TITLE: The Status of the Initial Rise as a Marker of Focus in French

AUTHORS: James Sneed German$^{1,2,3}$ and Mariapaola D’Imperio$^{2,3,4}$

$^1$Nanyang Technological University, Singapore

$^2$Aix-Marseille Université, Aix-en-Provence, France

$^3$Laboratoire Parole et Langage, Aix-en-Provence, France

$^4$Institut Universitaire de France

ACKNOWLEDGEMENTS: This research was partially supported by a grant from the Agence National de la Recherche [ANR-06-BLAN-0044]. We would like to thank the members of PROGRAM for their many valuable insights and contributions throughout the development of this study. We especially thank Amandine Michelas for her invaluable assistance with the materials and analysis, Anne Tourtellle and Pauline Peri for their role in recording and data collection, and Charmaine Hon for her assistance with labeling.

CORRESPONDING AUTHOR’S ADDRESS:

James Sneed German
Laboratoire Parole et Langage
BP 80975
13604 Aix-en-Provence, France

Email: james.german@lpl-aix.fr

Tel.: (+33)(0)4 13 55 36 34
Fax: (+33)(0)4 13 55 37 44
ABSTRACT

This study addresses the relationship between information structure and intonation in French. Using an interactive speech production experiment, we tested the hypothesis that the French initial rise (LHi) is used to mark the left edge of a contrastively focused constituent. Since the occurrence of the initial rise is also known to be sensitive to the length of an Accentual Phrase (AP), we manipulated AP length within the same experiment in a 2x2 design. This allowed us to explore the issue of whether the initial rise represents a true marker of focus in the traditional sense, or whether the association is less direct. The results show that both focus and phrase length make contributions to the distribution of the initial rise, but with no interaction. We argue that these findings are incompatible with a model that assumes a direct mapping between focus and the initial rise, and that the relatively weak association can nevertheless be informative in a model of interpretation that integrates multiple probabilistic inputs to initial rise occurrence. These findings represent the first quantitative experimental assessment of focus realization in French in a non-corrective context, and establish a previously undocumented link between the initial rise and discourse-level meaning.
INTRODUCTION

Research on the relationship between focus\(^1\) and intonation is largely driven by what is known from Germanic languages such as English or Dutch. The prosodic phonology of French, however, differs from those languages in a number of important ways, and the differences have consequences for the way the interface is studied. For example, primary stress at the word-level is generally word-final in French, though whether such stress is realized or not depends on a word’s position in the phrase; as such, pitch prominence, metrical lengthening, and other correlates of stress are primarily determined by position within a phrase (Dell, 1984; Jun & Fougeron, 2000, 2002). As in many languages, prosodic phrasing in French is sensitive to a wide range of factors including lexical, syntactic, phonological, and stylistic ones (Rietveld, 1980, Lucci, 1983; Pasdeloup, 1990; Delais, 1995; Jun & Fougeron, 2002). Compared to languages like English then, in which a pitch accent may be assigned to different words within a phrase depending on the location of focus, intonational prominence in French cannot be as readily interpreted as a consequence of pragmatic functions like focus.

A few phenomena relating information structure and prosody have been widely observed and pose relatively little challenge for our understanding of French. One example is the extreme pitch range compression that occurs to the right of a contrastively focused constituent in

---

\(^1\) Not all authors agree on the proper ontology of terms like “focus”, “contrastive focus”, “information focus”, etc., and it should be noted that our study mainly concerns a specific notion of contrastive focus, which we define explicitly further along. For the time being then, we use the term *focus* rather loosely to refer to the general phenomenon whereby an utterance is partitioned into two parts, such that one part (the *focus*) is understood as semantically instantiating the other (the *background*) in a way relevant to the current discourse. Where appropriate, we distinguish as carefully as possible among the various related phenomena.
declaratives (Jun & Fougeron, 2000; Touati, 1987; Clech-Darbon, Rebuschi & Rialland, 1998; Dohen & Lœvenbruck, 2004; Di Cristo & Jankowski, 1999) and that closely resembles post-focal deaccenting in English. In both languages, such deaccenting effectively serves to mark the location of the right edge of a focused constituent. A few authors (Di Cristo, 2000; Féry, 2001; Astésano, Bard & Turk, 2007) have also suggested that a focused constituent may be marked at its left edge by a specific intonational feature, which we refer to here as the Initial Rise (IR)\(^2\). To date, however, no study has tested this hypothesis experimentally.

According to Jun and Fougeron’s (2000) analysis, which we provisionally adopt here, the basic unit of phrasing in French is the Accentual Phrase (AP). This unit is characterized by a prominent f0 rise at its right edge (primary stress) accompanied by pre-boundary rime lengthening (Delattre, 1966; Pasdeloup, 1990; Jun & Fougeron, 2000). The Initial Rise (IR) is an additional f0 rise occurring at the left edge of the phrase (Jun & Fougeron, 1995, 2000; Welby, 2006) and is accompanied by onset lengthening (Pasdeloup, 1990; Mertens, 1992; Astésano, 2001; Astésano et al., 2007). While the phrase-final rise, or Final Rise (FR), is generally assumed to be an obligatory feature of AP in the default case, the occurrence of the Initial Rise is associated with a high degree of variability, and has often been characterized as “optional”.

Figure 1 illustrates the same AP both (1a) with and (1b) without an Initial Rise.

\(^2\) This feature has been given different labels by different researchers, including “initial accent” (Astésano et al., 2007), “initial rise” (Jun & Fougeron, 2000, 2002; Welby, 2006) and “initial high tone” (Féry, 2001). For convenience, we adopt here the terminology of Jun and Fougeron (2000, 2002) and Welby (2006).
(a) ![Image](image1.png)
(b) ![Image](image2.png)

**Figure 1.** F0 traces for two productions of the phrase *en genévrier* (‘out of juniper (wood)’) realized as a single AP either (a) with both an Initial Rise (LHi) and Final Rise (LH*), or (b) with only a Final Rise (LH*).

While some studies treat the IR as ‘optional’, others have shown that its occurrence is sensitive to a wide range of factors including speaking rate (Lucci, 1983; Jun & Fougeron 2000, Welby 2006), speaking style (Fonagy 1980, Vaïssière 1974), segmental composition (Fonagy, 1980; Lucci, 1983), and the length or phonological weight of the AP (Lucci, 1983; Jun & Fougeron 2000, Welby 2006). Astésano et al. (2007) showed that the occurrence of the IR was simultaneously (i.e., within the same experiment) sensitive to both syntactic constituency (high versus low attachment for postmodifying adjectives) and the length of the phrase. Given that the IR is sensitive to so many factors, an important issue for our study is not only whether an association between focus and the IR exists, but also how strong the association is and how it may depend on other factors. Assuming it is found that the occurrence of the IR does depend on focus in a statistically significant way, in other words, we leave open the question of whether it is a true *marker* of focus in the traditional sense of exhibiting a one-to-one correspondence. We consider instead whether the relationship may be better characterized as part of a complex, probabilistic, interaction among many competing associations.
To address these issues, we conducted a speech production experiment, in which the discourse context was manipulated to evoke specific patterns of contrastive focus in the target utterances. Following Astésano et al. (2007), we simultaneously manipulated phrase length by varying the length of the lexical items that occurred in the target phrases. Unlike that study, though, syntactic structure was held constant. This allowed us (i) to directly test for an association between the IR and focus, and (ii) to gauge the extent to which that association is influenced by a factor that is already known to condition the occurrence of the IR. In other words, we tested whether the occurrence of the IR is primarily driven by focus, which is predicted if the IR is a marker of focus, or else whether phonological constraints are as strong or possibly stronger in determining IR distribution. The latter finding would suggest a rejection of the (deterministic) focus-marking view, in favor of a more probabilistic account in which the IR-focus association is conditioned by independent, and competing, phonological constraints. Wh-interrogatives were used as target utterances, since these provide a good balance in terms of sensitivity to the pragmatic context, control over intonational variation, and naturalness of the task. Specifically, we explored the information-structural properties of the non-wh portion of interrogatives by evoking contrastive focus on specific constituents and then examining how this affects left edge prominence. We discuss how our findings are expected to generalize beyond interrogatives given that focus is widely assumed to operate on the same semantic principles across utterance types.

In the remainder of this section, we provide an overview of the phonological and distributional properties of the IR, followed by a discussion of key proposals regarding the prosodic realization of focus in French and the interpretation of focus in wh-questions specifically. The main finding of the study is that the occurrence of the IR is positively correlated
with the left edge of a contrastively focused constituent. This provides a degree of empirical support for a number of earlier proposals claiming that such a relationship exists. However, as in Astésano et al.’s study, the occurrence of the IR was also sensitive to the length of the AP, and no statistical interaction was found between focus and length as predictors of the IR. We argue, therefore, that the IR is not a marker of contrastive focus, per se, but that it plays only a limited role in signalling focus constituency.

The Phonetics, Phonology and Distribution of the Initial Rise in French

Phonological characteristics of the Initial Rise. The distribution of pitch prominence in French is largely determined by phrasing at the level of the AP. While this unit goes by different names in different accounts, there is general agreement on a level of phrasing, smaller than the Intonation Phrase (IP), which typically encompasses at least one content word plus any associated functional items (esp. articles or prepositions). Furthermore, most accounts draw a distinction between at least two types of tonal events in connection with this unit. As its name suggests, the Final Rise (FR) is associated with the end of the AP at a location corresponding to the primary stressed syllable, and is characterized by a prominent f0 rise, lengthening of the preboundary syllable (in particular, its rime), as well as other correlates of stress (Jun & Fougeron, 2000, 2002). Primary stress in French is realized on the final syllable of an AP unless this syllable is reduced (Dell, 1984; Jun & Fougeron, 1995, 2000). Since this position generally coincides with a word boundary, it follows that most primary stressed syllables in (standard) French are word-final.
The term initial rise generally refers to a prosodic event that occurs on the first or second syllable of the first content word in an AP and is characterized primarily by an f0 rise in that location. Most analyses distinguish between two types of phrase-initial rise, which differ in terms of both form and function (esp. Rossi, 1984; Di Cristo, 1999). The first type is typically associated with emphatic or corrective functions and goes by different names including the *accent d’insistance* (Di Cristo, 1999), the *emphatic IR* (Astésano, 2001), or the *focus accent* (H, Jun & Fougeron, 2000, 2002). The second type is more closely associated with basic phrase-level structure. For Jun & Fougeron (2000, 2002), for example, it is part of the default structure of an AP. In other accounts, the location of this *secondary* initial rise is specified in the lexical entry of a word, and the rise is manifested in connection with either rhythmic or (non-emphatic) pragmatic functions including focus-like highlighting (Di Cristo, 1999; Astésano, 2001; *i.a.*). Phonetically, the first type of initial rise is associated with a more prominent f0 rise than the second (Jun & Fougeron, 1995, 2000, 2002; DiCristo, 1999; inter alia). Astésano (2001) also shows that while both types involve onset lengthening of the syllable carrying the rise, the first type (or *emphatic IR*) involves greater onset lengthening than the second (or *secondary IR*). Additionally, the emphatic initial rise involves rime lengthening while the secondary rise does not. In our study, we restrict our attention to just the latter, non-emphatic type of initial rise, and we reserve the use of “IR” specifically for that phenomenon.

Different proposals treat the phonological status of the IR in different ways. In addition to the views already mentioned, Post (2000) argues that IRs are essentially FRs that have been

---

3 However, if the first content word has more than three syllables, they may appear later. Specifically, there is a tendency for initial rise to appear on the second syllable of words that lexically begin with a vowel (Mertens 1992, Pasdeloup 1992, as cited in Post 2000). See Post (2000) for a discussion.
displaced following erasure of the right AP boundary with which they are associated underlyingly. In other words, a FR is shifted leftward (from a word-final position) in order to increase the distance from other accents with which it shares a phrase (i.e., to avoid accent “clash”) as a consequence of restructuring. On that view then, IRs have the same properties as FRs. Other evidence, however, suggests that IRs are phonologically and phonetically distinct from FRs. Dell (1984) has suggested, for example, that IRs do not correspond to a unique stress location, while Astésano (2001) showed that rhythmic IRs lack rime lengthening, which is typical of FRs.

As Figure 1a illustrates, it is possible, and in fact typical, for IR and FR to occur together within a single AP. In Jun and Fougeron’s (2000, 2002) autosegmental-metrical model, the underlying structure of an AP is assumed to be a sequence of low and high tones LHiLH* corresponding to the combination of the IR (LHi) and the FR (LH*). Thus, the default composition for an AP is LHiLH*, while variants include LLH*, LHiH*, and LH* (i.e., a FR only). In their model, the FR is a pitch accent that is aligned to the last stressed syllable of the AP, while the IR is a phrase accent that aligns with its left edge.

One of the most notable properties of the IR is its high variability of occurrence within the AP as compared to the FR. This has led many to treat the IR as a “secondary” (Pasdeloup, 1990; DiCristo, 1999) or “optional” feature of the AP (Post, 2000; Jun & Fougeron, 2000). Fonagy (1980) suggests a number of factors that may influence IR occurrence, including the tendency for an IR to be more common in exclamatory or imperative utterances, as well as more frequent in reading, conference or broadcast style than in spontaneous speech. Segmental factors identified by Fonagy include a tendency for the IR to occur more often following stops versus liquids, more often on nasal vowels than oral vowels, and more often in closed syllables than in open
ones. The IR also tends to occur more often in slow speech than in fast speech (Jun & Fougeron, 2000; Welby, 2006). One of the most reliable predictors of IR occurrence appears to be phrase length. In a production study, Welby (2006) varied the number of syllables in the content word of the AP and found that the number of syllables, as well as the overall time duration of the AP, were both very good predictors of IR occurrence. Using each factor in turn as the independent variable in a regression model resulted in an accuracy of 79.5% and 76.2%, respectively, when compared against the experimental data. Finally, the IR can occur minimally on a bisyllabic word (Mertens, 1992; Portes, D’Imperio & Lancia, 2012), without preventing the occurrence of a final rise. Overall, existing findings therefore support the idea that the IR and FR represent distinct phonological events, and that accent clash does not explain the occurrence of IR as suggested by Post (2000).

Phonetic characteristics of the Initial Rise. Phonetically, the IR does not appear to induce rime lengthening in the syllables on which it occurs (Pasdeloup, 1990; Astésano, 2001; Portes et al., 2012), a fact which distinguishes it both from the emphatic initial rise and from the FR (Astésano, 2001). Several studies have also found a correlation between the presence of the IR and onset lengthening (Pasdeloup, 1990; Mertens, 1992; Astésano, 2001; Astésano et al., 2007; Portes et al., 2012). Together, these facts lend further support for the IR’s role as an initial boundary phenomenon (Fougeron & Keating, 1997) that is structurally distinct from the FR. They also suggest that onset lengthening, as an objectively measurable phonetic correlate of the IR, provides a potentially useful diagnostic for its presence. Other known phonetic properties of the IR are based on tonal alignment measures. Welby (2006) showed experimentally that the IR
has a stable timing association with the boundary between the last function word and the first content word in an AP\(^4\).

*Other determinants of Initial Rise distribution.* Astésano et al. (2007) explicitly tested the role of the IR in marking syntactic boundaries. By comparing identical strings under different patterns of syntactic attachment, their study showed that the IR is more likely to occur at the edge of a syntactic constituent than inside one. Crucially, the length of the lexical items involved was at least as important as syntax for the occurrence of the IR. Pairing this finding with evidence from durational contrasts, the authors conclude that the IR is ultimately a marker of prosodic constituency, and that its apparent role in marking syntactic constituency follows indirectly from the alignment of phrasing and syntax. Their evidence points most strongly to the AP (or Phonological Phrase in their account) as the relevant level, though the IR was slightly more likely at an Intermediate Phrase boundary. The authors suggest that the recruitment of prosodic phrasing, and therefore the IR, as a marker of constituency is likely to generalize to other levels of description besides syntax, including information structure. A few studies have suggested a possible relationship between focus and the IR, and these are discussed in detail in the sections that follow. To date, however, there is no experimental evidence for the claim that the distribution of the IR can be systematically explained by information structure.

**Focus and Prosody in French**

A few experimental studies have explored the prosodic and phonological effects of various types of focus in French. Jun and Fougeron (2000) report that in a corrective context (or “incredulous

\(^4\) Specifically, the low tone target of the initial rise showed this association. The high tone target showed no particular timing association to any position.
“echo-question” in their terminology), the contrastive element is realized with a contour that is both higher and aligned earlier than a typical final rise in a broad focus context. Additionally, they found a marked reduction in f0 variation and f0 range in the region following the focused element, suggesting a suppression or erasure of the tonal features that usually appear at that location. This widely observed phenomenon (Touati, 1987; Clech-Darbon et al., 1998; Dohen & Lœvenbruck, 2004) is often referred to as deaccentuation or dephrasing, though Jun and Fougeron (2000) show that such regions maintain their durational cues to phrasing, and thus may not be appropriately characterized as “dephrased”. There is also some evidence that the region preceding the corrected constituent undergoes a moderate degree of pitch range compression (Jun & Fougeron, 2000; Dohen & Lœvenbruck, 2004; also observed in Touati, 1987) as well as reduced articulatory movements (Dohen, 2005).

Such well-established observations are drawn largely from highly specialized pragmatic contexts, involving correction or insistence, for example, and concern primarily phonetic, rather than phonological, cues. A more general notion of focus can be characterized by the fact that it is used to “indicate the presence of alternatives [in the discourse context] that are relevant for the interpretation of linguistic expressions.” (Krifka, 2007: 18). Focus may be used, for example, to establish coherence between the wh-phrase in a question and the constituent that corresponds to it in the answer (Hamblin, 1973; Rooth, 1992). The notion of contrastive focus may be distinguished by the fact that the indicated alternatives are used to establish parallels among different utterances by distinguishing those portions of the utterances that differ (the foci) from those that do not.

Proposals that address these more general notions of focus in French can be distinguished by which level of (phonological) description is considered basic to the phenomenon. Di Cristo (1999, 2000), for example, assumes a formal status for the last major prominence in an utterance,
or nuclear accent. In contrastive contexts\(^5\), a focused constituent “attracts” the nuclear accent to its rightmost edge, which is followed by deaccentuation up to the end of the utterance. Such a view is broadly in line with the so-called Focus-to-Accent approach (Gussenhoven, 1983; Ladd 1996/2008, i.a.) widely adopted for Germanic languages, in that (i) the notion of a focus is formally independent of the locations of pitch accents, (ii) a focus can encompass a constituent larger than a single word, and (iii) the placement of pitch accents is determined by rules relative to a particular choice of focus.

Di Cristo (1999, 2000) explicitly suggests a role for the Initial Rise in marking focus. In his account, the IR and FR are both included in the lexical representations of words, but their relative prominence may be either promoted or suppressed by various rhythmic or functional processes. Specifically, constituency of various kinds, including focus, may give rise to bipolarisation, a process which promotes the prominence of rises lying at the extremities of the constituent so marked. The account distinguishes between different types of initial rises based on the function for which they are recruited (e.g., rhythmic vs. emphatic); most types of focus fall within a single broad functional category (contrast), which is linked to rhythmic IR.

Féry (2001) argues that for French, (informational) focus is not marked intonationally per se, but rather that it is one of a number of grammatical factors, including syntax and phonology, that together govern the distribution of phrases in a non-deterministic and variable manner. In that view, syntax determines a “neutral” phrasing which is largely respected even under different patterns of focus. Under certain circumstances, the default phrasing may be overridden, as when, for example, a narrow focus on the syntactic subject results in total dephrasing (roughly

---

\(^5\) For Di Cristo (2000), information focus is argued to be inherently contrastive, and is therefore considered to be a subcase of contrastive focus.
equivalent to deaccentuation) of the postfocal portion of the sentence. She suggests that there is a weak tendency for the focused constituent to be phrased as a unit. The role of IR is similarly indirect. Féry notes a variable tendency for the IR to occur near the beginning of a focus domain, though she suggests that this tendency may be related to the size of the domain, such that a narrow focus is more likely to be marked by the IR, while “unmarked or wide focus is often only indicated by the presence of a final falling tone” (Féry, 2001: 26). This latter suggestion is interesting given that the IR has been shown to be more likely to occur in longer phrases (Post 2000, Jun & Fougeron 2000, Astésano 2001, Welby 2006). Compared to Di Cristo’s view then, Féry’s proposal is distinguished by the fact that phrasing, and not the distribution of specific intonational units, is the principal correlate of focus constituency. Similar to the view of Astésano et al. (2007), focus contributes jointly with other factors to the distribution of phrases, and accents/rises are a reflex of phrasing.

In English, the rules of pitch accent assignment generally require that just a single primary prominence (i.e., a nuclear pitch accent) be assigned to any one focused constituent. This is typically the internal argument if one is available (Selkirk 1986, 1995; Schwarzschild 1999; inter alia), which in English also tends to lie furthest to the right. In general, then, the location of a nuclear pitch accent provides a reliable cue to the position of the right edge of a focused constituent, but provides little or no information regarding the left edge of that constituent. As a result, certain pitch accent patterns give rise to a kind of ambiguity, since there may be more than one pattern of focus that is consistent with a particular nuclear pitch accent pattern. It has been suggested that the distribution of prenuclear pitch accents may play a role in this regard, though findings have been mixed. Welby (2003) found in a perception experiment that the presence of a prenuclear pitch accent had little effect on whether an utterance was judged to be an appropriate
response to a question targeting narrow focus. More recently, however, Bishop (2013) showed using a prominence rating task that the location of the left edge of the focus constituent affects a listener’s perception of prominence, while a cross-modal priming task showed that utterances were more easily processed when prenuclear accents corresponded to the left edge of the focus constituent. Bishop’s findings provide strong evidence that prenuclear pitch accents are an important and available cue for marking the left edge of focus in English, and the strength of that association presents an interesting point of comparison for the present study.

On Féry’s view, French is more reminiscent of Basque or Japanese in terms of the role played by phrasing. In Basque, for instance, corrective focus is signaled by introducing an intermediate phrase boundary before the Accentual Phrase corresponding to the focus (Gussenhoven, 2004). Japanese seems to employ a very similar mechanism in order to signal both presentational and corrective focus (Pierrehumbert & Beckman, 1988; Gussenhoven, 2004). Since French also marks the right edge of a focus as in English (via deaccenting of the post-focal material), the possibility that IR reliably marks the left edge of a focused constituent suggests that ambiguities related to the size of the focus may be less prevalent than in languages that do not mark the left edge.

The key issue for the relationship of the IR to focus is therefore variability. Among other reasons, independent evidence suggests that the IR is sensitive to a wide range of factors from different sources and levels of grammar. This raises the question of how robust any association with focus could be in the face of multiple competing influences. Previous accounts agree that the association of the IR with focus is highly variable, though none has made claims regarding the strength of the association or the type of model that could provide for such variability. Our study therefore not only represents an explicit test of the IR-to-focus association, but it allows us
to explore the organization of the grammar by comparing the strength of the association against another known predictor of IR, namely phrase length. It can also reveal the extent to which the strength of IR-focus association is actually conditioned by such factors.

**Wh-interrogatives in French (Qu-interrogatives)**

*Prosodic characteristics of French wh-interrogatives.* In our study, we tested whether the IR is associated with a contrastive focus occurring in French wh-interrogatives, specifically, those beginning with *qui* (‘who’). In French, wh-interrogatives generally begin with a high f0 on the wh-word, which Di Cristo (1998) analyzes as a pitch accent. Like declaratives, wh-questions generally have a final falling contour (Delattre 1966, Di Cristo 1998), though Smith (2002) found some variability in this regard, including some speakers who produced final *rising* contours as often as 80% of the time (see also Beyssade et al., 2007). A typical pattern is illustrated in **Error! Reference source not found.** for one of the sentences elicited in our study.

**Figure 2.** F0 trace for a production of the sentence *Qui a commandé le merlan aux macadamias ce soir?* (‘Who ordered the whiting with macadamias this evening?’). The label *Hq* shows the location of the high f0 target associated with the wh-word *qui* (‘who’). Subsequent peaks associated with Final Rises (*H*) have a somewhat lower f0 value.
Note that the initial high rise on *qui* (labelled here as *Hq*) is followed by a series of Final Rises corresponding to AP boundaries, which are generally lower than the initial high rise itself. In our own previous elicitation studies (German & D’Imperio, 2009) we observed that when a relatively short verbal complex (e.g., *commandé* ‘has ordered’) follows *qui*, the first AP boundary will usually occur after the lexical verb. For the purposes of our study, the relative invariance of this initial portion of the wh-question pattern allowed us to more reliably assess the contribution of the effects of focus and length on the target regions that immediately followed. It should also be noted that in the example in Error! Reference source not found., the final phrase *ce soir* (‘this evening’) ends with a rising intonation much like the pattern observed in Smith (2002) and Beyssade et al. (2007).

*Information structure in wh-interrogatives.* Wh-interrogatives have long played an important role in the exploration of focus effects in answers. The discussion of focus effects *within* questions, however, has largely been limited to the issue of whether or not the wh-element itself constitutes a focus. Culicover and Rochemont (1983), Lambrecht and Michaelis (1998), and others, for example, have argued that the wh-element is necessarily a focus, while Erteschik-Shir (1986) suggests that the choice of focus (or Dominance in her framework) is independent of whether the sentence contains a wh-element, and that a focus therefore may or may not include the wh-element, depending on the context. Roberts (1996, p. 21) notes that “the set of alternatives proffered by a question may depend in part on its prosody”. Such effects are clearly evident from examples like (2), where (2ii) with the nuclear stress on *Melanie* is felicitous in the context of (2i), but (2ii’) with nuclear stress on *invite* is not.
(2)  
i. Who invited who?  
   ii. Who did MELANIE invite?  
   ii'. #Who did Melanie INVITE?  

Büring (2003) extends the notion of congruence among sets of questions in his account of contrastive topic. In that account, the interpretation of a contrastive topic utterance is a structured set of Questions Under Discussion (what both Büring and Roberts refer to as a *strategy*). The contour associated with (3), for example, marks the fact that the utterance is part of a discourse in which the set of questions \{Who did Melanie invite?, Who did Tom invite?, etc.\} is salient.

(3)  Melanie invited Joe  
      L+H* L-H% H* L-L%  

Crucially, these questions may be either explicit or implicit, and while Büring’s proposal is intended to account specifically for the intonational marking of declaratives in such contexts, the intuition is clear – *discourses may involve sets of similar questions that are related to each other systematically based on the substitution of alternative semantic values for a specific constituent.* We take this assumption as a point of departure for the design of the materials used in our study. Furthermore, we assume along with Rooth (1992), Roberts (1996), Büring (2003) and others that a general notion of focus operates on the same semantic principles for both declaratives and interrogatives. Formally, focus operators can be introduced at any level in the syntactic structure; the result of computing a focus semantic value over a whole sentence will yield a set of semantic objects having the same semantic type as the sentence itself. This means that the focus interpretation of a sentence like (4) is a set of questions of the form “Who did X invite?”.
(4) Who did [Sue]$_F$ invite?

If interpreted contrastively, this is accompanied by a presuppositional constraint that (i) at least one member of the set is salient in the discourse, but (ii) that member is not equivalent to the question (4) itself. In other words, (4) is licensed in a discourse in which at least one of \{Who did Melanie invite?, Who did George invite?, etc.\} is salient.\(^6\)

At least two studies take up the issue of prosody and information structure in interrogatives in French specifically. Hamlaoui (2011) accounts for the choice of raised versus in-situ wh-phrases on the basis of an interaction between constraints on focus marking on the one hand, and generalized alignment constraints on phrases and heads on the other. Crucially, the possibility of focused constituents outside of the wh-element is provided for in that account, and the location of final prominence is assumed to have consequences for the set of available focus interpretations. Like Hamlaoui then, our study sets aside the issue of whether the wh-element is itself a focus, and we instead emphasize the information structural properties of the non-wh portion of a question. Whereas Hamlaoui’s study concerned only the role of right edge prominence in marking focus, our study explores the possibility that left edge prominence is also associated with focus in interrogatives. In our materials, the predicted location of the rightmost prominence was held constant.

Beyssade et al. (2007) propose a general treatment for the intonational properties of both wh-interrogatives and polar interrogatives in French, whereby the phrase accent of a nuclear contour associates to the left edge of an XP that contributes the domain restriction in a structured meaning-based interpretation (Krifka, 2001). In their analysis, this principle accounts for the

---

\(^6\) Von Stechow (1991) specifically discusses the focus interpretation of sentences like (2ii) in a structured meanings approach, though the differences in the two analyses are both complex and tangential to the goals of this study.
high f0 marking (and incidentally, also the low f0 marking) that they observed on the wh-element in their materials. Beyssade et al. do not take up the issue of wh-questions that are marked for focus.

Our analysis differs from Beyssade et al. since following Jun & Fougeron (2000, 2002), we do not assume the notion of a nuclear contour. Additionally, we follow Roberts (1996), Erteschik-Shir (1986), Hamlaoui (2011) and others in assuming that a wh-question may contain a focused constituent. The issue of whether such focus is marked prosodically is what we are explicitly testing. According to the definitions above, we assume that the focus interpretation of (5) is a set of question meanings formed by substituting different values for the focused element (as in (6)), accompanied by a presupposition that such a set is saliently available in the discourse context.

(5) Qui a commandé le merlan [aux navets]F ce soir?

‘Who ordered the whiting with turnips this evening?’

(6) i. A: Qui a commandé le merlan à la sauce citron ce soir? – B: C’est Marie.

‘Who ordered the whiting with lemon sauce this evening?’

ii. A: Qui a commandé le merlan aux navets ce soir? – B: C’est Suzanne.

‘Who ordered the whiting with turnips this evening?’


‘Who ordered the whiting with capers this evening?’

Thus, the focus interpretation of (5) is readily satisfied in a discourse like (6), where such alternatives are explicitly mentioned. We further assume that a contrastive focus interpretation is
made salient by a context like (6), much in the way that a question-answer pair saliently suggests a specific focus interpretation for its answer.

 Goals of the Study

Our study seeks to explicitly test whether the Initial Rise marks the left edge of a focus constituent in wh-interrogatives in French. Given that the occurrence of the IR is highly variable and subject to strong influence from other factors, our study seeks to explore how focus compares against other predictors of the IR. To do this, we elicited speech data that controls for both the size of the focused constituent (specifically, how far leftward it extends) and the length (in syllables) of the prosodic phrase it comprises, simultaneously in a 2x2 factorial design. While it is known that syntax plays an important role in the distribution of the IR, that issue is not explored in our study. Instead, syntactic structure was held constant for all target utterances in our study. This allowed us to isolate the effect of focus on IR occurrence and compare it against the effect of its strongest known predictor, namely phrase length. If the IR is very robustly associated with the left edge of focus, then there is evidence that it is a marker of focus along the lines of the Focus-to-Accent approach. If, however, the role of focus is conditioned strongly by phrase length, then it is unlikely that the association is due to such a direct mapping. Instead, this would suggest a more probabilistic view whereby IR is used and interpreted in conjunction with other conditioning factors and cues to focus. It would also provide indirect support for the view of Astésano et al. (2007) and others that the IR is primarily a reflex of prosodic constituency, and that its association with other types of constituency arises only indirectly.

As already discussed, wh-interrogatives have special prosodic characteristics. Since focus interpretation is predicted to be independent of utterance type, however, we expect our findings to largely generalize to other utterance types including declaratives. Indeed, wh-questions are
common in speech and are therefore deserving of exploration in their own right. Additionally, a common criticism (usually mentioned only informally) of elicitation studies based on Question-Answer Congruence is that direct answers to wh-questions are rarely expressed as full sentences and that it may be unnatural to do so. By contrast, it is more typical for wh-questions to be expressed with a full sentence. As a means for exploring focus effects experimentally then, wh-questions may prove to be the better tool. In our study, we seek a reasonable compromise between control and naturalness by having our participants use scripted wh-questions to request information from another person as part of a cooperative task. In this way, we are able to engage participants in a truly communicative action while maintaining control of the speech materials.

METHODS

Materials

The target materials in our study consisted of 24 pairs of wh-interrogative sentences. All began with the word qui (‘who’), which targeted the syntactic subject. In addition, all sentences included a direct object consisting of a noun phrase followed by a prepositional phrase (PP). Each noun in the first phrase (NP1) was preceded by an article. Each noun in the second phrase (PP) was preceded by a monosyllabic word that was either a preposition or a preposition plus a definite article contraction (e.g., $au = à ‘to/at’ + le ‘the (masc.)$’, $aux = à ‘to/at’ + les ‘the (pl.)’$). The length of the AP corresponding to this PP was manipulated by varying the number of syllables in the noun it contains, which we refer to as “NP2”. These had either two syllables (short) as in (7a), or four syllables (long) as in (7b).
Pairs of target sentences were identical in all other respects. In particular, the first noun always consisted of two syllables. All target nouns (i.e., those in NP1 and NP2) either lexically began with one of the voiced consonants /l/, /m/, /n/, /r/, /v/, /z/, or began with a vowel but were preceded by a function word that resulted in one of /zl/, /n/, or /l/ being the syllable-initial consonant by liaison (as in les arènes /le.za.re.n/ ‘the arenas’) or by cliticization (as in à l’agent /a.la.zɑ̃/ ‘to the agent’). Additionally, all but two of the target nouns included a voiced continuant or nasal in the onset of the second syllable of the noun. These conditions were applied as filtering criteria to the lexical database Lexique (New, Pallier, & Ferrand, 2005), and the resulting list was used to construct sentences that were judged by three native speakers of French to be natural when in context.

In the experiment, target sentences appeared as the second in a series of three wh-interrogatives. The sentences appearing before and after the targets had the same overall frame as the targets, but differed with respect to the contents of either just NP2 as in (8), or the entire direct object comprising both NP1 and the PP as in (9).
In this way, different patterns of focus were obtained for the same target. For (8ii), for example, the contrastively focused portion of the sentence is predicted to be the prepositional phrase (PP) aux navets, since (8i) and (8iii) differ from (8ii) only in the value of that syntactic constituent. By comparison, the focused portion of (9ii) is predicted to be the entire direct object le merlan aux navets, since (9i) and (9iii) have entirely different direct objects. In essence, this manipulation altered the expected location of the left edge of the focused region, while leaving the right edge of the focus constant.
Through a manipulation of both the length of the target and the size of the contrastively focused portion, each pair of target sentences yielded a total of four conditions as illustrated in (10), for a total of 96 items.

(10)  Narrow focus/short:  Qui a commandé le merlan [aux navets]F ce soir?
      Narrow focus/long:  Qui a commandé le merlan [aux macadamias]F ce soir?
      Wide focus/short:  Qui a commandé [le merlan aux navets]F ce soir?
      Wide focus/long:  Qui a commandé [le merlan aux macadamias]F ce soir?

Finally, all sentences in the target sequences ended with a temporal adverbial phrase such as ce soir (‘this evening’) or la semaine derniere (‘last week’), etc. As shown in Smith (2002), wh-interrogatives may end with either L% or H%. The presence of the adverbial phrase thus serves to create a distance between the target region and the final edge tone at the end of the utterance. It is therefore expected to help minimize the effects of at least one source of variability.

The items were divided into four counterbalanced lists in which each sentence appeared in only one of the four conditions. Each list also included twelve filler items that consisted of interrogatives of varying types, including polar interrogatives and wh-interrogatives, but excluding those beginning with qui. Each list occurred in three distinct pseudorandomized orders.

Participants

Twelve speakers, five male and seven female, participated in the study for paid compensation. Their ages ranged from 18 to 35 years of age. All were native, first-language speakers of French, had spent the majority of their lives in France, and had completed a university degree or were
pursuing one at the time of the study. All were judged by a trained phonetician and native speaker of French to have used a standard variety of French during the experiment.

**Experimental procedures**

To collect subjects’ productions, an interactive task was used. This task involved both the main participant and a “naïve” experimenter, who was selected in advance and trained by the experimenters to provide consistent, neutral responses, but who was not aware of the specific goals of the study. The main participant was allowed to believe that the naïve experimenter was recruited in the same manner and had not previously taken part in the study.

At the start of the experiment, the participant was provided with written instructions stating that he or she would be assigned to the role of *interviewer* and would be working together with an *interviewee* (the confederate) to accomplish several tasks. For each task (corresponding to one experimental item), the participant was given additional instructions regarding specific pieces of information that he or she would need to request from the *interviewee* (the confederate), and was informed that the interviewee would have “all the information necessary to provide the answers.” Each task was set within a role-playing context, a description of which the participant read aloud at the start of each task. This step was taken in order to provide additional semantic support for the lexical items appearing in the targets. Below the text of the short context, three questions appeared on separate lines, followed by three lettered answer choices. The participant would pose a question from the list out loud and wait for a response from the interviewee. Once the response was given, the participant was instructed to write the letter for the correct answer next to the question. This was repeated until all three questions had been asked and answered. At the beginning of the experiment, the participant was instructed to ask each question as naturally as possible, using the exact wording written, though they were free to add extra words such as *et*
“and”, *alors* “then; so”, *puis* “then”, etc., before or after each question. Appendix A provides an example of one complete trial including the context and answer choices.

Both the participant and interviewee were seated at a table facing one another inside a sound-attenuated chamber. The participants’ speech was captured using an AKG C520 headworn microphone and recorded onto a Zoom HD16 at a sampling rate of 44.1 kHz. The extracted target sentences were phonetically aligned in PRAAT (Boersma and Weenink, 2013) using the EasyAlign plug-in (Goldman, 2011), and the alignment was subsequently hand-corrected by a research assistant trained in phonetics. A total of four tokens were repeated by participants at the end of the experiment because the target sentences were initially read incorrectly. Five tokens were excluded from the analysis after the experiment due to disfluencies that interfered with labelling, such as laughing or long hesitations. Thus, the total number of trials used in the analysis was 283, with each containing two target words for a total of 566 possible IR locations.

**Analysis**

Two separate analyses were carried out on the resulting sound files and textgrids. First, both authors independently annotated each target sentence for the presence of Final Rises and Initial Rises within the target region (the NP1 and NP2, plus the preceding lexical verb). The primary measure of interest was the mean rate of IR occurrence on each of NP1 and NP2, as well as the overall pattern of phrasing and tonal realization. Following Jun & Fougeron (2000, 2002), we identified the FR based on the presence of a prominent f0 rise that reached a peak at or near the end of the final syllable of a content word, with some allowance for f0 peaks that occur just after the end of the final syllable. Since the FR is also associated with general prominence including rime lengthening and loudness, overall perceived prominence was used in a small number of cases where it was difficult to resolve the f0 contour. We further assumed that all instances of the
FR corresponded to AP boundaries and did not, therefore, attempt to assess the presence of AP boundaries independently.

There is less agreement regarding the identification of Initial Rises. Among other issues, the f0 peaks associated with the IR are often lower than those for the FR (Jun & Fougeron, 2000), and they are therefore more difficult to distinguish from microprosodic perturbances arising from segmental effects. Especially when an IR is adjacent to a FR, it can appear similar to a perturbation in the rise associated with the FR. Since IRs are typically not associated with syllable rime lengthening, overall perceived prominence is not a reliable alternative. We therefore took a conservative approach, counting as IR only those f0 movements that bore clear evidence of an independent high tonal event. Following the diagnostic characterizations outlined in Jun and Fougeron (2000, 2002) and Welby (2006), such evidence consisted of (i) an f0 rise from a low value near the beginning of the content word, followed by (ii) a trough, followed by (iii) a second rise to the peak of the Final Rise. This is, in other words, the characteristic AP pattern consisting of LHiLH* shown in Error! Reference source not found.a. Jun and Fougeron (2000, 2002) and Welby (2006) also describe AP patterns with no L intervening between the initial and final rises (LHiH*). Thus, an IR was also counted in cases where f0 reached a peak or plateau early in a non-final syllable and showed evidence of a less pronounced fall or a continued plateau (as in Error! Reference source not found.a) that (i) could not readily be explained by microprosodic perturbances and (ii) could not be readily interpreted as the interpolation of a single LH leading up to the end of the AP (as in Error! Reference source not found.b).
Figure 3. Productions of two phrases illustrating f0 contours that were either counted as having an Initial Rise (a) or not having an Initial Rise (b). (L) indicates an undershot low tone. Both utterances occurred in a Narrow Focus condition with a short NP2 (i.e., the focus is on the PP that is to the right of mémolmerlan).

The two sets of labeled files were compared and assessed for inter-labeler reliability. All tokens for which the two labelers disagreed were labeled by a third labeler, who is a trained phonetician and a native speaker of French. The combined consensus tokens plus the outcomes from the third labeler were used for the final analysis. For NP1 targets, inter-labeler reliability with regard to the presence of the IR was found to be Kappa=0.75 (95% CI: 0.68, 0.83), while for NP2 targets, reliability was Kappa=0.85 (95% CI: 0.79, 0.91). An outcome above Kappa=0.75 is considered “substantial” or “excellent” according to common guidelines (Landis & Koch, 1977; Fleiss, 1981), and our estimates are comparable to those found in studies on English when only the presence or absence of a pitch accent was considered (Kappa=0.89 for Yoon, Chavarria, Cole & Hasegawa-Johnson, 2004, e.g.). A total of 53 targets (9.4% of the total) were labeled by a third labeler.

Jankowski et al. (1999) used inspection to distinguish between the two major types of phrase-initial rises (emphatic and rhythmic/non-emphatic). Based on a similar set of criteria, we observed only one type of initial rise in our dataset, which matched closely with the existing
descriptions of the rhythmic or non-emphatic type. According to Astésano (2001), the emphatic rise should differ from the non-emphatic rise in terms of both the presence of rime lengthening and the degree of onset lengthening of the associated syllable. In order to further rule out that such a distinction existed in our data, therefore, we explored the subset of targets classified as having an IR to see whether any phonetic evidence could be found for more than one group. Additionally, since syllable onset duration is known to be associated with the IR, we tested whether this measure was correlated with our classification of the presence versus absence of IR (which was based exclusively on inspection of the f0 contour). All duration measures were extracted automatically from the corrected TextGrids.

**Predictions**

Based on the contextual manipulation, we assume that the left edge of the contrastive focus region will occur at the NP1-PP juncture in the Narrow Focus conditions, and at the verb-NP1 juncture in the Wide Focus conditions. If the IR is associated with focus, then at the left edge of NP2, an IR should occur more often when the focus is Narrow than when it is Wide, whereas at the left edge of NP1, an IR should occur more often when the focus is Wide than when it is Narrow. Since IR is thought to be linked to the left edge of the AP, these predictions are effectively conditionalized on the presence of an AP boundary at the NP1-PP juncture (or the V-NP1 juncture in the case of NP1)\(^7\). In case of significant variability in that regard, different

\(^7\) Note, however, that if the claimed association between IR and focus is taken at face value, such that IR is a direct marker of focus, then the prosodic organization of the utterance should bend to the requirements of focus realization. In other words, if an IR is needed for focus marking, and IR only occurs at an AP boundary, then focus should require the presence of the relevant AP boundary. While the issue of phrasing is clearly important, our study could be viewed as a test of this more basic hypothesis without considering the different phrasing choices separately.
phrasing choices would need to be treated and analyzed separately. Since Féry (2001) suggests that focused constituents tend to be phrased together, it was expected that there might be fewer AP boundaries at the NP1-PP juncture in the Wide Focus conditions that in the Narrow Focus conditions. In the end, however, we observed almost no variability in this regard in that nearly all tokens included AP-boundaries at these two junctures. Our analysis therefore excludes the small number of cases that lack the relevant boundaries.

As the role of syntax is not being explored in our study, it should be emphasized that the relevant comparisons here are within a given syntactic position (either NP1 or NP2). The contextual manipulation we used leads to predictions for both syntactic positions, so we report both sets of results in the interest of comprehensiveness and corroboration. Syntactic structure was identical across all conditions, and all items appeared in all conditions. For the comparisons we are interested in, therefore, any experimental effects cannot be attributed to the syntactic status of a particular boundary.

IR occurrence is also predicted to be affected by differences in phrase length. Specifically, when the PP comprises an entire AP, an IR should occur more often on that phrase when NP2 is long than when it is short. The length of NP1 was held constant, so the effect of length on that constituent depends on whether NP1 and the PP form a single AP or separate APs. In the former case, an IR is predicted to occur on NP1 more often when NP2 is long than when it is short. In the latter case, the prediction is more nuanced: If the IR is a feature of the AP only, then the occurrence of an IR on NP1 is not predicted to depend on the length of NP2. If, however, the IR is a feature of a larger constituent such as the Intermediate Phrase, then a dependency is possible, since NP2 would be contributing to the length of the higher level constituent, of which NP2 forms a part.
On the assumption that the effect of phrase length on IR occurrence is driven by a rhythmic or clash-based constraint, then a further prediction can be made: When NP2 is very short, as it is in the 2-syllable condition, then an IR should be unlikely in all focus conditions. In other words, the effects of the clash should dominate, and an IR should be very rare and relatively insensitive to focus. When the noun is longer, so that phonologically it readily supports the presence of an IR, then the occurrence of IR should be comparatively more sensitive to the effects of focus. In other words, a rhythmic account predicts that the occurrence of IR on NP2 will show an interaction with regard to phrase length and focus, such that the effect of focus is greater when NP2 is long than when it is short (i.e., the rate for Narrow should be greater than Wide by a larger amount for long than for short NP2). A direct corollary of this is that the effect size of length should be larger for narrow focus than for wide focus.

RESULTS

Observed patterns

Table 1 summarizes the most common patterns that were observed. Overall, IR occurred on NP1 in 34% of trials and on NP2 in 58% of trials. The pattern of phrasing was highly consistent, in that FR occurred on the verb in 97% of all tokens, on NP1 (and thus an AP boundary at the NP1-PP juncture) in 96% of all tokens, and on NP2 in 100% of tokens. Several patterns are not shown, including those lacking an FR on NP1 (11 tokens).
Table 1. Breakdown of tokens by the pattern of Initial Rise (IR) placement on words in the target region, and by focus/length condition.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Narrow/short</th>
<th>Narrow/long</th>
<th>Wide/short</th>
<th>Wide/long</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>LH*</td>
<td>LH*</td>
<td>LH*</td>
<td>LH*</td>
<td></td>
<td>108</td>
<td>38.2%</td>
</tr>
<tr>
<td>NP1</td>
<td>(P NP2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LH*</td>
<td></td>
<td>LH*</td>
<td>LH*</td>
<td></td>
<td>65</td>
<td>23.0%</td>
</tr>
<tr>
<td>NP1</td>
<td>(P NP2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LH*</td>
<td>LH*</td>
<td>LH*</td>
<td>LH*</td>
<td></td>
<td>52</td>
<td>18.4%</td>
</tr>
<tr>
<td>NP1</td>
<td>(P NP2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LH*</td>
<td>LH*</td>
<td>LH*</td>
<td>LH*</td>
<td></td>
<td>40</td>
<td>14.1%</td>
</tr>
<tr>
<td>NP1</td>
<td>(P NP2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All other patterns</td>
<td>2</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>18</td>
<td>6.4%</td>
</tr>
<tr>
<td>Overall</td>
<td>72</td>
<td>71</td>
<td>71</td>
<td>69</td>
<td>283</td>
<td>100%</td>
</tr>
</tbody>
</table>

Effects of Focus and Phrase Length

Overall, the pattern of IR occurrence as a function of focus and phrase length was closely in line with our predictions. As Figure 4 shows, the mean proportion of IR occurrence within NP2 was higher when the focus was on the PP (Narrow), regardless of whether the noun was long or short. Additionally, the frequency of IR was higher overall for long target nouns than for short ones. A mixed logistic regression model treating focus and length as fixed factors, and participants as a
random factor\textsuperscript{8} was fitted to the data. The results are summarized in Table 2. Both focus and length were found to be correlated with the likelihood of IR occurrence with no interaction\textsuperscript{9}. This is closely in line with predictions based on the assumption that an IR is more likely both near the left edge of a focus constituent, and in longer APs. The lack of an interaction, however, suggests that the conditioning effects of length on IR occurrence are not due to accent clash\textsuperscript{10}.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure4.png}
\caption{Mean proportion of Initial Rise occurrence for NP2 by focus and noun length.}
\end{figure}

\textsuperscript{8} Including items as a random factor did not significantly improve the fit of the model according to a likelihood ratio test ($\chi^2=1.86$, $p=0.17$). Fixed factors that did not improve the model include liaison status of the target word onset ($\chi^2=0.002$, $p=0.965$; when included in the model as a factor, $p=0.965$), and clitic status of the onset ($\chi^2=0.832$, $p=0.362$; when included in the model as a factor, $p=0.360$).

\textsuperscript{9} Including the contrast of these factors did not improve the fit of the model according to a likelihood ratio test ($\chi^2=1.38$, $p=0.24$). When the contrast was included, both main effects remained highly significant, and the contrast was non-significant ($p=0.235$).

\textsuperscript{10} As we explain previously, if IRs are actually FRs that have been displaced due to accent clash (Post, 2000), then for very short phrases, those same clash effects should strongly dominate, thereby constraining the variability that can be contributed by focus. For longer phrases, clash effects should not dominate as strongly, thereby permitting a larger effect size for focus.
Table 2. Summary of mixed logistic regression analysis of the likelihood of Initial Rise occurrence on NP2.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>z-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus (Narrow vs. Wide)</td>
<td>-1.4522</td>
<td>0.3204</td>
<td>-4.532</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Length (Short vs. Long)</td>
<td>1.6189</td>
<td>0.3269</td>
<td>4.953</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Figure 5 summarizes the results for IR occurrence within the NP1 target region. As predicted, an IR occurred more often for Wide Focus, where there was a focus boundary at the left edge of NP1. The IR did not occur more frequently on NP1 when NP2 was longer. In fact, the length of NP2 appeared to have the opposite effect, so that an IR on NP1 was slightly more frequent when NP2 was short. A mixed logistic regression model treating focus and length as fixed factors, and participant and item as a random factors was fit to the data\(^1\). Focus, but not length, was found to be significantly correlated with the likelihood of Initial Rise occurrence. There was a marginally significant interaction of focus with length due to a slightly weaker effect of focus when NP2 was long. These results are summarized in Table 3.

As already noted, the lack of a systematic length effect for NP1 is expected given that NP1 was phrased separately from the PP in nearly all tokens (96%). While the presence of an AP boundary between NP1 and the PP is likely to be important for the occurrence of IR on NP1, the number of tokens without such a boundary is very small (11), so it is not possible to test for this effect specifically. The small proportion of tokens also means that the difference between the presence or absence of an AP-boundary cannot explain our results. Indeed, whether or not the

\(^1\) Fixed factors that did not improved the model include liaison status of the target word onset ($\chi^2=0.475$, p=0.491; when included in the model as a factor, p=0.965). None of the NP1 onsets originated from clitics.
tokens lacking a boundary were included or excluded did not meaningfully affect the statistical results (i.e., the pattern of significant/non-significant did not change).

**Figure 5.** Mean proportion of Initial Rise occurrence for NP1 by focus and noun length.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>z-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus (Narrow vs. Wide)</td>
<td>1.8510</td>
<td>0.4110</td>
<td>4.503</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Length (Short vs. Long)</td>
<td>0.3739</td>
<td>0.4341</td>
<td>0.861</td>
<td>0.3891</td>
</tr>
<tr>
<td>Focus*Length</td>
<td>-1.0457</td>
<td>0.5714</td>
<td>-1.830</td>
<td>0.0673</td>
</tr>
</tbody>
</table>

**Table 3.** Summary of mixed logistic regression analysis of the likelihood of Initial Rise occurrence on NP1.

**Phonetic Correlates of the Initial Rise**

Figure 6 summarizes the observed measures of onset duration by labelled presence of IR for each position. A linear mixed effects regression model, treating label, target location (NP1 vs. NP2)
and consonant category as simple fixed factors, and participant as random factors, was fit to the data. The parameters were used in a Markov Chain Monte Carlo (MCMC) sampling with 10,000 repetitions to obtain p-value estimates. Consistent with previous findings, onset duration shows a significant positive correlation with the presence of the IR. Syntactic location was also significant, since onsets for NP2 nouns were shorter than those for the NP1 nouns. These results are summarized in Table 4. Also consistent with previous findings (Portes et al., 2012), the fit of the model was not improved when liaison status (i.e., whether an onset arose from liaison processes) was included as a factor, corroborating the view that IR-related onset lengthening is not restricted to internal onsets.

Figure 6. Boxplot of onset duration for each target position according to the labelled presence of an Initial Rise.

12 Including the contrast of these factors did not improve the fit of the model according to a likelihood ratio test ($\chi^2 = 0.067, p = 0.796$).
To find out whether prosodically distinct initial rises were present in our data, we explored the onset and rime durations of syllables classified as having IR. Specifically, since the prediction is that a larger number of emphatic rises may have occurred at focus boundaries, and since onset and rime durations are predicted to be longer for emphatic rises, we tested whether either of these measures is reliably correlated with focus. Out of 97 tokens that included an IR on NP1, 65 occurred at a focus boundary and 32 did not. Out of 164 tokens that included an IR on NP2, 100 occurred at a focus boundary and 64 did not. Rime and onset durations for these groups are summarized in Figures 7 and 8, respectively.

![Figure 7](image_url)

**Figure 7.** Boxplots of rime duration by focus condition for targets labelled with IR in (a) NP1 and (b) NP2.
Figure 8. Boxplot of onset duration by focus condition for targets labelled with IR in (a) NP1 and (b) NP2.

For both onset and rime durations, the distributions across focus conditions are very similar, and rime durations actually trend slightly opposite of what is predicted if emphatic rises are associated with focus boundaries. In a logistic regression analysis of rime duration, the model with the best fit to the data that included focus as a factor also included vowel category (fixed) and subject (random). Focus was not significantly correlated with rime duration for NP1 (pMCMC=0.741) or for NP2 (pMCMC=0.973). For onset duration, the model with the best fit for NP1 included focus (fixed) and subject (random), but not consonant category, whereas for NP2 the best-fitting model also included consonant category (fixed). Focus was not significantly correlated with onset duration for either NP1 (pMCMC=0.2570), or for NP2 (pMCMC=0.7834). Given that onset and rime lengthening are the most reliable correlates of initial rise type, there is little evidence to support the presence of more than one type of initial rise in our data.
Focus and Phrasing

Only 11 tokens lacked an AP boundary at the NP1-PP juncture. For 9 of those tokens, NP1 and the PP were phrased as a single unit, with an FR on the preceding lexical verb. Seven of those were in a Wide Focus condition (NP1+PP), lending some support for the hypothesis that foci have a weak tendency to be phrased as a unit in the absence of other factors favoring a boundary. Given that so few tokens lacked an FR on NP1, however, it was not possible to address this hypothesis conclusively.

DISCUSSION

The primary goal of our study was to test the claim that the Initial Rise is associated with the left edge of a contrastively focused constituent. Our results show that there is such an association, and that it is robust in the sense that it was statistically significant for both syntactic positions (NP1 and NP2), as well as across the two levels of NP2 length. As in earlier studies, the Initial Rise was more likely to occur on longer APs than on shorter ones. Our study therefore shows that there are at least two factors that can simultaneously condition the presence of an Initial Rise at the left edge of an Accentual Phrase. In that sense, it compares closely with the findings of Astésano et al. (2007), which concerned syntactic constituency rather than information structural constituency.

In our study, the effects of focus and phrase length showed no interaction and appear to make independent contributions to the distribution of the Initial Rise. In other words, the size of the effect of focus was not smaller for short phrases. This is somewhat surprising if the effect of phrase length is due to accent clash, or more importantly, if IRs actually arise from clash-driven processes (Post, 2000). The short phrases in our study contained two-syllable content words,
which is the minimum length that is predicted to be able to carry both an IR and a FR simultaneously (Jun & Fougeron, 2000). If clash is involved, then its effect is predicted to strongly dominate at such short lengths. Not only are few instances of an IR expected for short phrases, but there should be a reduced tendency for the presence or absence of an IR to reflect focus constituency. Instead, focus contributed to a 32% difference\(^\text{13}\) in the occurrence of the Initial Rise on NP2 for those tokens where NP2 was short, and Initial Rise rates on short phrases reached as high as 61% when the PP was focused (Narrow). These facts suggest that the relationship between the IR and phrase length should be explained in a different way.

The lack of an interaction also indicates that the size of the effect of phrase length was not reduced when a focus left edge was present. This would be surprising if the IR were a true marker of focus. This is true even in a model where the left edge of a focus constituent is a sufficient, but not a necessary condition for the presence of an IR. Such a system would tolerate the presence of an IR for reasons other than a focus, such as long phrase length, but would require an IR in case a focus boundary were present. This predicts that IR occurrence should approach ceiling levels (within experimental error) whenever a focus boundary is present at the left edge of AP. As already mentioned, however, the occurrence of IR on NP2 was instead highly sensitive to the effect of length independently of whether a focus boundary was present. When NP2 was long and a focus boundary was present, IR occurrence was 80%, but when NP2 was

\[^{13}\) Here and elsewhere, mean effect size was estimated using the formula shown below, and therefore differs slightly from the difference in the means as indicated in Figure 1 and Figure 2 above. \(x_1\) and \(x_2\) refer to the frequency of IR in each of two conditions being compared, while \(n_1\) and \(n_2\) refer to the corresponding total number of observations in each condition.

\[
\text{mean effect size} = \frac{(x_2 - x_1)}{(n_2 + n_1)/2)}
\]
short, IR occurrence was 61%, meaning that 39% of tokens lacked IR in spite of the presence of a focus boundary. These findings are therefore inconsistent with the hypothesis that focus is a sufficient condition for IR occurrence.

The overall mean effect size of phrase length for NP2 was 25%, reaching a minimum as low as 19% when the PP was a focus. This is comparable in magnitude to the overall effect size of focus itself, which was 26% on average for NP2. Regardless of whether a focus boundary was present, in other words, phrase length made a relatively large contribution to the variability in IR occurrence. Any listener who attempted to recover the focus structure of an utterance based on IR alone is therefore predicted to choose the wrong interpretation with a relatively high frequency. At best, IR is a weak cue to focus.

In spite of this, a listener’s experience with the various inputs to IR can be informative when trying to interpret IR as a cue to focus structure. If we assume that our results provide an estimate of a listener’s experience with IR for all similar syntactic constructions, then we can estimate the probability that he or she would assign to the presence of a focus boundary under various conditions. Without taking phrase length into account, the conditional probability (using Bayes’ Rule) of a focus boundary at the NP1-PP juncture given that an IR is present, or P(focus|IR), is 61%, while the probability given no IR, (P|no IR), is 36%. If these estimates are further conditionalized on phrase length, however, then a slightly different pattern emerges. When the phrase is long, the probability of focus is 56% when IR is present (P(focus|IR, long)) versus 37% when IR is absent (P(focus|no IR, long)). When the phrase is short, the probability is

\[ P(focus|IR, \text{short}) \]

\[ P(focus|\text{no IR, short}) \]

\[ P(focus|IR, \text{long}) \]

\[ P(focus|\text{no IR, long}) \]

14 This assumes that the prior probability of focus is roughly 50%, which objectively it was in our experiment. This is arguably not true for the general case, however, where prior probability assignments for focus vary widely and are strongly conditioned by the context. Our example is provided merely for illustration, though the overall pattern of conditional dependency is expected to generalize.
67% when IR is present (P(focus|IR, short) versus 36% for no IR (P(focus|no IR, short). In other words, a listener is expected to adjust his or her expectations regarding the strength of IR as a cue to focus based on what is known from experience about how length affects IR occurrence. In this case, since longer phrases are more likely than shorter ones to include IR for rhythmic reasons, a rational listener should treat IR as a weaker cue to focus when the phrase is long, and as a stronger cue when the phrase is short\textsuperscript{15}.

On its own, such probabilistic reasoning does not necessarily improve the success of communication with respect to focus. This is because a listener must ultimately choose the one interpretation that is most likely (>50% if two choices are present), and in the above example this choice is not affected by length. However, if the probability estimates serve as inputs to a more sophisticated decision mechanism, and the information is pooled with that from other cues, then knowing how the cue strength of IR is affected by length can improve reliability substantially. Additional studies are needed to test for the presence of additional phonetic or phonological cues to the left edge of focus in order to understand how these may be integrated with phrase length to facilitate the listener’s recovery of the focus structure with greater reliability.

The high variability that IR exhibits in connection with focus and its various other correlates potentially sets French apart from languages like English, where phonological correlates of focus are generally assumed to be robust. German, Pierrehumbert and Kaufmann (2006), for example, found in a production experiment that speakers either accented or deaccented a target NP as predicted from information structure with a reliability of 91%, with one third of the subjects

\textsuperscript{15} In somewhat oversimplified terms, this is reflected in the fact that the difference between the probabilities with and without IR is smaller when the phrase is long (56%-37%=19%) and larger when the phrase is short (67%-37%=30%).
scoring 100%. Variability has been observed, however, in the focus-prosody mapping for English. In the same study, for example, it was observed that phonological constraints against pitch accents on prepositions could partially interfere with the pragmatically optimal nuclear accent pattern, giving rise to substantial variability in the output. The authors show that these effects can be modeled through stochastic constraint interaction. Calhoun (2010) similarly proposes that the weak association (in production) between prenuclear pitch accents and information structure in English can be modelled through a probabilistic mechanism, while Bishop (2013) explores this association in perception.

Féry (2001) suggests that focus may be weakly associated with the distribution of lower-level phrase boundaries (phonological phrases in her framework), and that dephrasing will tend to occur within a focus constituent such that it is phrased as a single constituent. In our study, the vast majority of tokens included a phrase boundary between NP1 and the PP regardless of which constituent was the focus, so no evidence was found for such dephrasing. Given Astésano et al.’s suggestion that the distribution of IR may reflect a level of phonological organization higher than the AP, we do not rule out the relevance of phrasing for focus realization in French. Recent evidence reported in Michelas & German (2012) in fact suggests an association between focus and the intermediate phrase (ip). In that study, the right edges of focus constituents (as compared with focus-internal positions) were associated with changes in syllable duration and f0 consistent with the presence of an intermediate phrase boundary (Michelas & D’Imperio, 2014; Michelas, 2011). The presence of an association between IR and the right edge cues to ip would provide support for the suggestions of both Féry and Astésano et al., and is highly reminiscent of the phenomenon of bipolarisation described by Di Cristo (1999). Existing studies do not simultaneously control for both right boundary strengthening and Initial Rise within the same
phrase, though the method for doing so is a more or less straightforward extension of existing studies.

The issue of focus and (de)phrasing may be further clarified through a more detailed consideration of syntax. Jun (2011), for example, found an interaction between focus and syntax with respect to phrasing in Korean. Specifically, while a narrowly focused one-word NP tended to induce dephrasing over the following constituents, a focused NP consisting of multiple words in a genitive construction tended to result in phrasing of each word as a separate AP, with the last word receiving additional, ip-like prominence. The latter pattern compares closely with our own data. This suggests not only that the specific syntax may have played a role in determining phrasing choices, but also lends support to the idea that constituency effects in our study were driven by an intermediate phrase.

Just as numerous other studies have restricted attention to one or two factors while holding the role of information structure constant, in our study we chose to address information structure and phrase length while holding syntax and other factors constant. In order to better control for segmental factors, only NP-PP constructions involving the prepositions à or en were used in the direct object targets. It is entirely possible that different syntactic constructions would have yielded different results with respect to both IR occurrence and phrasing. Comparing to Astésano et al.’s results, for example, where IR is shown to be sensitive to syntactic boundaries, the overall rate of IR occurrence in our study may have been biased either up or down by the fact that strong morphosyntactic cues were already present and did not need to be marked through prosody.16 Indeed we make no strong claims about whether our data addresses the absolute rate of occurrence of either IR or AP-boundaries. What we do know is that in the context of our study, the rate of IR occurrence was in a sensitive regime (neither too high nor too low for experimental

16 We thank an anonymous reviewer for this observation.
effects to appear) with respect to the effects of both focus and phrase length, and on that basis, we were able to discover how these factors jointly contribute to the presence of IR when other factors are held constant. It is clear that future studies will need to consider whether interesting interactions arise when more than two factors are included in the design (following e.g., Jun (2011) for Korean).

Our study materials made use of wh-interrogatives, to the exclusion of declaratives, polar interrogatives, directives, commissives, fragments and many other utterance types. On the one hand, this contributed to the quality of our results in at least three important ways: First, it provided a natural way for participants to use language meaningfully in a cooperative task by requesting information from a partner. Second, it provided a means to elicit specific focus patterns on whole-sentence utterances in a natural way, which may set it apart from similar studies using declaratives. Third, compared to closely related data on declaratives and polar questions (German & D’Imperio, 2009), the required high initial tone on the wh-element helped reduce variability in phrasing in the early part of the sentence. On the other hand, the use of wh-interrogatives does raise the question whether similar effects would obtain for other sentence types. From the standpoint of the theory of focus interpretation adopted here (Rooth, 1992; Roberts, 1998; Büring, 2003), there is, in fact, no important difference between interrogatives and other sentence types, since the notion of alternatives is defined over constituents of any semantic type. We therefore fully expect that focus and length should contribute to the occurrence of IR in very similar ways across utterance types.

Our findings also bear on existing theories of focus in French. As already mentioned, it is largely taken for granted that in English wh-interrogatives may carry a contrastive focus interpretation, while for French, it has been claimed that intonational marking of information
structure is limited to the semantic restriction on the wh-element (Beyssade et al., 2007). Regardless of whether IR turns out to be a true marker of focus or is only indirectly associated with focus, its occurrence in our study was clearly sensitive to differences in the surrounding discourse context in a systematic and predictable way. Our study therefore shows that wh-interrogatives do indeed carry a focus interpretation that is independent of the wh-element or its restriction.

Finally, our phonetic analysis of onset duration bore out the prediction that the IR is associated with onset lengthening, and corroborated the findings of Portes et al. (2012) that the liaison status of the onset consonant is not important for that association. Onset duration and the presence of IR were identified independently in our study. Given the challenges involved in identifying an objective metric based on f0 for IR detection, the findings of the two studies together suggest that onset duration (or perhaps onset strengthening more generally) should be explored as a possible alternative.

CONCLUSION
The primary goal of our study was to test for an association between contrastive focus and the Initial Rise in French. The results show straightforwardly that there is such an association, but given the important role played by phrase length, they also point towards a model in which the IR does not directly mark focus, but instead is used and interpreted against a backdrop of multiple competing inputs to IR realization, and possibly other cues to focus boundary locations. The low reliability of the IR as a cue to focus suggests that interlocutors rely on cues from a variety of sources in order to successfully communicate the presence and extent of focused constituents. A demonstration based on Bayesian probability showed that knowledge of this interaction can help interlocutors cope with the high degree of variability, though future models
will need to integrate more explicitly the wide range of factors that appear to contribute to the distribution of IR.

REFERENCES


Probus, 14(1), 147-172.


Michelas, A., & German, J. (2012). Prosodic boundary strength and focus marking in French: The need of a minimal intermediate phrase boundary at the right edge of focus regions. Poster presented at Tone and Intonation in Europe 5, Oxford, UK.


Appendix A:

Context (read aloud by the participant):
Vous êtes serveur/serveuse dans un restaurant et vous avez tout juste apporté une partie de la commande à une grande table. Découvrez qui a commandé quoi, en utilisant les questions suivantes:

“Vous êtes serveur/serveuse dans un restaurant et vous avez tout juste apporté une partie de la commande à une grande table. Découvrez qui a commandé quoi, en utilisant les questions suivantes:"

Question 1: Qui a commandé l'entrecôte ce soir ?
“Who ordered the sirloin this evening?”

Question 2: Qui a commandé le merlan aux navets ce soir ?
“Who ordered the whiting with turnips this evening?”

Question 3: Qui a commandé les gambas ce soir ?
“Who ordered the prawns this evening?”

Answer choices:

a. L’homme à la veste marron.
   “The man in the brown jacket.”

b. La femme aux cheveux courts.
   “The woman with short hair.”

c. La petite fille.
   “The little girl.”
Appendix B. Target sentence pairs including either a short NP2 (a) or long NP2 (b)

1. a. Qui va coordonner le voyage en Allemagne cette année ?
   ‘Who is going to coordinate the trip to Germany this year?’

   b. Qui va coordonner le voyage en Indonésie cette année ?
   ‘Who will organise the trip to Indonesia this year?’

2. a. Qui veut goûter la gelée aux melons ce soir ?
   ‘Who wants to taste the melon jelly this evening?’

   b. Qui veut goûter la gelée aux aubergines ce soir ?
   ‘Who wants to taste the eggplant jelly this evening?’

3. a. Qui cherche un gérant en laverie cette semaine ?
   ‘Who is looking for a laundromat manager this week?’

   b. Qui cherche un gérant en maroquinerie cette semaine ?
   ‘Who is looking for a leather shop manager this week?’

4. a. Qui a commandé le merlan aux navets ce soir ?
   ‘Who ordered the whiting (fish) with turnips this evening?’

   b. Qui a commandé le merlan aux macadamias ce soir ?
   ‘Who ordered the whiting (fish) with macadamias this evening?’

5. a. Qui organise la venue à l'usine cette année ?
   ‘Who is organizing the visit to the factory this year?’

   b. Qui organise la venue à l'animalerie cette année ?
   ‘Who is organizing the visit to the pet shop this year?’
6. a. Qui va réviser le mémo aux maliens cette semaine ?
   ‘Who edited the memo to the Malians this week?’

   b. Qui va réviser le mémo aux vénézuéliens cette semaine ?
   ‘Who edited the memo to the Venezuelans this week?’

7. a. Qui a commandé la valise en lézard la semaine dernière ?
   ‘Who ordered the lizard (skin) suitcase last week?’

   b. Qui a commandé la valise en rhinocéros la semaine dernière ?
   ‘Who ordered the rhinoceros (leather) suitcase last week?’

8. a. Qui a visité le Vallon aux Lilas ce matin ?
   ‘Who visited the Valley of Lilacs this morning?’

   b. Qui a visité le Vallon aux Miraculés ce matin ?
   ‘Who visited the Valley of Miracles this morning?’

9. a. Qui va faire une maison en vélin ce semestre ?
   ‘Who is going to make a house out of vellum paper this semester?’

   b. Qui va faire une maison en origami ce semestre ?
   ‘Who is going to make a house out of origami this semester?’

10. a. Qui a ratifié les ajouts au roman le mois dernier ?
    ‘Who approved the additions to the novel last month?’

    b. Qui a ratifié les ajouts à l’avertissement le mois dernier ?
    ‘Who approved the additions to warning (message) last month?’
11. a. Qui va porter la visière en nylon demain soir ?
   ‘Who is going to wear the nylon visor tomorrow evening?’

   b. Qui va porter la visière en linoléum demain soir ?
   ‘Who will wear the linoleum visor tomorrow evening?’

12. a. Qui a signalé une rougeur au majeur ce matin ?
   ‘Who complained of a rash on the index finger this morning?’

   b. Qui a signalé une rougeur à l'auriculaire ce matin ?
   ‘Who complained of rash on the little finger this morning?’

13. a. Qui a rédigé les éloges au lyonnais ce soir ?
   ‘Who edited the accolades (speech) to the Lyonnais (person from Lyon) this evening?’

   b. Qui a rédigé les éloges à l'avignonnais ce soir ?
   ‘Who edited the accolades to the Avignonnais (native of Avignon) this evening?’

14. a. Qui a acheté le moulage en argile ce soir ?
   ‘Who bought the silver casting (sculpture) this evening?’

   b. Qui a acheté le moulage en maïzena ce soir ?
   ‘Who bought the corn starch casting this evening?’

15. a. Qui a prononcé les hommages aux nageurs lundi soir ?
   ‘Who read out the tribute to the swimmers Monday evening?’

   b. Qui a prononcé les hommages aux marathoniens lundi soir ?
   ‘Who read out the tribute to the marathon runners Monday evening?’
16. a. Qui a acheté les armoires en argent ce matin ?
   Who bought the wardrobe (furniture) in silver this morning?

   b. Qui a acheté les armoires en genévrier ce matin ?
   Who bought the wardrobe in juniper (wood) this morning?

17. a. Qui va couvrir les rizières en Iran ce mois-ci ?
   ‘Who will cover (journalistically) the rice paddies in Iran this month?’

   b. Qui va couvrir les rizières en Mélanésie ce mois-ci ?
   ‘Who will cover the rice paddies in Melanesia this month?’

18. a. Qui veut fabriquer une horloge en émail cette année ?
   ‘Who wants to build a clock out of enamel this year?’

   b. Qui veut fabriquer une horloge en aluminium cette année ?
   ‘Who wants to build a clock out of aluminium this year?’

19. a. Qui a vérifié le virement à l'agent vendredi ?
   ‘Who verified the wire transfer to the agent on Friday?’

   b. Qui a vérifié le virement au mauritanien vendredi ?
   ‘Who verified the wire transfer to the Mauritanian (person) on Friday?’

20. a. Qui a noté les aveux aux mineurs ce matin ?
   ‘Who wrote down the confessions (made) to the miners this morning?’

   Qui a noté les aveux aux végétariens ce matin ?
   ‘Who wrote down the confessions (made) to the vegetarians this morning?’
21. a. Qui va peindre le Manoir aux Génies cette semaine ?
   ‘Who is going to paint the Manor of Genies this morning?’

   b. Qui va peindre le Manoir aux Émerveillements cette semaine ?
   ‘Who is going to paint the Manor of Marvels this morning?’

22. a. Qui a photographié les arènes aux rêveurs vendredi ?
   ‘Who photographed the arena of dreamers on Friday?’

   b. Qui a photographié les arènes aux magnétiseurs vendredi ?
   ‘Who photographed the arena of magicians on Friday?’

23. a. Qui a essayé les gélules à l'oseille ce mois-ci ?
   ‘Who tried the sorrel capsules this month?’

   b. Qui a essayé les gélules à l'échinacée ce mois-ci ?
   ‘Who tried the echinacea capsules this month?’

24. a. Qui a emballé les envois au Niger ce matin ?
   ‘Who packaged the parcels for Niger this morning?’

   b. Qui a emballé les envois au Vénézuéla ce matin ?
   ‘Who packaged the parcels for Venezuela this morning?’