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Focus, phrase length, and the distribution of phrase-initial rises in French

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Abstract

This study addresses the relationship between information structure and intonation in French. More specifically, it tests whether phrase-initial rises (LHi) are associated with the left edge of contrastively focused constituents in *wh*-interrogatives. Since LHi distribution has also been correlated with length, the study further examines the relative contribution of constraints operating at two distinct levels: information structure and phonological structure. The results show that each set of constraints makes an independent contribution to the occurrence of LHi, but with no interaction. In other words, LHi is more likely to occur at the left edge of a contrastive focus domain, and more likely to occur in longer phrases, though phrase length does not influence the extent to which LHi marks focus. The findings of this study represent the first quantitative assessment of focus realization in French in a non-corrective context, and establish a previously undocumented link between LHi and discourse-level meaning.

Index Terms: French, intonation, focus, information structure

1. Introduction

In French, utterances are parsed into a series of phrasal units, which minimally consist of a prosodic word (typically a content word plus zero or more associated functional items) and define the domain of stress and tone assignment. It is generally agreed that these units are obligatorily marked by a prominent F0 rise near the end of the phrase, and optionally include an additional F0 rise near the beginning of the phrase.

In this paper, we analyze the structure of these phrasal units within the autosegmental framework of [1] and [2]. In that framework, the structure of *accentual phrases* (APs) and their constituent early and late rises can be described by a sequence of high and low tones. The late rise, or *final accent*, consists of a low plus a high tone (denoted by LH*) and is associated to a metrically strong syllable that is typically the last full syllable of the phrase (excluding word-final schwa). The early rise, or *initial rise*, also involves a sequence of low and high tones (denoted by LHi) but is doubly associated to a syllable near the beginning of the phrase (typically either the first or second syllable of the first content word occurring in the phrase) as well as to the left edge of the AP [3]. Since LH* is obligatory, a minimal AP consists of the LH* sequence, while a maximal AP would consist of the sequence LHiLH* (see Figure 1). Other well-formed and attested sequences include LLH*, LHiH* and HiLH*.

It is generally accepted for many languages that utterances may be partitioned into information that is part of a *background*, in the sense of being shared by interlocutors, and information that is part of a *focus*, in the sense of being presented by the speaker as either novel or contrastive. In French, the extent to which such a partition is reflected in the prosodic signal has not been fully resolved. Previous work in this regard emphasizes the role of contrast in emphatic or corrective contexts. Typically, the focused element is said to be marked by a single rising-falling contour, which is distinct in various respects from either the early or late rise, and which may be realized on either final or non-final syllables in the phrase. For [4], for example, this is the *accent d'insistance*. For [1] and [2], it is the *focus accent*, or *Hf*, which they show experimentally to consist of a rise that is both higher and aligned later than a typical AP-final accent in a broad focus context. The region following the contrastive element, or the *post-focal* region, is often characterized by the absence of prominent pitch movements [1, 4, 5, 6]. The *pre-focal* region, by comparison, retains the early and late rises associated with rhythmically regular phrasing and in this sense is not markedly different from the broad focus pattern, though there is some evidence that this region may be associated with a compressed pitch range [1, 5, 7] and a reduced number of phrase boundaries [7]. [8] explores the marking of focus in question-answer contexts. While no quantitative findings are presented, the study suggests an overall tendency for a focus to be phrased as a single unit. The pre-focal region also shows this tendency, though a syntactic subject is generally phrased separately regardless of its relationship to the focus.

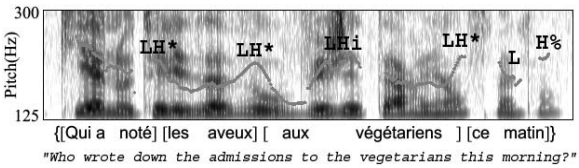

Figure 1: F0 trace, spectrogram and intonation labels for one speaker's production of a target sentence (*PP-focus long)*.

It is generally agreed that the transition from the focal region to the post-focal region is readily identified in French on the basis of post-focal deaccenting (for polar interrogatives, a high plateau). The extent to which the *left* edge of a focus region is prosodically marked, however, remains an open question. In general, the pre-focal and focal regions are regularly phrased into APs (subject to conditions of rhythm and syntax). Therefore, the transition between them cannot be reliably identified on the basis of LH* alone. Given the tendency for foci to be phrased as a unit [8], however, an extended stretch of unaccented material might in principle serve to mark a kind of minimum boundary for the leftward extension of a focused region. Assuming probabilistic constraints on the maximum size of a phrase, however, such outputs are predicted to be dispreferred for larger foci except in very fast speech. It remains to be tested, therefore, whether other intonational features might serve to mark this boundary.

Widespread agreement on the prosodic hierarchy of French is limited to the distinction between a single lower level unit and a single higher level unit (e.g., the *accentual*

phrase and *intonational phrase*, respectively). A number of recent studies, however, have raised the possibility that an intermediate level of phrasing exists for French, which may be recruited for demarcative functions at the level of syntactic or pragmatic constituency. [9] and [10], for example, provide evidence for an intermediate level of phrasing at the boundary between a syntactic subject and a VP, whose domain is marked by systematic tonal scaling relationships between the F0 peaks of its constituent AP-final accents. Moreover, [11] show that the distribution of initial rises (initial accent or *IA* in that work) is correlated with syntactic constituency for contrasts involving attachment ambiguities. Thus, for the sequence *les bagatelles et les balivernes saugrenues* ('the crazy trifles and nonsense') the adjective *saugrenues* ('crazy') may be interpreted as modifying only the second NP (1a), or as modifying both the first and second NPs (1b).

(1) a. [*les bagatelles*] [*et les balivernes saugrenues*]
b. [*les bagatelles et les balivernes*] [*saugrenues*]

Higher rates of initial rises were observed on the adjective when taking wide scope (1b), suggesting that this feature is recruited to mark the stronger syntactic boundary occurring between the second NP and the adjective in that case. Correspondingly, more initial rises were observed at the left edge of the second NP when the strong syntactic boundary occurs at the NP1-NP2 juncture (1a). The authors suggest that this correlation may reflect a more general tendency for initial rises to mark an intermediate level of phrasing, which may in turn be sensitive to constituency in other domains.

If [11]'s suggestion is correct, then there is reason to suspect that the distribution of initial rises may be linked to information structural boundaries. Indeed, [12] found evidence that initial rises are more likely to occur in APs whose left edge coincides with the left edge of a focus region. The current study addresses this issue directly through a controlled production experiment involving *wh*-interrogatives with focus domains of varying sizes. In contrast to earlier studies, the materials used in this study were not designed to evoke corrective or emphatic meaning. Thus, the feature being targeted in our study is not the *accent d'insistance* of [4] or *Hf* of [1] and [2], which generally occurs alone within an AP, but the initial rise (LHi), whose distribution is limited to phrases which also bear a final accent (LH*).

We hence assume a notion of contrastive focus in which a set of two or more closely related utterances are partitioned into information that is either shared or not shared between them. We further assume that such interpretations are likely to occur in contexts in which sets of utterances related in this way are uttered in close sequence. Contrastive focus is typically discussed in connection with declarative utterances, though theories of focus interpretation typically extend readily to other types of utterances including interrogatives [13, 14]. For the current study, it is sufficient to assume that a series of question-answer pairs like those in (2) is predicted to induce a focus partitioning as indicated by F-marking.

(2) A: Who wrote [the music]$_F$ for *South Pacific*?
B: Rodgers.
A: Who wrote [the lyrics]$_F$ for *South Pacific*?
B: Hammerstein.

We now turn to the distributional properties of initial rises. The initial rise has often been characterized as optional, since APs are frequently observed without it. Known predictors of its occurrence, however, include speaking rate, number of syllables in the phrase [1, 2, 15], and morphological status (e.g., content versus function word). [11] found a simultaneous association to syntactic constituency and number of syllables in the phrase, which they take as evidence that the demarcative function of initial rises is first and foremost a prosodic one. Building on their model, then, our study seeks to characterize the distribution of initial rises along two dimensions. In addition to testing for an association with the left edge of focus, we simultaneously varied the length, in number of syllables, of the word units being phrased into APs. [16] show that in English, probabilistic constraints on the accentability of certain part-of-speech categories lead to a reduced tendency for nuclear accent placement to encode focus. If it is the case that phrase length represents a similarly probabilistic constraint on the realization of initial rises, such that phrases with fewer syllables are less likely to include them, then one conceivable outcome is that phrase length and focus will interact as predictors of initial rise. When a phrase is very small, for example, then initial rise may be so dispreferred that focus will have little effect on the likelihood of its occurrence. In the extreme case, initial rises on one-syllable phrases may not be well-formed. By comparison, longer phrases may actually require initial rises for rhythmic or structural reasons [17], and thus the occurrence of initial rise may be insensitive to focus in a different way.

In summary, our study seeks to address the following questions. First, to what extent is the left edge of a contrastive focus region systematically marked in French, and what role does initial rise play in this encoding? Second, what are the factors affecting the distribution of initial rises? Are they truly 'optional' as is often assumed, or can the variability in their distribution be explained by constituency at other levels of description? Finally, to what extent do constraints from distinct levels of the grammar (i.e., prosody and information structure) interact? Do they make equal contributions to the likelihood that initial rise will occur, or do constraints from one level interfere with the ability of initial rise to encode constituency at another level?

2. Methods

2.1. Materials

The materials in our study consisted of 24 pairs of subject-extracted wh-interrogative sentences beginning with the word *qui* 'who'. Crucially, these included a direct object consisting of a noun phrase followed by a prepositional phrase. The noun phrase and the prepositional phrase each consisted of a single functional item (either an article, a preposition or a prepositional contraction) followed by a noun. Each target sentence then occurred in one of two versions, according to the constituent length of the *second* noun (underlined): either *short* (2 syllables) as in (3a) or *long* (4 syllables) as in (3b). Target sentences in a pair were identical in all other respects.

(3) a. *Qui a commandé le merlan aux <u>navets</u> ce soir?*
'Who ordered the whiting with turnips this evening?'
b. *Qui a commandé le merlan aux <u>macadamias</u> ce soir?*
'Who ordered the whiting with macadamias this evening?'

Target sentences were produced as the second of a series of three information-seeking questions. Thus, as outlined in Section 1, specific patterns of focus were induced by manipulating the *scope* of correspondence between the target sentence and the questions occurring before and after it. In the DO-focus condition (4), for example, the domain of the

focus is predicted to be the entire direct object (DO), since the surrounding context suggests that the DO is the relevant point of contrast. In the PP-focus condition (5), the domain of focus is limited to the prepositional phrase. Thus, each *item set* occurred in four conditions: DO-Focus/short, DO-Focus/long, PP-Focus/short and PP-Focus/long.

(4) DO-Focus (short)

i. *Qui a commandé l'entrecôte ce soir?*
'Who ordered the rib steak this evening?'
ii. *Qui a commandé [le merlan aux navets]$_F$ ce soir?*
'Who ordered the whiting with turnips this evening?'
iii. *Qui a commandé les gambas ce soir?*
'Who ordered the shrimp this evening?'

(5) PP-Focus (short)

i. *Qui a commandé le merlan à la sauce citron ce soir?*
'Who ordered the whiting with lemon sauce this evening?'
ii. *Qui a commandé le merlan [aux navets]$_F$ ce soir?*
'Who ordered the whiting with turnips this evening?'
iii. *Qui a commandé le merlan aux câpres ce soir?*
'Who ordered the whiting with capers this evening?'

The resulting 96 experimental items were divided among four versions balanced for condition. 10 filler items, consisting of a variety of question types (including polar, object-extracted *wh*-, etc.) were included as distractors.

2.2. Procedures

Participants were seated in a sound-attenuated booth with a conversational partner (native speaker of French). They were asked to pose each question to their partner "as naturally as possible" and then record the response on a sheet of paper. Preceding each item, a short context was read aloud by the participant. This served both to fix the interpretation of the lexical items comprising the targets and to help the participants situate themselves in the speaking role.

Recorded target sentences were aligned at the level of words, syllables and phonemes using EasyAlign [18]. Target sentences were labeled by the authors for the presence and syllable association of the following features:

- AP-final accent on the lexical verb (**V**)
- Initial rise on the first NP (**I1**)
- AP-final accent on the first NP (**F1**)
- Initial rise on the second NP, within the PP (**I2**)
- AP-final accent on the PP (**F2**)

There is generally good agreement regarding the identification of AP-final accents in French. It is widely assumed, for example, that they are characterized by a prominent F0 rise that reaches a peak at or near the end of the final full syllable of a content word. Typically, syllables bearing a final accent also have longer rhyme durations [19]. Identification of final rises was therefore based primarily on a combination of pitch track inspection and coder assessment of overall prominence. Only prominent rises in word-final positions were counted as final accents, allowing for the possibility that F0 peaks may occur just after the end of the AP-final syllable.

There is less agreement regarding the identification of initial rises. Since initial rises are typically not associated with rhyme lengthening, overall prominence is not a reliable measure. Furthermore, the pitch movements associated with initial rises may be less marked than for final accents, and may therefore be difficult to distinguish from perturbances in the rises or falls of adjacent final accents. We therefore took a conservative approach, counting as initial rises only those F0 movements that bore clear evidence of an independent high tonal event. In general, this means that qualifying features included a rise from an identifiable low target, followed by a trough preceding an ascent to the peak of a following final accent (i.e., the characteristic LHiLH* pattern of [1] and [2]). Rises preceding a final accent were counted as initial rises if they minimally reached a peak or plateau early in the associated syllable and showed evidence of a subsequent fall that could not be explained by microprosodic perturbances. Rises following a final accent of the previous AP were counted as initial rises if the peak of the preceding final accent was reached within the AP-final syllable, <u>and</u> either (i) a second peak was reached or (ii) there was a stable plateau extending from the peak of a preceding final accent more than 50% of the way into the following syllable. Initial rises are typically associated with the first or second syllable of the first content word within an AP [15], though it has been informally noted that they may also occur on a function word preceding the first content word. Initial rises meeting the above criteria were observed in all three positions (i.e., function word, first syllable, and second syllable of the content word).

2.3. Participants

Two male and two female speakers participated in this task either voluntarily or for pay. All were first language native speakers of a continental variety of French.

3. Results

Speakers produced a wide range of patterns in the target region, though a final accent occurred on V in approximately 90% of all productions, and a final accent occurred on F2 in 95% of productions. Thus, most of the variability concerned the status of I1, F1 and I2. Overall, initial rises occurred at I1 in 21% of all productions, and 75% of these occurred on the first syllable of the noun, while 25% occurred on the function word. Final accents occurred on F1 in 84% of productions. Finally, initial rises occurred on I2 in 39% of all productions. Of these, 38% occurred on the first syllable of the noun, 51% occurred on the second syllable of the noun, and 11% occurred on the function word.

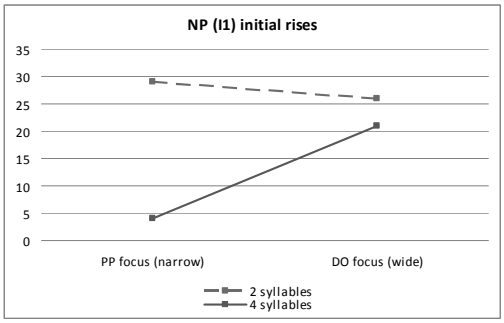

Figure 2: Percentage of targets bearing initial rise at I1 by Focus and Constituent Length.

Initial rises were more frequent at I1 when this coincided with a focus left edge (DO-Foc: 32%, PP-Foc: 18%) and when the second noun was short (2-syllable: 37%, 4-syllable: 15%), though as Figure 2 suggests, the effect of Focus appears to be larger when the second noun is long. A mixed effects linear regression analysis (treating Focus and Length as fixed effects and items as random effects) found Length, but not Focus, to be significantly correlated with the likelihood of initial rise at I1 ($p<0.05$) with no interaction.

At I2, initial rises were more frequent when a focus edge occurred there, but in comparison to I1, they were also more frequent when the second noun was long (2-syllable: 30%, 4-syllable: 83%). A second regression analysis found both effects to be significant at the $p<0.05$ and $p<0.1$ levels, respectively. As with I1, there was no significant interaction of Focus and Length, suggesting that each factor makes an independent contribution to the likelihood of an initial rise.

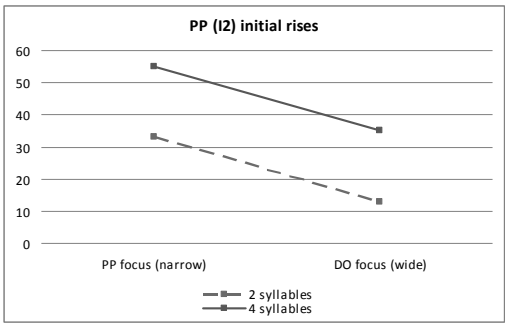

Figure 3: Percentage of targets bearing initial rise at I2 by Focus and Constituent Length.

4. Discussion

The above findings establish a new link between initial rises in French and the marking of information structure. Specifically, they suggest that initial rises may serve to mark the left edge of contrastive focus regions, given that this transition is otherwise obscured by the occurrence of rhythmically regular phrasing into APs. Initial rises were not reliably linked in our study to focus edge marking at the verb-DO boundary, though the trend in the data suggests that this association may be supported by further data collection. Alternatively, this could be due to other factors. First of all, with respect to the presence of a focus edge, the experimental manipulation differed for this position (I1) as compared to the DO-internal position (I2). At I2, the experiment manipulated whether the relevant position was at a focus left edge or *internal* to the focus, while at I1, the experiment manipulated whether that location was at a focus left edge or *external* to it (i.e., in the pre-focal domain). Second, the two positions differed in terms of the syntactic boundary that was present. It remains to be tested, for example, whether the juncture between a verb and a direct object enforces special constraints on prosodic structure that may impact the amount of variability that is permitted with regard to early rises.

An additional issue concerns the detection of initial rises. In this study, a conservative method was used that relied primarily on inspection of the F0 contour. As noted earlier, however, the effect of initial rises on the F0 contour may be concealed by the effects of adjacent rises. As a result, some initial rises may have gone undetected. Indeed, this is consistent with the authors' impressions: there were many cases where other acoustic properties of the syllable suggested the presence of an initial rise, but the associated position could not be labeled as such since it did not meet the established criteria. An additional correlate of initial rise appears to be lengthening of the onset of the associated syllable. Thus a more sensitive coding system would take into account the effect of initial rise in multiple acoustic dimensions.

By another measure, the reliability of our coding system is supported by the fact that a significant correlation was found between the prosodic features being measured, and a known predictor of initial rise (i.e., phrase length). In other words, there is good evidence in our data that the prosodic features our study links with focus left edges correspond to the same category treated elsewhere as initial rises.

Our study addresses the association between initial rises and focus in production, but additional research is needed to determine whether this association is utilized in perception. Finally, while it has been suggested that the demarcative function for initial rise is mediated by an intermediate level of phrasing, this study does not address this issue directly. Additional research is needed to determine whether independent evidence for intermediate phrase constituency can be linked to the type of alignment with information structure discussed here.

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