LEVELS OF RHYTHMICITY IN FRENCH : A COMPARISON BETWEEN THREE SPEAKING STYLES

Corine ASTÉSANO
Institut de Phonétique, CNRS ESA 6057 "Parole et Langage"
Université de Provence, 29, Avenue Robert Schuman
13621 Aix-en-Provence, FRANCE
Tel: + 33 (0)4 42 95 36 27 ; Fax: + 33 (0)4 42 59 50 96
e-mail : corine.astesano@lpl.univ-aix.fr

ABSTRACT

French rhythmic organization is characterized by a tendency for both accentual and syllabic regularity. This apparent duality results from the tendency in French to produce rather equal rhythmic groups in terms of duration and number of syllables, and when this can not be possible, to balance rhythmic groups by introducing an initial (rhythmic) accent. However, the different levels of timing realization are not equally solicited according to speaking styles. Indeed, we show that the way in which the different levels of prosodic constituency are affected by rhythmicity contributes to put the different speaking styles (from spontaneous to read speech) on a 'metricity' scale.

1. INTRODUCTION

French rhythm is characterized by the coexistence of two complementary accentual tendencies : a (melodic) word-initial accentuation, comparable to English accentuation, and the traditional word- or group-final accentuation marked by lengthening [11, 10, 17, 7].

This apparent 'duality' of French accentuation is complemented by two competing rhythmic tendencies. Like English or Swedish, French is characterized by a tendency to produce regular rhythmic groups (stress-timing), in spite of the strong syllabic weight [9] responsible for the tendency towards syllabic isochrony (syllable timing). This double rhythmic and accentual identity leads us to consider French as a language for which syllabic succession and accentual alternation [1] constitutes its rhythmic specificity.

This view is consistent with more recent propositions on the timing of languages. Indeed, several authors have questioned in the past fifteen years the traditional dichotomy initiated by Pike [16] and propose rather to consider that stress-timing and syllable-timing coexist in languages [3, 4, 6, 9, 17]. This dual timing or rhythmicity has been described for English [3, 4] and for French [18], two languages that have traditionally been opposed prosodically as representing the archetypes of stress-timing and syllable–timing respectively.

Besides, the rhythmicity of a language may vary according to speaking styles. Some authors have maintained that read speech and spontaneous speech are ruled by different organizing principles. The inclination for read speech to favor a metrical organization (i.e. the regularization of inter-stress intervals), and for spontaneous speech to favor a rhythmic organization (i.e. the production of contingent events), in this view, reflects the difference between these two types of encoding processes [14]. It has also been claimed that the differences in encoding processes are also expressed by the predilection for a level of actualization of rhythm, syllables being more isochronic in read speech and breath groups being more regular in spontaneous speech [17]. Guaïtella's and Vaissière's proposals of a clear division between speaking styles [14, 17] implicitly suggest that there is a specific linguistic code for each speaking style.

We do not subscribe to this point of view. On the contrary, we hypothesize the existence of a core linguistic system common to various speaking styles. Stylistic variability would then be expressed by variability in the *degree* of rhythmicity. Moreover, following Couper-Kuhlen [5], we hypothesize that rhythmicity can be found at different levels of the prosodic structure. The way in which the different levels of rhythm actualization are solicited according to speaking styles contributes to the classification of the speaking styles on a 'metricity' scale (from + 'metrical' to – 'metrical' or + 'rhythmic').

This work will attempt to account for the specificities of French rhythm through the comparison of various speaking styles. We thus wish to provide a description of the rhythmic patterns specific to French (core system) as well as the rhythmic variability induced by read and spontaneous speech 's encoding processes.

2. METHODOLOGY

2.1. Methodological frame and observation units

Rhythmicity in French will mainly be studied through the analysis of two levels of metrical constituency : the Prosodic Word (PW) and the Syllable.

The PW level allows us to account for the notions of grouping and accentual alternation, while the Syllable level accounts for the notions of succession and syllabic regularity, considered as characteristic of French rhythm.

The breath group (BG) (delimited by two respiratory pauses) will also be analyzed, as a unit of performance.

Two types of PW, adapted from Di Cristo's model [7], will be considered (Figure 1) :

- the *Simple PW*, constituted by one Metrical Foot (MF) delimited on the right by a final accent located either at a minor prosodic boundary (Word-Final accent : WF) or at a major (Intonation Unit) boundary, either terminal (IU-T) or non terminal (IU-NT). Some PW may thus be congruous to the upper metrical level, the Intonation Unit level.

- the *Complex PW*, constituted of 2 MF, the first MF being delimited on the right by a Word-Initial accent (WI), the second MF being delimited on the right by a final accent (WF, IU-T or IU-NT).

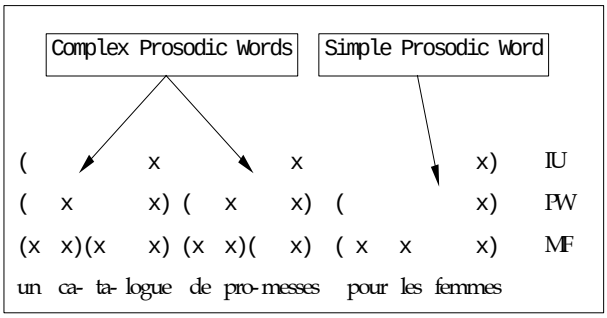

Figure 1. Representation of the levels of metrical constituency, according to the metrical grid representation proposed by Halle & Vergnaud [15]. The utterance is taken from one speaker of the Interview style. (IU : Intonation Unit ; PW : Prosodic Word ; MF : Metrical Foot).

Without fundamentally questioning the notion of metrical foot (MF), we privilege the PW level insofar as it is a unit of rhythmic integration that favors the formation of "accentual arches" (*Arcs accentuels,* [10]). Following Fónagy [10], we believe that, while favoring grouping by an initial (left) marking of a first lexical unit and a final (right) marking of a second lexical unit, the accentual arch is a rhythmic integrator of lexical units. We believe that phonological rules of rhythmic balancing, partaking of eurhythmy by alternating and arranging stressed and unstressed syllables, operate within PWs.

Beside this central rhythmic constituent, we also integrate in our research the constituent of lowest level in the metrical hierarchy, namely the Syllable, and more precisely the unstressed syllable (UN). Psycholinguists have indeed described the unstressed syllable as a 'standard' syllable, the duration of which constitutes a reference in the rhythmic structure of the utterance [12, 13]. It is also supposed to be of relatively stable duration in French, as opposed to stress-timed languages (See [2] for a discussion and for a more detailed presentation of the levels of metrical constituents).

2.2. Material and procedure

2.2.1. Material. Our investigation was carried out on 10 minutes of connected speech, consisting of three speaking styles ((a) reading, (b) radio news broadcast, (c) interview), each involving two speakers. Our speakers are all native speakers of educated standard French.

The reading material (a) consists of a connected paragraph extracted from a story, and was produced by two non professional readers. The radio news broadcast (b) are coherent excerpts produced by professional journalists from one of the French national broadcast stations. Finally, the interview material (c) involved two personalities discussing their work on a French national radio station. We selected a coherent passage of the interview for each speaker, consisting of the answer to a question asked by the journalist. The three speaking styles will henceforth be referred as 'Reading', 'News' and 'Interview' respectively.

The choice of 3 different speaking styles allows us to bring to light the potential invariance as well as the part of variability imputable to the difference in encoding processes (read vs. spontaneous speech). The 'News' speaking style was chosen to illustrate an intermediate speaking style, on a scale going from more spontaneous speech (Interview) to non spontaneous prepared speech (Reading).

2.2.2. Procedure. The recordings were transcribed without punctuation. An expert was asked to locate all perceived prominences, to mark non-terminal and terminal Intonation Unit boundaries.

On a total of more than 2600 syllables, our corpus comprises 786 prominences, i.e. as many Metrical Feet (MF), 630 Prosodic Words (PW) and 156 Breath Groups (BG).

Our experimental procedure is designed to investigate two main points : (1) the rhythmic variability of constituency levels ; (2) the relations between rhythmic reference units.

(1) In order to account for the regularity of events at the same level of constituency, we choose to express the variance at the levels of the unstressed syllable (UN), of the PW and of the BG. This variance is expressed by the ratio of the standard deviation to the mean duration of the constituents (coefficient of variation) and is expressed in percent.

(2) We want to establish the relations of rhythmicity between some reference units ('ground') and variable units ('figure') :

- at the syllable level, we examine the duration ratio between the unstressed syllable and the stressed syllables ;

- at the level of the constituents, we compare the duration of the mean inter-stressed interval with the duration of the entity 'Pause + Pre-pausal syllable' [8]. Unlike Fant et al., however, our inter-stress interval does not comprise the stressed syllable, but only the unstressed syllables located between two stressed syllables.

3. RESULTS

3.1. Constituency and rhythmic variability

One way of evaluating the temporal stability of prosodic constituents is to measure the percentage of dispersion around the mean (in raw duration) of each constituent.

At the syllable level, the duration stability of unstressed syllables informs us on syllabic regularity (syllable-timing).

At the Prosodic Word (PW) level, whether Simple (one MF) or Complex (two MF), the coefficient of variation informs us on accentual regularity, i.e. on the tendency for accents to occur at regular intervals (stress-timing).

Figure 2 displays the coefficients of variation at the various constituency levels, for the three speaking styles.

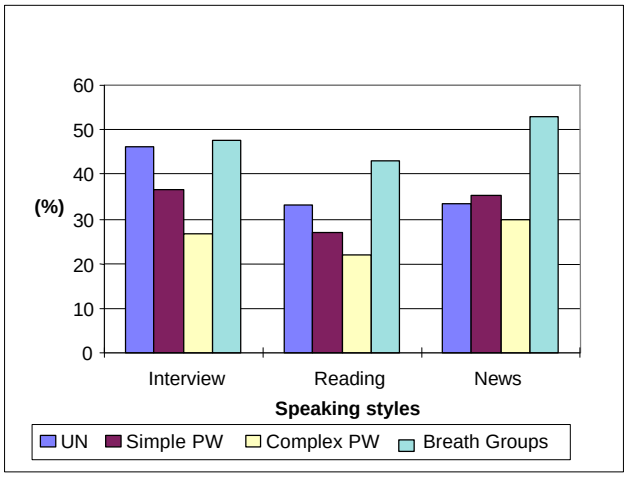

Figure 2. Coefficients of variation (ratio of the standard deviation to the raw duration mean, in percent) and levels of constituency, by speaking styles (UN : Unstressed syllables ; Complex PW : accentual arch).

The results indicate that the variability margin is on average less important at the Prosodic Word level (whether Simple or Complex) than at the Unstressed syllables and Breath Groups levels. This tendency is in agreement with stress-timing or accentual isochrony in French [9]. Within the PW level, Complex PW are clearly more regular than Simple PW, specifically when considering the Interview style. These results lead us to consider that the standard or reference rhythmic unit could be the Complex PW, thus granting the accentual arch a major role in the rhythmic cohesion of word groups.

Furthermore, the Breath Group level is the most variable and thus does not seem to constitute a privileged rhythmic unit even for spontaneous speech as was proposed by [17].

It is interesting to note that the Reading style presents a lesser variability than the News and Interview styles respectively, at all levels of the prosodic hierarchy. This statement leads us to conclude that what distinguishes read speech from spontaneous speech is not so much the choice of a specific level of rhythm actualization [17], but rather the tendency for read speech to express regularity at all levels of the prosodic hierarchy. The difference in encoding processes is thus manifested by the *degree* of regularity (variance span) and by the *superposition* of the levels of rhythmicity.

3.2. Reference units of the rhythmic organization

One may assume that the role of the Unstressed Syllable as a reference syllable is less important for spontaneous speech, since the variability is greater at this level for this speaking style (cf. § 3.1). One may also assume that the contrast between unstressed and stressed syllables may be more or less important according to speaking styles. Now, when calculating the ratio between the duration of stressed syllables (all accentual categories combined) and the unstressed syllables for each speaker, the same result comes up (1.7) irrespective of speaking styles. The Unstressed syllable thus fully represents a reference value for the rhythmic structure of utterances, including for spontaneous speech. The proportion it maintains with stressed syllables does not contribute to the rhythmic distinction between speaking styles. This figure (1.7) corresponds exactly to the results Fant et al. [9] obtained for read sentences in French.

It appears that the main distinction induced by the difference between encoding processes lies in the organization of grouping and pauses. Thus, still according to Fant et al. [8, 9], a rhythmically sensitive reader tends to plan pauses + associated prepause lengthening to be of proportional length (multiple integer) to mean inter-stress intervals ('free foot').

Our own reference inter-stress intervals are delimited by Word-final accents, closer to what Fant et al. call the 'free foot', since it is generaly never followed by a pause. We choose the mean duration of accent category UI-NT as prepause syllable (co-occurrent to prepause lengthening in French), since they are followed by pauses by over 80% of the cases in our corpus.

Results show that all speakers, except the male speaker of the Interview style, have clear rhythmic balancing strategies. Analysis of the results concerning the News speaking style as well as the female speaker of the Interview style show that there is a relation of proportional duration between the rhythmic units, the pause + prepause syllable being twice as long as the mean rhythmic inter-stress interval. For the Reading style, this relation is triple, pauses for this speaking style having a much greater duration than the other speaking styles (around 600 ms compared to 300 ms).

According to Fant et al. [8, 9], the tendency to produce rhythmic units in a proportional relation to one another is an indication of stress-timing in French, accentual isochrony being highlighted by pauses. This tendency is not restricted to reading, but extends also to professional speech and partly to spontaneous speech.

4. DISCUSSION AND CONCLUSION

Our investigation was designed to test 3 hypotheses :

(1) Stress-timing and syllable-timing coexist in French ;
(2) A core linguistic system is common to speaking styles ;
(3) Stylistic variability is expressed by the degree of rhythmicity at various levels of the prosodic structure, which contributes to the classification of speaking styles on a 'metricity' scale.

Our results are in agreement with the predictions inferred from our hypotheses. Indeed, we showed that the tendency to regularize inter-stress intervals is characteristic of French rhythm along with and in competition with the tendency for syllable-timing : the most obvious example is the Reading style for which both aspects strongly interact (cf. § 3.1). The greater duration stability of Complex Prosodic Words for all speaking styles and particularly for the Interview style lead us to seriously question the traditional prosodic descriptions of French as a syllable-timed language mainly characterized by 'boundary lengthening'. On the contrary, it appears that stress-timing may be even more salient than syllable-timing, especially for spontaneous speech.

Our second hypothesis concerning the existence of a core linguistic system is also verified. Indeed, our results show that some rhythmic 'figures' are common to the three speaking styles. First, rhythmic balancing is a general tendency (see § 3.2) : at the syllable level, the relation between stressed and unstressed syllables show a constant duration ratio (1.7), while at the group level, the relation between rhythmic constituents (PW and Pause + prepause syllable) is proportional, irrespective of speaking styles. Secondly, the Complex Prosodic Word appears to be a major reference rhythmic unit in the prosodic structure, since it is the most stable constituent across speaking styles. This lead us to consider the Complex PW as a proper metrical constituent in the French linguistic system.

Thus, concerning our third hypothesis, it appears that some parameters of the linguistic system are common to speaking styles, the stylistic variability affecting only the *dimensions* of these parameters. Therefore, in the light of our results, we can not subscribe to the hypothesis according to which read speech favors a 'metrical' organization (regularity) whereas spontaneous speech favors a 'rhythmic' organization (variability) [14]. Rather, our results show that speaking styles are located on a continuous 'metricity' scale : metrical and rhythmic tendencies seem to coexist to various degrees and at different levels throughout speaking styles. More precisely, Reading presents a greater regularity at all levels of prosodic constituency, whereas the Interview style, representative of spontaneous speech, demonstrates some sort of regularity mainly at the level of the Complex PW. The difference in encoding processes is thus manifested by the *degree* of regularity and by the *superposition* of the levels of rhythmicity. It is interesting to note that the News style is intermediary between the Reading and the Interview styles with respect to rhythmicity. It thus appears that the 'metricity' scale is somehow congruous to the 'spontaneity' scale (cf. 2.2.1).

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