stressless syllables	no	no
Stress	initial	final, optionally also initial

Tab. 1: Czech and French – general properties

The first hypothesis is that the correspondence between syntax and phonosyntax is weaker in French, where the morphology is more analytic: every word can be seen as a potentially stress-generating unit, subject to syntax-independent rhythmic constraints. Since the average word length is lower in analytic languages, and their number per sentence higher, the probability of mismatches between the two discussed levels increases.

Our investigation concerns spontaneous speech, which is characterized as less regular and more variable both on the level of prosody and syntax [7, 15]. In fact, the coding processes involved in spontaneous speech production

require more mental effort than in reading. This results into a less linear and more atomized prosodic structure. Therefore, the second hypothesis is that phonosyntax acts more autonomously in spontaneous production than in reading. To test this assumption, we make use of our previous data issued from the analysis of read speech [3].

3. EXPERIMENTAL DATA

The analysis is based on recordings made with three French speakers (two female and one male, average age 29 years) and three Czech speakers (two female and one male, average age 20 years), all university students speaking their mother tongue in a standard way. The instruction was to read a simple informative text, then to resume this text in their own words, with the aid of a set of key words. The total number of syllables analyzed was 358 for French and 501 for Czech (spontaneous speech).

The recordings were segmented into syllables, annotated and supplied with stress labels. The stress was evaluated on a perceptive basis by the author of this article, with an independent control of an expert in phonetics (unanimity rate higher than 80%). The labels used are:

- Czech: a) not stressed
 b) initial-stressed
- French: a) not stressed
 b) final-stressed
 c) initial-stressed

According to stress location, we then set the boundaries of stress units. Stress is adjacent to one of the boundaries of the unit (left in Czech, left or right in French), unless it is preceded by a pre-tonic syllable (e. g., in Czech: *jsou vybaveny...* [jsou'vɪbavɛni] 'they are equipped ...') or a post-tonic syllable (e. g., in French: *soixante-dix langues* [swasɑ̃tdi'lɑ:gə] 'seventy languages'). Apart from initial-stressed and final-stressed units, there also exist biaccentual units (in French only): *tellement importants* [tɛlmɑ̃tɛpɑ̃'tɑ̃] 'so important'.

- a) The typical rhythmic scheme is a succession of initial-stressed units in Czech, and final-stressed units in French.
- b) In French, word-initial stress and word-final stress tend to form a biaccentual group, called 'arc accentuel' by I. Fónagy [5]. This unit can correspond to one word (*médiathèque* [medja'tɛk] 'resource centre') or to more words (*soixante-dix langues* [swasɑ̃tdi'lɑ:gə] 'seventy languages').

4. RESULTS AND DISCUSSION

4.1 Stress group length and word length

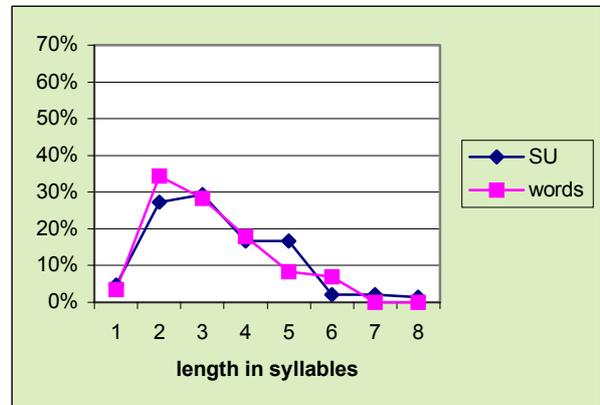


Fig. 1: Distribution of stress units and words as a function of their length – Czech

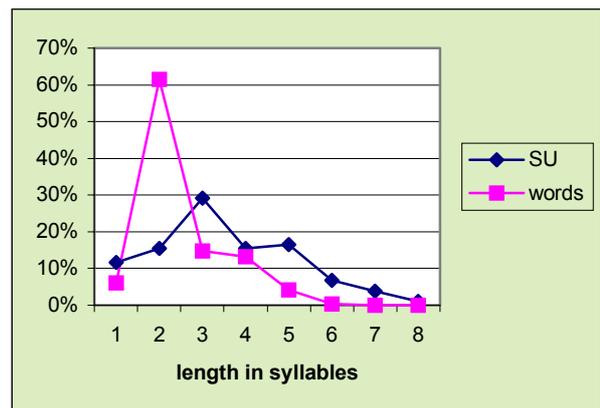


Fig. 2: Distribution of stress units and words as a function of their length – French

The first graph indicates a rather similar distributional behaviour of the two curves in Czech (correlation coefficient 0.93, mean word length 2.18 syllables, mean stress unit length 3.34 syllables), whereas the second one shows a large disproportion between the size of the stress unit and the word in French (correlation coefficient 0.38, mean word length 1.48 syllables, mean stress unit length 3.50 syllables). These differences originate from the grammatical structure of the two languages in question: the more analytic it is, the more words there are typically in a stress unit (2.37 in French and 1.53 in Czech on the average). While the 'syntactic' length of the stress unit (in terms of words) may vary considerably, the 'phonetic' length tends to remain stable, and obey universal rhythmic laws [4, 15].

The described quantitative properties of stress units and words are very similar to those established for read speech in our previous research [3]. The only difference worth

mentioning is a higher frequency of one-syllable words (conjunctions, adverbs etc.) in spontaneous speech, which slightly decreases the average word length. On the other hand, the mean stress unit length, where a more significant difference could be expected, shows only weak variance in read and spontaneous production (difference of 1% for French and 4% for Czech).

4.2 Syntactic properties of stress units

We may assume that a larger number of words increases the set of possible rhythmic groupings, and gives way to syntactically anomalous stress groups. This was examined in the following way: every stress group was provided with a label indicating whether:

- a) it corresponds to a single word;
- b) it corresponds to a syntagma;
- c) it corresponds to a sequence of words belonging to different syntactic nodes.

Examples for the categories above (SU – stress unit; σ – syllable; ' – stress):

- a) SU = word
 $\sigma \quad \sigma \quad ' \sigma$
répandues
 'wide-spread'
- b) SU = prepositional syntagm
 $\sigma \quad \sigma \quad ' \sigma$
dans le monde
 'in the world'
- c) SU = parts of different syntagmas
 $\sigma \quad \sigma \quad ' \sigma$
qui sont moins (... *répandues*)
 'which are less (... wide-spread')

The results are presented in the graph below:

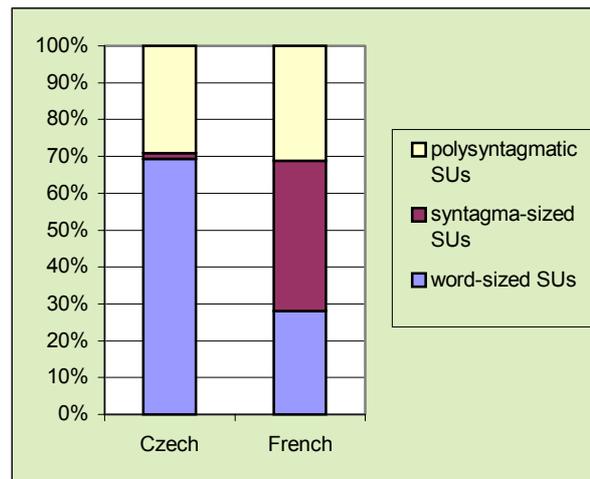


Fig. 3: Syntactic distribution of stress units (SUs – stress units)

The histogram shows clearly that the two languages differ as to the role of the syntagma in the domain of prosody. Only a small number of stress units correspond to a syntagma in Czech, whereas in French, this type of stress units is the prevailing one. The proportion of stress units covering more than one syntactic node is almost equal in both cases, which partly disproves the first hypothesis formulated above. The analytic character of French, which goes hand in hand with a larger number of words, does not lead to a higher rate of mismatches between syntax and prosody. On the prosodic level, functional words are associated with their full-meaning neighbours in a way which respects syntax. This fact reduces somehow – at least from a prosodic point of view – the sharpness of the frontier between analytic and synthetic morphology [14]: added to a fixed word order, the prosodic amalgamation practically shifts function words into the class of affixes.

However, the frequency of polysyntagmatic, and thus apparently 'asyntactic' stress units is the main factor that differentiates spontaneous and read speech. In the latter production mode, their frequency is by 35%/45% lower for French and Czech respectively. In addition to a generally accepted fact that spontaneous speech has a looser syntax, the data clearly show that linear prosodic organization has a weaker link to grammatical syntax.

4.3 Grammatical words and pre-tonic syllables

Despite the regular, word-initial position of stress in Czech, stressed syllables need not be directly adjacent to the stress unit's boundary: a grammatical word which precedes a word-initial stress and can not be joined to the preceding stress unit because of a pause has to be accounted for as an extrametrical, pre-tonic syllable (as in the case of the cited example *jsou vybaveny...* [jsou'vɪbavenɪ] 'they are equipped ...'). This monosyllabic word (or, more rarely, sequence of two monosyllabic words) is often referred to as anacrusis [12].

If no pause is present, the conflict between grammar and prosody can be settled in favour of regular rhythm (e. g. *která se nachází* ['ktera:se 'naxa:zi:] 'which is located' – the reflexive pronoun 'se' belongs syntactically to the following verb, but rhythmically to the preceding relative pronoun).

In French, a similar situation can be triggered by a word-initial (secondary) stress (e. g. *les équipements* [le'zekip'mã] 'the equipment'). Last but not least, rhythmic regularity of French is also violated by the cases where a final *-e* (*e caduc*) is pronounced (*soixante-dix langues* [swasãtdi'lã:gə] 'seventy languages'). These two kinds of systematic deviations from the typical rhythmic scheme of French (succession of final-stressed units) are often omitted in prosodic accounts of French. Initial stress, losing its emphatic connotations and penetrating into neutral speech, is of particular importance because of its continuously growing frequency [13].

Also, the cited instances of extrametricality are not as marginal as they might seem; the following table gives the percentages for both languages:

	Czech	French
pre-tonic syllables	11%	7%
post-tonic syllables	0%	13%

Tab. 2: Proportion of pre-tonic and post-tonic syllables (out of the total number of stress units)

5. CONCLUSION

The data presented above illustrate one of the many aspects of phonosyntax, the 'phonetic counterpart' of grammatical syntax. Prosodic influences, partly independent of grammatical syntax, strongly interfere in the rhythmic rendering of a sentence. Their action, though, is not purely mechanical, as it has been proved by comparing Czech and French, languages with synthetic and analytic morphology respectively. The analysis of polysyntagmatic stress groups shows that their frequency does not grow as a function of the number of words in a stress group. Prosodic grouping, however, shows considerable differences if we compare read and spontaneous production. Hesitations, slips of the tongue and other accidental phenomena characteristic of spontaneous speech perturb the mapping between syntax and prosody much more than in reading.

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