PERCEIVING RHYTHM IN FRENCH?

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ABSTRACT

This paper deals with the problem of rhythm in French, a language with no strong stress contrast. First, oversimplified patterns at three different levels, the breath group (BG), the prosodic word (PW) and the CV syllable (CV) are proposed as archetypical reference rhythmic patterns. These 3 layers seem to correspond to psychological realities. BG layer, the larger one, consists in the alternation between 2 highly contrastive global tunes. PW layer is characterized the repetition of variants of an archetypal word pattern, shaped by at least one oscillation of pitch between the high and low registers, with a durational peak on its last sounded syllable, marking its end. The last layer is the succession of typically rising, tense CV syllables with soft onset. One of the three layers may become perceptual more dominant than the others for the perception of rhythm, depending on the speaking mode. Second, despite important differences, PW layer in French and the tone group in English are interpreted as 2 variants of the same archetypal psychological pattern where accentuation and lengthening are associated with the notion of beginning and end, respectively. In English, accentuation is dominant, and lengthening recessive. In French, it is the contrary, but accentuation is also intrinsically present (emphatic stress and initial rise at word beginning) leading to some confusion in the present-day scheme of French rhythm.

INTRODUCTION

In speech, the notion of rhythm is often based on the perception of stress and recurring prominent syllables. Heffner notes that "languages with strong stress are likely to have rhythms of no subtlety whatever; languages which make less use of stress contrast have rhythms which are less obvious." (Heffner, 1950: 227). Naive speakers of French do not have a clear idea of what a "stress" can be, and locating prominent syllables in non emphatic French is a difficult task. What about rhythm in French, which obviously is not primarily based on the perception of an alternation between stressed and unstressed syllables?

1. THE MULTILAYERED TEMPORAL RHYTHM

There seem to exist 3 perceptual units which give rise to a multilayered rhythm in French: (i) two basic global tunes, (ii) an archetypal "prosodic word" (PW) pattern; (iii) a typical open syllables CV. It is difficult to disentangle the different units in a purely acoustic study since the 3 layers interfere. The following caricatural patterns should be interpreted as *prototypical percepts* toward which the acoustic realisations tend to correspond (see Figure 1).

1.1: The two BGs

The first ingredient is the *alternation* of two highly contrastive global contours at the level of the breath group. The contrast between BG+, ending by a sharp rise on the final syllable and BG-, ending by a sharp fall extend over several syllables and seems largely "exaggerated" in French, as compared to English (Delattre, 1966:75). Both BGs are characterized by final lengthening.

1.2: The PWs

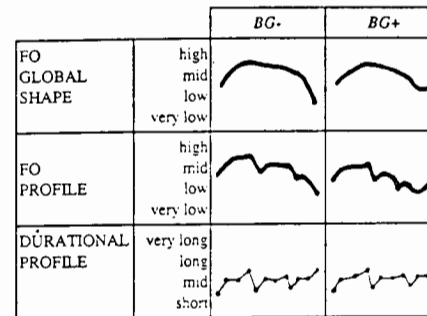|		BG-	BG+
FO GLOBAL SHAPE	high / mid / low / very low		
FO PROFILE	high / mid / low / very low		
DURATIONAL PROFILE	very long / long / mid / short		

Figure 1: The two archetypal BGs and their decomposition into 3 PWs: the "valleys" in Fo and duration correspond to the function words, and the peaks to the final syllables of the PWs and BGs. The idealized curves correspond to BGs composed by 3 three-syllabic lexical words preceded by a monosyllabic function word.

Long BGs are prosodically substructured by an almost regular oscillation of the pitch between the high register and the low register and by durational contrasts. The reaching of the high register and a durational peak roughly corresponds to a PW in French (see Vaissière, 1983 for discussions on other languages).

1) long lexical word often corresponds to a single PW. Semantically related short words tend to be regrouped into a single PW. The tendency to have PWs of equal length in terms of number of syllables in read speech (probably as a consequence of rhythmic behavior) is so apparent in French that it was already included in an early model for speech synthesis (Vaissière, 1971).

2) the detailed Fo and duration profile of each PW depends mainly on the glide associated with the PW final syllable. As agreed by most phoneticians, the choice of a particular glide (rising with anticipation, rising, flat, falling) depends in part on the degree of dependency of the PW with the following PW (the more rising, the more independent). Rhythmic constraints play also role in the choice of PW: each individual speaker tends also to repeat the same PW (Vaissière, 1974:256).

Both the duration and melodic profiles may be described as "rising", from short and low for the function word at the PW beginning to high and long syllables at the PW end (see also Delattre, 1966; Touati, 1987), with a plateau on the intermediate syllable (s).

Figure 1 only represents main tendencies observed in data, and rather correspond to hypothesized archetypical concepts. The acoustic realisation of the PW is obviously disturbed by a number of conflicting influences: (i) a short-long alternation (Duez & Nishinuma, 1984); (ii) longer duration of "heavy" syllables (closed syllables and syllables with nasal vowels) and end of morphemes; (iii) relative lengthening of the penultimate syllable as a mark of several regional "accents" (Carton, 1967); (iv) intrinsic and cointrinsic characteristics influence (as observed in other languages, Di Cristo & Hirst, 1986), and same vowels, such as /e/ are particularly short, even in final position. Nevertheless, the deviations of the Fo and duration profile from the idealized curves seem to be most of the time explicable.

The PW notion corresponds to the traditional notion of "sense group". In terms of size, the PW corresponds to the stress group level in English. Because it does not have a clear anchor point such as a stressed syllable, the PW is probably less salient as a perceptual unit than the tone group, leaving more room for the syllable to play perceptually a more dominant role than in English.

I.3: The CV syllables

The well-noticed perceptual saliency of the syllable as a rhythmic unit in French (Dauer, 1983, Wenk & Wioland, 1982) is probably due to the lack of clear strong beat at the PW level, leading to an apparent uniformity of the syllables. Phonation is also perceived as uniformly particularly tense (no affricates, no lax vowels, not much reduction, no diphthongs and no diphthongized vowels, Delattre, 1966: 323). Each syllable seems predominantly

open and "rising", with the vocal tract opening progressively up to the very end of the syllable, which typically ends with a vowel, with a delayed Fo peak and intensity peak (Delattre, 1966:151), and a strong anticipatory coarticulation effect during the consonant preceding each vowel (Delattre, 1966:122), contributing to a softer attack (onset) of the vowel, as compared to English. The number of **open syllables** prevails in French (76% according to Delattre, 1965:42) and most of the syllables have the simple structure CV (54.9%). Since the simple CV structure is highly repetitive, it is a good candidate to become a pregnant percept (cf the notion of "pregnancy" in the Gestalt Theory). PW and CV percepts coexist, such as the tendencies of giving same length to both the successive PW and the successive CV.

One of the 3 layers may be made perceptually more emergent than the others: isochronous syllables, in carefully spoken speech; same size PW in poetry, and regular BG in rapid, conversational speech. Interspeaker variability may be explained by the fact that each speaker is free to give more or less weight to one of the 3 main tendencies.

It is difficult to "prove" in a scientific way the coexistence of the different percepts in the speaker's mind. The "pregnant" speech patterns stored in speakers' memories are often said to influence the way they perceive the different languages. Delattre's examples of repetition of a sentence in a given language by natives of different languages (1965:23) seem to indicate that the stored basic patterns are very different (quite opposite) for French and English listeners. Results of psychoacoustic experiments on the perception of rhythm in non speech stimuli seem however to reveal that French and English archetypal speech patterns, apparently very different, may be 2 variants of the realisation of a universal pattern.

2: TEMPORAL VERSUS INTENSIVE RHYTHMITISATION

Psychoacoustic experiments on tone bursts have largely confirmed the role of a longer interval or of a elongation of a pulse as a right boundary marker, the role of accentuation (by increase intensity or pitch) as a left boundary marker. They have shown a clear tendency to perceive

the elements inside a grouping (once they have been perceived as grouped) as more isochronous than they actually are (Fraisse, 1956 and 1974 for a summary and references and Allen, 1975). Perception of rhythm in speech seems to rely on the same basic principles as the perception of the rhythm in non speech stimuli.

The perception of intensity, pitch and duration in non speech stimuli (and in speech stimuli) are known to be not independent. For example, when some elements in a isochronous series are made more intense, the majority of listeners perceive the boundary before the accented burst ("rhythmitisation intensive", according to Fraisse, 1956, the listeners associating accentuation with beginning). Not all listeners react in the same way to the same stimuli. One third perceive the accented burst as group final ("organisation temporelle", the accented element is perceived as longer, and consequently as final). Fraisse therefore made the distinction between intensive rhythmitisation (relying on direct interpretation of increased intensity as right boundary marker) and temporal rhythmitisation (more intense elements seems to be lengthened elements, and therefore interpreted indirectly as final). Both rhythms may coexist in the same speech material, where more intense elements are often lengthened and their coexistence makes it more difficult to define rhythm in an easy way. In particular, it is difficult to estimate in some cases whether an accented element marks the beginning or the end of a rhythmic unit.

The inherent ambiguity between accentuation and induced lengthening may explain why French seems to avoid a strong accentuation of final syllables (because accented syllables tend to be perceived as initial), and overlengthening of non-final syllables in the group (because of the association between lengthening and right boundary). It also explains why emphatic stress falls on the word initial syllable, and not on the word final syllable. What makes interpretation of French rhythm more complicated is the fact that while the temporal organization (leading to the interpretation of the final syllable as the accented one) prevails, accentuation rhythm (like in English) marking the word beginning coexist in modern French.

Prominence on final syllables was generally considered to be the rule in non emphatic French. There is however a long series of papers starting in the previous century which question this traditional point of view (see Fonagy, 1980, for a review). Fonagy & Fonagy (1976) have shown that while in conversational speech and story telling, final syllables were perceived as more prominent, in journalistic style, initial syllables were perceived as more prominent in 74% of the cases. The frequent regular use of emphatic stress at the word beginning by the journalists and the politicians is less and less perceived as emphatic, but as a special style. The present-day French prosodic system is in the process of a change and the difficulty of present-day phoneticians on making firm statements on French prosody may be the expression of the on-going change. As a consequence, it is very difficult to make clear statements on French prosody, since there are typically at least two different prosodies.

CONCLUDING REMARKS

The French PW and the English tone group may be interpreted as 2 variants of the same archetypal psychological pattern which associated accentuation with the beginning and lengthening with the end. In English, accentuation is dominant, and lengthening recessive. In French, temporal organisation is predominant, but (initial) accentuation is also intrinsically present (emphatic stress and initial rise), making the study of rhythm a very difficult matter. Progress may come from experiments in non speech stimuli and from investigation on how the same basic psychological constraints are integrated into the prosody and rhythm of diverse languages.

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