DISCOURSE-BASED EMPIRICAL EVIDENCE FOR A MULTI-CLASS ACCENT SYSTEM IN FRENCH.

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ABSTRACT

In this paper we present a pilot study of French accentuation in discourse, based on two types of corpora, consisting of FM broadcast news and interviews. The main purpose of this research is to validate empirically, by means of a pluriparametric analysis of raw and normalised data, the accentual categories which are considered as constitutive of the contemporary French accent system.

INTRODUCTION

There are two current views about French accentuation : the *extreme view*, as a language without accent ([1], for a discussion) and the *traditional view*, which claims that French possesses only two types of accents : a phrase-final rhythmic accent and a word-initial emphatic accent [2, 3]. This view is extremely frequent in recent works on prosodic phonology [4, 5, 6]. Data gathered in recent studies, however, which have been carried out on different corpora involving various speech styles [7, 8], together with results of our own work [9], strongly suggest that these two points of view are questionable and lead us to conclude that accentuation in French is far more complex than has previously been stated. To explain the peculiar nature of this accentuation, we propose a general typological framework based on three main classes of accents : lexical, rhythmic and semantico-pragmatic. It is well known that French is only concerned by the last two classes.With regards to the rhythmic class, besides the traditional *phrase-final accent*, modern French is characterised by an optional *secondary accent* which is assigned to the first syllable of a polysyllabic word in order to avoid a accent clash (i.e."un *cha*peau blanc") or more generally to favour the formation of an eurhythmic pattern. Despite its early identification [7], this secondary accent has been neglected by phoneticians and only recently has been incorporated into a phonological description of French prosody [10].

The semantico-pragmatic accent class can be divided into two sub-categories: the non-emphatic class, which contains the *nuclear accent* (associated with the tonic of an Intonation Unit) and the emphatic class which includes both the contrastive accent and the focal accent for intensification usually named *accent d'insistance* . The latter, which is most often assigned to the first syllable of a word, is often confused in the litterature with the secondary rhythmic accent which occupies the same position. It has been argued, nevertheless [11], that the secondary accent is a true pitch accent, meaning that its realisation is not accompanied by any lengthening effect, a feature which has been assumed to be common both to the primary phrasal accent, the nuclear accent and the two emphatic accents. It is the purpose of this paper to verify if this assumption is tenable for discourse and to what extent we can associate each of the categories of accent proposed above with specific qualitative parameter features.

A second aim of this study is to examine the way in which lengthening is distributed throughout the syllable for the different accent classes we define. Campbell [12] suggested the strong hypothesis that once raw duration values of phonemes have been normalised as z-scores, the presence of a lengthening effect is distributed equally throughout the syllable in English. Bailly & Barbosa [13] on the other hand claimed that the relevant unit for lengthening in French is not the syllable but the sequence of phonemes from one vowel onset to the next. Other studies, however, have suggested that lengthening does not apply equally to the different syllable constituents. Thus Fant & Kruckenberg [14] for example found that postvocalic consonants in French were lengthened only in prepausal position. Similar results were reported for English by Campbell [15] who found that codas were lengthened more in pre-boundary position while onsets were lengthened more in prominent syllables not followed by a boundary.

MATERIAL AND PROCEDURE

We extracted from our database on prosody two FM recordings of continuous speech lasting approximately 2 minutes each by two native male speakers of educated standard French. The first was an extract from a radio news broadcast and the second an interview. These recordings were transcribed without punctuation. As a preliminary test three experts were asked to indicate all perceived accents, to mark emphatic accents and non-terminal and terminal Intonation Unit boundaries. Approximately 330 accents were identified. These were classified into the following categories : emphatic (EMP), final in a terminal Intonation Unit (IU-T), final in a non-terminal Intonation Unit (IU-N), word-initial (WI), and (prosodic) word-final (WF). The remaining syllables were labelled as unaccented (UN).

Experimental procedure:

The excerpts were digitalized at 16 kHz on a Sun Sparc station and labelled phonemically and in syllables by hand. Approximately 2500 phonemes and 1200 syllables were labelled.

Each constituent of the syllable was coded as onset, nucleus or coda.

Duration. The duration of the different syllable constituents was measured and the raw data was normalised using the Z transform method [12], with the phonemic means and standard deviations pooled from a database of seven speakers.

Fundamental frequency. The fundamental frequency of the extracts was modelled with a quadratic spline function using an automatic modelling algorithm Momel with manual corrections [16]. For each syllable the nearest maximum target was calculated as well as the distance of the target with respect to the onset of the corresponding vowel. F0 values were normalised using the ERB scale [17] offset to the mean of the speaker's range.

RESULTS

Duration

Analysis of variance on the phoneme durations showed considerable differences for the different accent classes. Both accent class and position in the syllable were highly significant factors (p < 0.0001) and the interaction between the two factors was also highly significant (p < 0.0001). These effects were observed for both speakers on both raw and normalised durations. Figure 1 shows the normalised durations for Onset, Nucleus and Coda for the different accent-classes for speaker 1. It can be seen that the ratio between nucleus and coda remains fairly constant showing that the syllable rhyme seems to be treated as a consistent unit for lengthening in different environments.

The syllable Onset, by contrast, behaves rather differently. The onset is longer than the other constituents of the syllable in unaccented syllables and word-initial accents, both emphatic and non-emphatic. The onset is shorter than the other syllable constituents when the syllable occurs at the end of either a Terminal or a Non-Terminal Intonation Unit. When the syllable was word final but not at the end of an Intonation Unit the ratio of the onset to the other syllables was intermediate.

Results for the second speaker showed similar effects except that the relationship between the Nucleus and the Coda were less constant. The ratio of the syllable Onset to the rhyme showed the same effects as for the first speaker in the different contexts (Figure 2).
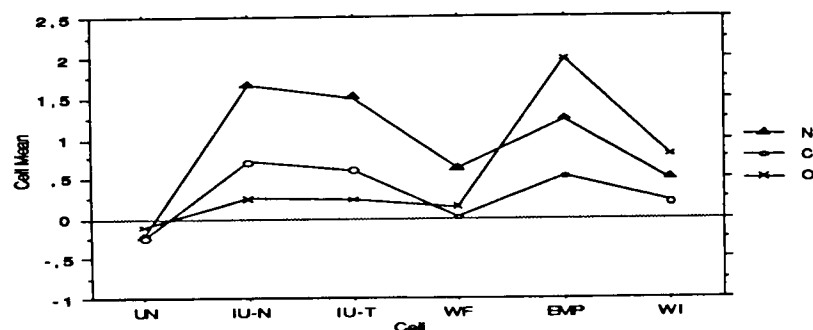
Figure 1 : Mean durations of onset (O), nucleus (N) and coda (C) for the different accent classes (see text) for speaker 1.

Figure 3 : Target points (in ERB units) for the different accent classes (see text) for speaker 1 . Vertical line indicate 95% confidence intervals.
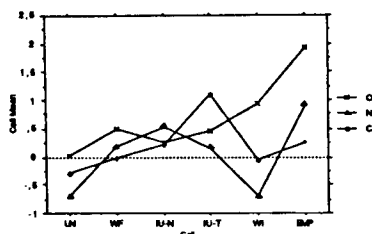

Figure 2 : Mean durations of onset (O), nucleus (N) and coda (C) for the different accent classes (see text) for speaker 2

Fundamental frequency

Figure 3 shows the mean target values in ERB by accent class for speaker 1. Analysis of variance showed that the differences between the classes were highly significant (p < 0.0001). Post hoc tests confirmed that each pair of values was significantly different (p < 0.05) except between the unaccented syllables and the syllables in final position in Terminal Intonation Units.

The temporal location of the target points was also significantly different for certain of the classes, being located at a mean of 91 ms from the vowel onset for the end of Non-Terminal Intonation Units, 66 ms for emphatic accent and from 30-40 ms for the other accent classes which were not significantly different from one another.. Similar

results were observed for the second speaker.

DISCUSSION

The different categories of accent type which we hypothesised were all clearly distinguished by the acoustic parameters. Duration was particularly effective in distinguishing preboundary accents from others confirming for both read and spontaneous speech results mentionned above [14, 15]. The only category where durational effects did not play a role was the distinction between Terminal and Non-Terminal Intonation Units which were distinguished by the value of the F0 target and its timing (cf Vincent et al. [18] for similar findings).

These results can be summarised in the following table where the value of duration is represented as very short (--), short (-), long (+) or very long (++).

	Onset	Rime	F0	Timing
U N	--	--	low	early
WI	+	+	high	early
EMP	++	++	high++	mid
WF	-	+	high	early
IU-N	-	++	high+	late
IU-T	-	++	low	early

The results of this preliminary study suggest that the parameters we have identified characterizing the different accent classes are relatively independant of discourse type.
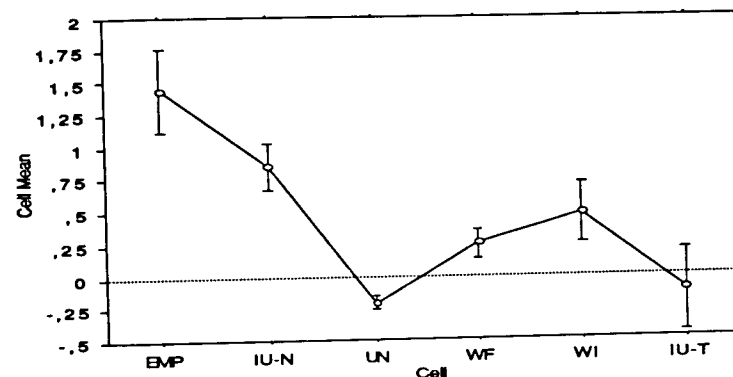
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