

ARTICLE

Pragmatic effects on the sentence-final intonation of answered wh-in-situ questions in French

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Abstract

The final intonation in French wh-in-situ questions is subject to much debate. Although a wide variety of final pitch movements has been observed, recent studies generally agree on a tendency for final rises. In our study, we analysed the answered wh-in-situ questions (e.g. *Tu veux savoir quoi? – Tout!* ‘What do you want to know? – Everything!’) in a corpus of eleven audio books.

For our analysis, we used perceptual classifications by three annotators. Annotations included not only the perception of final intonational movement (‘rise’/‘fall’/‘plateau’), but also string-related (wh-lexeme; ‘wh-word final’/‘wh-word non-final’) and pragmatic (‘information-seeking’/‘non-information-seeking’; ‘hierarchical’/‘non-hierarchical’) features.

Our results show that a) even string-identical wh-in-situ questions can be pronounced with rises as well as falls and b) pragmatics affect the final pitch movement. If the speaker is hierarchically superior to the hearer, rises are less likely, and questions that are answered by the same speaker are even associated with a non-rising default. However, our data also suggest that pragmatic functions cannot be directly mapped to pitch movement. Information-seeking questions can be pronounced with all three final intonations and speakers may even choose opposite patterns for the same interrogative in the same context.

Keywords: oral corpus; intonation; pragmatics; prosody; wh-in-situ; speaker variation; perception; audiobooks

Résumé

L’intonation des questions fait l’objet de nombreux débats. Bien qu’une grande variation dans l’intonation finale ait été observée, les études récentes s’accordent généralement sur une tendance à une montée finale pour les questions in situ directes (c’est-à-dire les interrogatives avec un mot qu postverbal et un point d’interrogation). Dans notre étude,

nous avons analysé les questions in situ suivies d'une réponse (p.ex. Tu veux savoir quoi ? – Tout !) dans un corpus de onze livres audio.

Pour notre analyse, nous avons utilisé des classifications perceptuelles par trois annotateurs. Les annotations comprenaient non seulement l'intonation finale ('montée'/'chute'/'plateau'), mais aussi des aspects de formulation (mot interrogatif ; 'mot qu final'/'mot qu non-final') et pragmatiques ('répondu par l'interlocuteur'/'répondu par le demandeur' ; 'hiérarchique'/'non-hiérarchique').

Nos résultats montrent que la pragmatique exerce une influence sur le mouvement intonatif. Si le locuteur est hiérarchiquement supérieur à l'auditeur, les montées sont moins probables et les questions auxquelles le demandeur répond lui-même sont même associées à une chute par défaut. Cependant, nos données suggèrent également que les fonctions pragmatiques ne peuvent pas être directement mises en correspondance avec l'intonation finale. Les requêtes d'information, voire les mêmes interrogatives dans le même contexte, peuvent être prononcées avec une montée ainsi qu'une chute.

1. INTRODUCTION

As is well known, French has a variety of strategies for asking information-seeking wh-questions whose final intonation comes under several guises (cf. among others Wunderli 1982; Déprez et al. 2012, 2013; Delais-Roussarie et al. 2015). This article aims at renewing the research on variation in wh-questions in French with an innovative method based on a corpus of audio books, crossing intonational, string-related and pragmatic analyses. Prototypical questions are information-seeking. We define the latter here as utterances that express a request to fill the information gap encoded in the wh-phrase (cf. Braun et al., 2019: 780; Reinhardt, 2019: 48). To operationalise this definition, we will focus on questions that entail an answer.

One of these strategies is wh-in-situ questions, as shown in (1).

- (1) On va où ?
 One goes where
 'Where are we going?'
 (Our corpus, 7624_JUST)

Since the question word follows the verb, these question forms can also be referred to as 'wh-postverbal interrogatives' (i.e., structures with a postverbal wh-phrase) or as [SVQ] structures (i.e., structures with the word order subject - verb - question word). In the present article, we will use the term *wh-in-situ questions* throughout.

This structure is frequently used in spoken colloquial French (Coveney, 2011; Faure and Palasis, 2021; Hamlaoui, 2011; Koch and Oesterreicher, 2011, a.o.). As wh-in-situ questions contain a question word, they are morphosyntactically marked as interrogative sentences. However, the morphosyntactic marking can be supplemented by intonational means. Especially the (final) pitch movement ('final intonation') is a much-debated topic. For instance, Cheng and Rooryck (2000), Koch and Oesterreicher (2011: 175), and Delais-Roussarie and colleagues (2015: 89) state that wh-in-situ interrogatives are generally rising. Hence, one might assume that, if a final rise is the most common intonation pattern, it will be the

prototypical realisation and can thus be considered the default. On the other hand, Reinhardt (2019, 2021) and Wunderli (1982) show that pitch movement (i.e., the tonal perception linked mainly to f_0 , cf. Niebuhr et al. 2021) does vary strongly in wh-in-situ structures. This challenges the ‘rising pattern’ and raises doubts about its prototypical nature. Consequently, the primary objective of this study is to evaluate the validity of this concept.

Once we have accomplished this, we will be better equipped to identify the mechanisms behind intonational variation in wh-in-situ interrogatives. In previous studies, it has been suggested that the intonation of interrogatives is linked to their wording (i.e., string-related factors, cf. among others Delattre, 1966; Wunderli, 1982, 1983; Delais-Roussarie et al., 2015) as well as to their communicative function and situation (i.e., pragmatic factors, cf. among others Delais-Roussarie et al., 2015; Glasbergen-Plas 2021; Michelas et al., 2016; Portes et al., 2014; Portes and Beyssade, 2015). Consequently, our second goal is to determine how final pitch movement in wh-in-situ questions can be predicted.

The article is organised as follows: We will begin by providing an overview of the current state of the art and subsequently formulate our hypotheses (Section 2). Following that, we will introduce our corpus (Section 3), present and analyse our results (Section 4), and conclude by summarising our findings and offering insights for future research (Section 5).

2. STATE OF THE ART AND HYPOTHESES

In this section, we will first summarise the most important research findings related to the intonation of wh-in-situ questions, in the areas of yes/no vs. wh-questions (Section 2.1.1), morphosyntax (Section 2.1.2) and pragmatics (Section 2.1.3). Based on this summary, we will then set up hypotheses to be tested in our study (Section 2.2).

2.1 Previous studies on the intonation of interrogatives

2.1.1 Yes/no vs. wh

In a pioneer article, Delattre (1966) claimed that yes/no interrogatives are rising (‘question’, see (2)), whereas wh-interrogatives are falling (‘interrogation’, see (3)).

- (2) Jean-Marie va manger ?¹
 Jean-Marie goes eat
 ‘Is Jean-Marie going to eat?’
 (Delattre, 1966: 8)

- (3) Qui est là ?
 who is there
 ‘Who is there?’
 (Delattre, 1966: 8)

¹For all examples taken from other articles, we added annotations and translations.

Empirical testing by Wunderli (1982, 1983) confirmed this hypothesis overall, although intonation in *wh*-questions was shown to be more varied than in *yes/no* interrogatives. The same studies also revealed that both question types could be produced with a final fall as in statements, provided they contained a ‘segmental marker’, such as a *wh*-word, or the context was clear enough (Wunderli, 1990: 39–40).

2.1.2 *Wh-in-situ* structures

Wunderli not only elaborated on the difference between *yes/no* and *wh*-questions, but also focused on different morphosyntactic structures. Specifically, he examined the structure of *wh-in-situ* questions, which he found to be mostly pronounced with a falling contour in a reading experiment (Wunderli, 1982, 1983). In the case of *wh-in-situ* questions, he investigated three subtypes: those with a monosyllabic *wh*-phrase (e.g., *où* ‘where’ or *quoi* ‘what’, see (4)), those with a disyllabic *wh*-phrase (e.g., *à quoi* ‘of/to what’ or *comment* ‘how’, see (5)), and those with a polysyllabic *wh*-phrase (e.g., *sur quel sujet* or *combien de fois*, see (6)).

- (4) Tu vas où ?
 you goes eat
 ‘Where are you going?’
 (Wunderli, 1983: 174)
- (5) Tu penses à quoi ?
 you think in/of what
 ‘What are you thinking of?’
 (Wunderli, 1983: 174)
- (6) Il est né en quelle année ?
 he is born in which year
 ‘What year was he born in?’
 (Wunderli, 1983: 174)

All structures yielded similar results, regardless of the syllable count of their *wh*-phrase (cf. Wunderli, 1983: 174). Reusing Delattre’s (1966) categories, most contours were classified as ‘interrogation’, i.e., a strong fall that may be preceded and followed by a rise, fewer as ‘finality’, i.e., a simple and rather slight fall, and the least as ‘question’, i.e., a simple rise. Since ‘interrogation’ contours allow for a final rise, it needs to be pointed out that most speakers did not produce this final intonation. There are several further publications supporting that *wh-in-situ* questions are generally, or at least more frequently, pronounced with a falling intonation pattern (cf. among others Di Cristo, 1998: 206; Laenzlinger, 2003: 99–100).

In contrast, Cheng and Rooryk (2000) argue that French *wh-in-situ* questions are licensed by the same intonation morpheme as *yes/no* questions, leading to a final rise. Adli (2006: 183) tested this hypothesis. He interviewed three native speakers of

French on the intonation of interrogatives (7) and (8), and five speakers on structures like (7) and (9):

(7) Jean a acheté ce vase ?
 Jean has bought this vase
 ‘Has Jean bought this vase?’
 (Adli 2006: 182)

(8) Jean a acheté quoi ?
 Jean has bought what
 ‘What has Jean bought?’
 (Adli 2006: 182)

(9) Jean a acheté quel vase ?
 Jean has bought which vase
 ‘Which vase has Jean bought?’
 (Adli 2006: 183)

As all of the speakers stated, (7) has to be pronounced with a rising contour, whereas (8) and (9) may be pronounced with either a rising or falling contour. More specifically, according to the interviewees, there may be a rise in the ultima in (8) and in the penult in (9). Hence, the assumption of a yes/no intonation morpheme made by Cheng and Rooryck (2000) is not consistent with empirical data. Instead, there seems to be evidence for optionality in the intonational realisation of French *wh*-in-situ questions, so that Wunderli’s findings are supported.

However, more recent data from experiments and corpora once again call Wunderli’s observations into question. In several empirical studies from the last ten years, final rises prevailed in *wh*-in-situ questions (cf. Delais-Roussarie et al. 2015; Déprez et al., 2012, 2013; Glasbergen-Plas et al., 2020; Glasbergen-Plas, 2021; Reinhardt, 2019, 2021). In other words, while earlier studies documented a predominance of final falls, more recent ones showed a tendency towards rises.

Several factors, such as language change, methodological dissimilarities and the nature of the corpora or sample selection may be at play here. For example, Wunderli’s technique of having participants read out a list of question words may have led to a reading effect, whereas the experimental design of Déprez and colleagues’ (2012, 2013) study may have been closer to real interaction, as they presented the questions individually and with a short scenario (see also the difference between a reading task and an elicitation task based on spontaneous speech in Peninsular Spanish, observed by Henriksen 2009). Hence, studies are partly contradictory, and it remains unclear where the observed variation in the intonation of *wh*-in-situ questions comes from. What seems to be uncontroversial, however, is that *wh*-words are often associated with a high tone.

2.1.3 Pragmatics

In recent years, researchers have increasingly focused on pragmatic aspects of the intonation of French interrogatives (see Baunaz and Patin, 2011; Glasbergen-Plas,

2021; Hamlaoui, 2011). Given that the encoding of pragmatic meaning is one of the main functions of intonation (Ladd, 2008: 6), it is reasonable to assume that the intonation of interrogatives should be investigated by narrowing down their contextual usage and meaning. For example, one can control for the various speech acts that the interrogative conveys. To illustrate, *imperative questions* convey a directive speech act (i.e., seeking to influence the actions of the listener) and *rhetorical questions* convey an assertive speech act (i.e., committing the speaker to something being the case) (Searle 1969). However, speech acts alone are often too broad to determine the specific pragmatic function of a question (for a particular type of interrogative with an assertive meaning, see *introductory questions* in Section 4.2). When intonational analyses are carried out, it is therefore useful to determine concrete pragmatic types - also called *utterance types* (Delais-Roussarie et al. 2015: 98). We will refer to different kinds of questions (see below) as such.

Delais-Roussarie and colleagues (2015) distinguish four utterance types of wh-questions: biased, echo, imperative, and information-seeking ones. While imperative and biased wh-questions are said to be generally realised with a final fall or rise-fall,² there was no clear preference for information-seeking questions. In the case of wh-in-situ questions, the authors indeed relate them to rising contours. This is in line with Glasbergen-Plas' (2021) results. Focussing on information-seeking wh-in-situ questions and distinguishing between narrow and broad focus, she did not find clear differences in final intonation, as this type of question constantly displayed a final rise.

Yet, as we have seen, her findings are challenged by Wunderli's (1982, 1983) experiments, Adli's (2006) interview study, and Reinhardt's (2019, 2021) corpus data. While it seems uncontroversial that echo questions are generally rising, other wh-in-situ questions (including information-seeking ones) have been observed with rising as well as falling contours.

A particularly relevant experiment is that of Déprez and colleagues (2012, 2013), which provides evidence from a Discourse Completion Task for intonational regularity and variability in information-seeking non-wh-final wh-in-situ questions (e.g., *Elle a mis quel élément au milieu ?* 'Which element did she put in the middle?'). As the authors observed, there was an overall tendency for rises, even though there was a difference between speakers (only 73.3% of the participants produced final rises).

Finally, these findings can be complemented by the results of a production experiment on *C'est quoi, ce [N]* ('What's that...') and *Qu'est-ce que* questions. Here, Celle and Pélissier (2022: 293) observed that the majority of the final contours (presumably both of the structures) were non-rising. As Déprez and colleagues (2012, 2013) did not examine structures involving right dislocation, the dispreference for final rises may be linked to the type of structure (see also Fontaney, 1991: 145–146). However, Celle and Pélissier also report a main effect of utterance type: overall, final rises were significantly more frequent in

²Beyssade and Delais-Roussarie (2022: 281–282) provide further evidence for a positive correlation between non-information-seeking questions and final falls.

information-seeking questions (39.17%) than in what Celle and Pélissier call ‘surprise questions’ (13.47%), i.e., questions expressing counter-expectation (see (10)).

- (10) Qu’ est-ce qu’ il crie ?
 what (+ question particle) he shout
 ‘What/why is he yelling?’
 (Celle and Pélissier, 2022: 288)

In addition to the potential influence of utterance type, two other pragmatic factors were identified. First, Reinhardt (2019, 2021) showed that interrogatives in direct speech are more often rising than in narrative passages. However, as we focus on answered “wh-in-situ” questions in our study, this factor will not be considered further in this article.

Second, and for the current study more importantly, in a study on Greek wh-interrogatives, Baltazani et al. (2020) found that high-ending tunes are perceived as more polite and appropriate in information-seeking contexts. As the concept of politeness has traditionally been associated with freedom and choice offering (cf. the rules of politeness ‘do not impose’ and ‘give options’ by Lakoff, 1973: 298, see also Leech (1983), and Brown (2015) for a more recent overview), final rises may be perceptually linked to openness, whereas final falls may be associated with assertiveness or social dominance, or in other words, with the concept of (social) hierarchy. For the remainder of the paper, we will refer to these concepts as such. While politeness is sometimes difficult to assess, social hierarchy is a more objective feature. We will go more into detail below and explore whether this idea also applies to French.

2.2 Our hypotheses

As we have seen, wh-in-situ questions can occur with both rising and falling contours. While early studies showed a preference for final falls, studies from the 21st century have been rather consistent in finding a tendency for final rises, especially in the case of information-seeking questions ending in the wh-word. Based on these observations, we put forward the following four hypotheses (H):

- H1: French information-seeking wh-in-situ questions are mostly produced and perceived with a final rise.
- H2: Wh-in-situ questions are more often produced and perceived with a final rise when they end in the question word.
- H3: Hierarchy plays a role in the choice of intonation contours in that wh-in-situ questions uttered by a socially dominant speaker are less often produced and perceived with a final rise.
- H4: French wh-in-situ questions that are not information-seeking are less frequently produced and perceived with a final rise.

3. CORPUS CONSTRUCTION AND DATA ANALYSIS

3.1 Data collection

Originally, we limited our investigation to answered *wh*-in-situ questions in order to obtain information-seeking questions and to exclude marginal types, such as rhetorical questions. In the end, we also investigated a small number of non-information-seeking questions, namely introductory questions, i.e., an utterance type used for structuring the discourse (see Section 4.2) by this operationalisation.

3.1.1 Selection of Recordings

To study the intonation of French *wh*-in-situ questions, a spoken corpus with good recording quality and (varied yet) clear communicative situations is needed. Here, we made (re)use of a corpus that consisted of professional recordings of ten contemporary detective novels, yielding about 110 hours in total (Reinhardt, 2019, 2021).³ One novel, *Total Khéops* (TOKE), was available in two versions, so that a total of eleven audiobooks were analysed. While it is true that audiobooks belong to staged orality (Heyd 2010) and thus cannot be considered spontaneous speech, we do believe that their linguistic analysis is promising. In fact, the quality of the recording itself is superior to any corpus of spontaneous speech, as audiobooks are produced with professional equipment by trained speakers and there are no overlapping turns or slips of the tongue, which frequently occur in spontaneous speech. Since audiobooks are edited, one can assume that pronunciation mistakes are removed, and the result is standardised to a certain extent. Besides, the context of the interrogatives is clear most of the times, i.e., the situation is well determined, it is recognisable to whom an utterance is addressed, and if/how a question is answered. Additionally, by analysing two recordings of the same novel, further insights into the variation between speakers can be gathered. Also, the mere fact that audiobooks are based on a written text can be very helpful for an efficient extraction of direct interrogatives. As questions can be identified by means of punctuation, they can be easily collected and do not have to be transcribed.

3.1.2 Procedure of Corpus Construction

In a first step, all *wh*-in-situ questions, that is matrix sentences with a postverbal *wh*-word and a question mark (see Section 2.1.1), were extracted semi-automatically from the respective ebooks. This yielded a corpus of 433 questions. We eliminated then all the questions that were not answered immediately (see Section 1), reducing the corpus further to 189 questions.⁴

³Although a truly representative corpus of spontaneously spoken French would be ideal, existing corpora such as ESLO (<http://eslo.huma-num.fr/>) or CLAPI (<http://clapi.ish-lyon.cnrs.fr/>) do not offer a search for specific sentence types or question forms. Furthermore, our preliminary analysis of excerpts from these corpora did not yield enough tokens to justify a detailed manual analysis. The usage of professionally recorded audiobooks also had the advantage of eliminating speech disfluencies, ubiquitous in spontaneous speech (Prahallad 2010). This and the professional recording environment (Prahallad 2010), made the analysis of the final intonation easier.

⁴Among the 244 interrogatives eliminated, 1 was an echo question. The size of our corpus may not be sufficiently big for detailed statistical testing, but it is still bigger than previous studies on the intonation of French *wh*-in-situ interrogatives. For instance, the corpus used by Wunderli (1983) consisted of 30, and the corpora by Wunderli & Brasselmann (1980) and Deprez and colleagues (2012, 2013) each of 60 *wh*-in-situ-questions. It is however smaller than the one collected by Glasbergen-Plas (2021) with 480 *wh*-in-situ-questions.

Table 1: IAA-rates in the original corpus. Annotated levels: ‘rise’, ‘plateau’, ‘fall’

Overall IAA-rate	81.34%
Complete agreement (3 out of 3)	49.76%
Partial agreement (2 out of 3)	31.63%

Next, using the open-source software Audacity (Audacity Team 2021), the questions were extracted from their respective recordings. Due to the two recordings of TOKE, 26 questions were present twice. Our final corpus contained thus 215 questions, which were then annotated based on intonational, morphosyntactic, as well as pragmatic criteria (see Section 3.2). A further 40 tokens were eliminated due to the lack of inter-annotator agreement (IAA, see Section 3.2.2), leaving 175 for further analyses. The IAA-Rate can be seen in Table 1.⁵

As the corpus consists of copyrighted material, only the spreadsheet with our annotations can be published as an open resource. However, the audio files may be viewed for quality control purposes. Consequently, both the spreadsheet and the audio files were uploaded to Ortolang, with access to the recordings restricted to registered persons. Our corpus is accessible through the following link: <https://hdl.handle.net/11403/wh-in-situ-q-audio-books>.

3.2. Annotation and Analysis

In Table 2, an overview of the annotated and analysed variables is given. The variables, which are classified according to their different nature (i.e., intonational, morphosyntactic and pragmatic), are explained in more detail below.

3.2.1 Intonational annotations

The annotation of the final tonal movement turned out to be especially challenging. In the end, we used a three-level classification of pitch (‘rise’, ‘plateau’, ‘fall’), which was subsequently applied by both authors (two near-native speakers of French) and a research assistant with no knowledge of French. To obtain robust data, we considered only tokens that were not classified as both ‘rise’ and ‘fall’, and that were annotated with the same value by at least two people. Tokens with annotations like ‘rise’|‘rise’|‘fall’, ‘na’|‘rise’|‘plateau’, or ‘na’|‘fall’|‘na’ were thus excluded from analysis. For the analysis, the value given by the majority of the annotators was used.

In the beginning, we tried to obtain f_0 measurements, such as the mean difference between the last two syllables in PRAAT (Boersma and Weenink, 2022) and different perceptual categorisations, such as nuclear configurations (cf. Delais-Roussarie et al., 2015). However, for a considerable number of tokens, measurements were not possible (e.g., due to creaky voice), and in some cases,

⁵The IAA-Rate was calculated as the percentage of agreed items (i.e., ‘number of items the reviewers agreed on/total number of items * 100’).

Table 2: Annotation variables and their respective values

Category	Variable	Values
Intonation	Final pitch movement	fall plateau rise
Morphosyntax	Question word	combien comment où quand quel qui quoi
	Position of wh-word	final non-final
Pragmatics	Question type	information-seeking non-information seeking
	Hierarchy	yes no
Other	Narration type	direct speech narrative passage other

differences in semitones⁶ did not correspond to the perceived intonation. Additionally, we wanted to collect data independently of theory, and to link up with as many previous studies as possible. As a result, we opted for a simple binary distinction between ‘rise’ vs. ‘fall’.

However, even the classification of ‘rising’ vs. ‘falling’ proved difficult. To test this impression empirically, we conducted two informal surveys with a total of 20 raters. The raters differed in their knowledge of French (from naïve to native speaker), but there seemed to be no correlation between knowledge of French and perception of intonation. Raters were asked to listen to each of the 12 selected tokens from the audiobook corpus (i.e., 0015_TOKE1, 0015_TOKE2, {6173_LTEA/0052_TOKE2}, {4373_MMAT/0369_TOKE2}, {0467_TOKE2/0380_TOKE1}, 1479_TRAV, 1124_TRAV, 0467_TOKE1, 2875_ALEX, 1865_TEEL, 1456_TRAV, 0439_TOKE1) three times and to rate the final pitch movement as either ‘final rise or high plateau’ or ‘final fall or low plateau’, or to select ‘unclear’ if they had no preference. The results revealed a high level of variation in perception. As it turned out, the perception of flat contours was particularly variable, but also cases with a measurably clear tonal movement were perceived as both rather rising and rather falling or marked as ‘unclear’. To resolve these issues, we decided to a) introduce ‘plateau’ and ‘na’ (not available, i.e., no value) as further categories, and b) recruit a third annotator.

3.2.2 Morphosyntactic annotations

To capture variation regarding the formulations of wh-in-situ interrogatives, morphosyntactic (i.e., string-related) annotations were added. The first variable we annotated was the question word (i.e., wh-word/wh-lexeme). This was done in order to facilitate classification of the tokens and to allow for further factorial analyses based on the question word (e.g., mono- vs. disyllabic). The second variable concerned the absolute position of the question word. In French wh-in-situ questions, the wh-phrase can surface not only in sentence-final position, i.e., as the last element in the utterance (see (11)), but also in non-final position, i.e., followed

⁶In Western music, a semitone represents the smallest interval (e.g., between C and C#). Semitones are used in intonational analyses to standardise differences in absolute frequencies and relate them to perception (Zarate et al. 2012).

by one or more constituents. In case of non-final *wh*-words, the sentence-final words can syntactically belong to the *wh*-phrase (see (12)), but it can also be part of some other phrase (see (13)).

- (11) Tu as trouvé ça comment ?
 you have found this how
 ‘How did you find this?’
 (Our corpus, 1300_TRAV)
- (12) Vous bossez dans quel commissariat ?
 you work in which how
 ‘In which police station do you work?’
 (Our corpus, 8538_JUST)
- (13) Bon, c’est quoi au menu ?
 well that’s what in the menu
 ‘Well, what’s on the menu?’
 (Our corpus, 128_TOKE)

Knowing that a perceived final rise in French *wh*-in-situ questions might be attributed to a high tone on the *wh*-word (cf. among others Delais-Roussarie et al., 2015: 89), we annotated whether the question word itself was in sentence-final position.

3.2.3 Pragmatic annotations

To test our H3, we annotated two factors, namely a) whether the question was ‘information-seeking’ (see Section 1) and b) whether the question was uttered in a hierarchical situation, i.e., if the speaker expressed social dominance towards the addressee.

As for the factor of hierarchy, we started from the following definition: “Hierarchy refers to an *asymmetrical interpersonal relationship* in which a speaker indicates that they are of a *higher status than their conversation partner*. [It] is expressed in conversation by a style that can be described as domineering, authoritarian or autocratic [...]” (Markel, 2014: 102, our emphases). However, as we presumed that the use of a certain final intonation may be used as a means of asserting dominance, we did not consider it useful to link the categorisation to the expression itself. Instead, we used only speaker-related and situational criteria for the annotation of this factor. A question was thus annotated as ‘hierarchical’ if the speaker is in a higher social position than the addressee and the resulting dominance is not solely due to their social relationship but also to the concrete situation, e.g., an interaction between a teacher and a student in a classroom setting. Due to the fact that our corpus consisted of detective novels, the communicative situations concerned were mostly interactions between police officers and suspects/witnesses as well as those between higher and lower ranking officers. Note that questions containing the informal second person singular pronoun *tu* are indicative of, but not decisive for, the classification of hierarchy in our corpus, as questions making use of

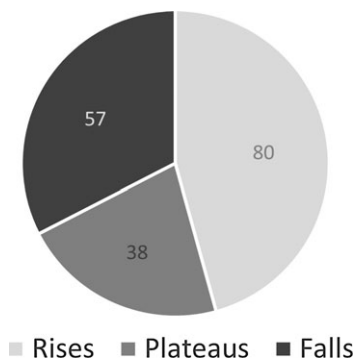


Figure 1. Pie chart visualising the overall distribution of final pitch movements.

the formal variant (*vous*) were also used in hierarchical situations. Likewise, informal ‘you’ also surfaced in non-hierarchical contexts.

4. RESULTS AND DISCUSSION

At first sight, our analysis confirmed the results of recent studies (see Section 2.2.2), showing that the most frequent final pitch movement was a rise (see Figure 1).

On the other hand, more than half of the final pitch movements were perceived as a plateau or fall. Since the *wh*-word is at the end of the sentence in a majority of the interrogatives, the perceived rise at the end could be due to a high tone associated with the *wh*-word. When comparing distributions across positions of the *wh*-word, it is striking that the *wh*-word was sentence-final in almost two thirds of the interrogatives observed with a rise (see Figure 2).

The claim of a general prevalence of final rises in *wh*-in-situ-questions does therefore not hold true. Rather, our data confirm the observation that the final pitch movement in *wh*-interrogatives is highly variable.

We will first analyse our findings with regards to the intonation of information-seeking *wh*-in-situ questions (Section 4.1) with a special focus on the effect of hierarchy (Section 4.2). Following this, we will elaborate on the intonation of non-information-seeking questions and the effect of answer introduction (Section 4.3).

4.1 Information-seeking questions

Of the 160 information-seeking questions analysed, i.e., questions with a speaker change and some reaction to the encoded information gap, 78 were annotated with a rise, 29 with a plateau and 53 with a fall. However, of the 78 observed rises, only slightly more than a third appeared in *wh*-word non-final structures. In fact, when looking only at information-seeking questions that do not end in a question word, falls were just as frequent as rises: We observed 29 rises, 18 plateaus, and 30 falls. Our H1 is thus not confirmed by our data, whereas H2 is clearly substantiated.

Going by our quantitative data, it seems thus rather unlikely that a final rise can be considered a prototypical final pitch movement in French information-seeking *wh*-in-situ questions. These findings are opposed to recent experimental studies

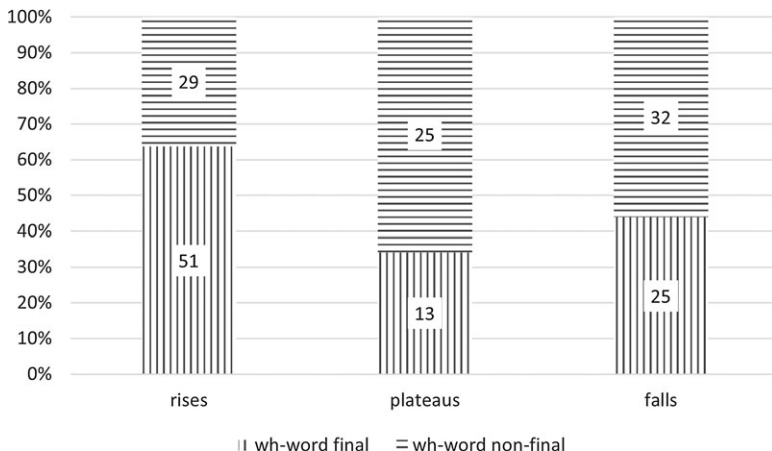


Figure 2. Stacked bar chart visualising the relation between final intonation and wh-word position.

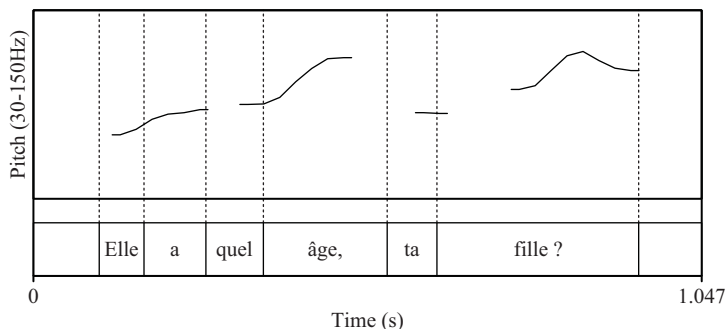


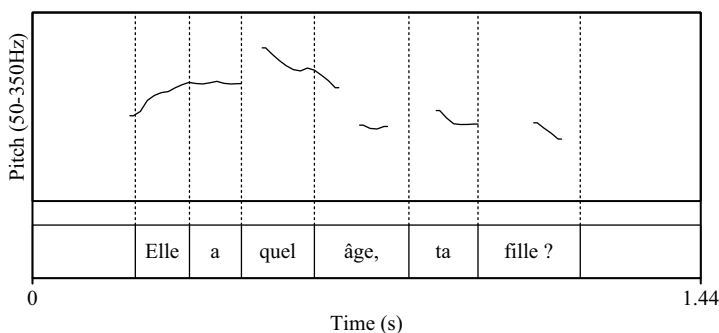
Figure 3. PRAAT picture of 129, TOKE1 ('How old is your daughter?').

(see Section 2.1). On the other hand, Déprez and colleagues (2012, 2013) also indicated a certain speaker variability, since the realised final intonation of one and the same interrogative varied across subjects. This observation can be further substantiated by our audiobook corpus, as two recordings of the novel *Total Khéops* were available and could be compared. Indeed, the same interrogatives in the same contexts are often realised with different final intonations (see also Reinhardt, 2021). This is exemplified in Figures 3 and 4. Here, the very same question is realised with a rise (Figure 3) and a fall (Figure 4).

In the information-seeking questions of which two recordings were analysed, ten identical and nine different final pitch movements were observed. Of the nine different ones, five were even opposite (i.e., once rising and once falling). In four out of these five pairs of tokens, the observed fall was produced by the same actor, suggesting that speaker preference might play a role here, but cannot be the only explanation. At any rate, it is noteworthy that our data prove one more time that intonational realisations may vary between speakers and that string-identical

Table 3: Final intonation of information-seeking wh-questions dependent on the final constituent

	rise	plateau	fall
Wh-word final	49	9	23
Wh-word non-final	29	18	30

**Figure 4.** PRAAT picture of 129, TOKE2 ('How old is your daughter?').

information-seeking questions are not always produced with the same final pitch movement, not even when they are uttered in the same situation.

Ultimately, however, one has to ask whether and how one can predict the final pitch movement in information-seeking questions. In this paper, we will not be able to give a conclusive answer, but we can present a few initial ideas. One of them might be the position of the wh-word. In Section 2.1.2, it was noted that wh-words are frequently pronounced with a high tone, potentially giving the impression of a final rising intonation. The corresponding occurrences can be seen in Table 3 (see also Figure 2).

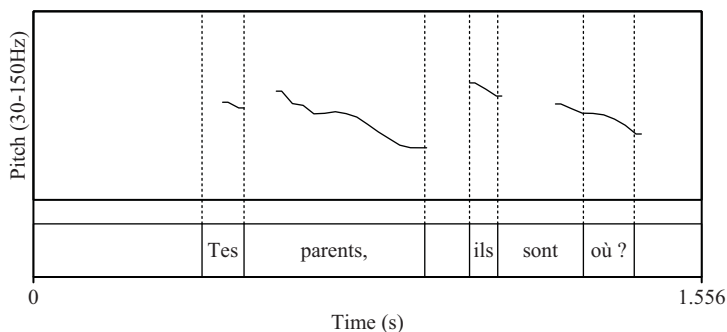
A corresponding χ^2 -test confirmed indeed that falls (and plateaus) are more likely to occur if the wh-word is not in sentence-final position ($p \approx 0.004$).

4.2 The effect of hierarchy

We hypothesised in Section 2.2 that wh-in-situ questions that are linked to assertiveness tend to be more frequently perceived with a final fall. One manifestation of this phenomenon might be the dominance of the speaker, as detailed in Section 2.1.3. Hence, interrogatives that are classified as uttered in a 'hierarchical' situation are expected to be more often falling than others. This assumption was at least partly confirmed. Of the 24 questions uttered in 'hierarchical' contexts, the most frequent final intonation was indeed a fall. Only a few were perceived with a plateau, slightly more than a third with a rise and half of them with a fall. Although all three intonation patterns occurred here as well, it is noteworthy that the observed tendency is exactly the opposite of that observed for

Table 4: Number of final pitch movement in hierarchical vs. non-hierarchical questions

	fall	plateau	rise
Hierarchical wh-in-situ questions	12	2	9
Non-hierarchical wh-in-situ questions	45	36	69

**Figure 5.** PRAAT picture of 139, TOKE1 ('Where are your parents?').

questions that were not uttered in hierarchical situations, such that H3 seems to be approved (see Table 4).

As this is a very limited data set, however, these results should only be interpreted as a first indication and not as a definite confirmation of the hypothesis that hierarchical questions show a tendency towards a final fall.

In order to provide a more detailed analysis, we looked more closely at all questions that had been annotated as hierarchical. To illustrate our findings, we present more detailed analyses of four tokens from *Total Khéops* below.

Let us start with a particularly clear case with two recordings. The respective question is uttered in a context where a police officer, trying to get important information, asks a teenage girl about the whereabouts of her parents (14).

- (14) Tes parents, ils sont où ?
 your parents they are where
 'Where are your parents?'
 (Our corpus, 439_TOKE)

As can be deduced from both social status and the situation resembling a police interrogation, the question is clearly hierarchical. As expected, the intonation drops at the end for both speakers (see Figures 5 and 6).

Both speakers produced the question in a similar way and the intonation is analysed by PRAAT as clearly falling, i.e., a drop in f_0 of several semitones, in this case six (TOKE1) and seven (TOKE2). This impression was confirmed by the perceptive annotation. In fact, both falls are exceptionally 'strong' and there was no inter-annotator disagreement.

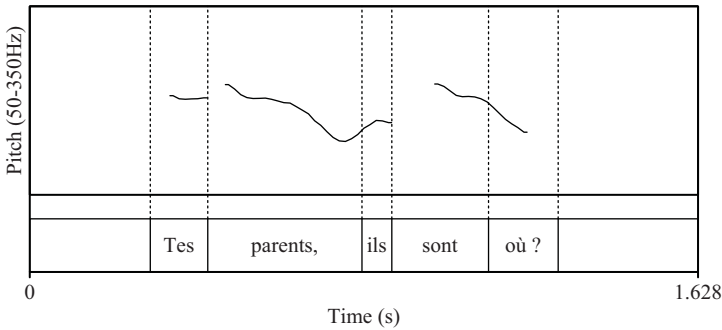


Figure 6. PRAAT picture of 139, TOKE2 ('Where are your parents?').

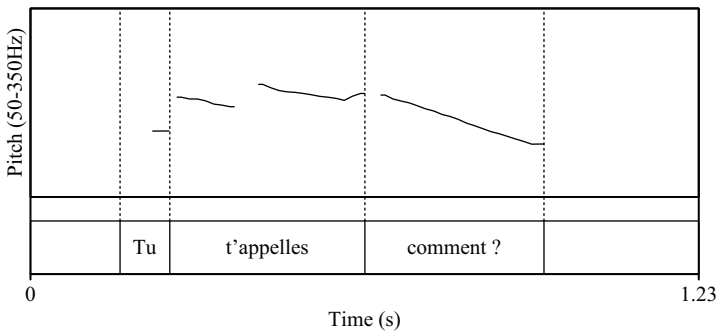


Figure 7. PRAAT picture of 15, TOKE2 ('What's your name?').

However, not all questions that were characterised as 'hierarchical' exhibit a final fall (see Table 3). In another interrogative from *Total Khéops*, an adult is addressing a teenage petty criminal. The situation takes place in a *banlieue* of Marseille, an impoverished area of council flats, where the speaker also grew up but has since moved away. To us, the situation clearly expressed hierarchy. Yet, we only see the prototypical falling final pitch movement performed by one speaker (see Figure 7). In the second recording, the actor chooses a clear final rise (see Figure 8). It is important to point out that the annotations, which were often conflicting, were unanimous in both instantiations of this interrogative.

The difference regarding the final pitch movement in the two recordings might be due to several reasons. On the one hand, the actor might have interpreted the context differently than we do, i.e., he might have concluded that the situation did not go beyond the expected level of hierarchy between adults and adolescents because the speaker and the addressee had grown up in the same area. On the other hand, the actor might have chosen the rising intonation since the interrogative is a 'classical' wh-question, nearing a fixed expression (see (15)), which is frequently used in colloquial French. It might be the case that these characteristics overruled in some way the potential effect of hierarchy.

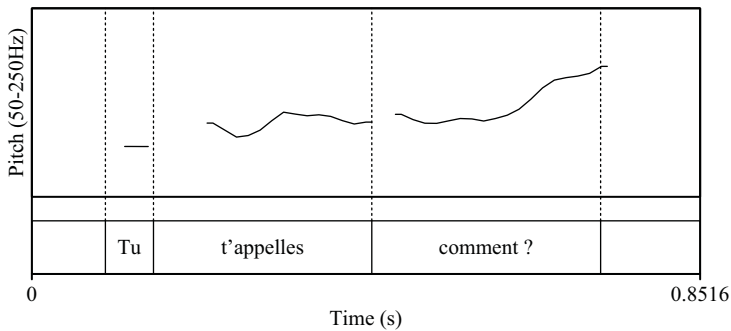


Figure 8. PRAAT picture of 15, TOKE1 ('What's your name?').

- (15) Tu t'appelles comment ?
 you yourself call how
 'What is your name?'
 (Our corpus, 15_TOKE)

4.3 Non-information-seeking questions and the effect of answer introduction

Having limited our search to interrogatives followed by a response or follow-up on the encoded information gap, we also observed 17 non-information-seeking questions, of which one is given as example in (16).

- (16) Bastiti me mènerait où ?
 Basiti me would bring where
 'Where would Basiti lead me ?'
 Followed by: *Au devant des emmerdes.* ('Into trouble.')

From a pragmatic point of view, these questions were very similar, as they were all used in the same way to structure the discourse. They were answered directly by the same speaker, suggesting that they were employed as a linguistic device to prepare the presentation of a particular thought. Therefore, these questions are introductions for other utterances and can be referred to as 'introductory questions' (cf. Reinhardt, 2019: 55).

All but two occurrences were annotated with a final plateau or fall. However, the two tokens perceived with a final rise were of a distinct nature: not only were they string-identical and recorded by the same speaker, but their structure also consisted of a grammaticalised expression (see (17)).

- (17) Vous savez quoi ?
 you know what
 'You know what, ...'
 Our corpus, 5390_LTEA

In this usage, the meaning of (19) is not the sum of the literal meanings of its words and sentence structure, since the speaker is not really asking what the listener knows. Rather, it is phatic, used to arouse curiosity before mentioning a new piece of information that the listener cannot know.

Moreover, in both of these utterances, the addressed person is the (fictitious) reader (of the protagonist's diary). Since it is clear from the lexicalised meaning that this is not an information-seeking question and the reader does not have the opportunity to speak out anyway, a rise cannot be (mis)interpreted as a handover of the speaker role. If a rise is linked to a request for turn-taking, the context here is thus clear enough to allow for deviations.

Among the other 15 non-information-seeking questions, 12 of them were *quoi*-questions; *combien*, *qui* and *où* each occurring once. Six of the self-given answers were statements (<.>, see (18)), three exclamations (<!>, see (19)), and six yes/no-questions (<?>, see (20)).

(18) Il me restait quoi dans mon jeu ?
 It me left what in my game
 'What was left in my game?'
 Followed by *Quatre dames*. ('Four queens.')

(Our corpus, 467_TOKE)

(19) Et je vous demande quoi en retour ?
 and I you ask what in return
 'And what do I ask for in return?'
 Followed by *Juste quinze minutes !* ('Just fifteen minutes!')

(Our corpus, 5302_LTEA)

(20) Tu veux que je fasse quoi ?
 you want that I do what
 'What do you want me to do?'
 Followed by *Que je commande une ambulance ?* ('Call an ambulance?')

(Our corpus, 4771_MMAT)

All recordings were perceived as clearly falling ('fall') or staying low ('plateau'). At first sight, one could think that these observations would support early works on French intonation since falls used to be predicted in all *wh*-interrogatives (see Section 2.1.2). However, this cannot be a valid explanation because most other *wh*-in-situ questions were pronounced with a final rise (see Section 4.1). Morphosyntactic structure cannot account for the falling pitch movement either, as the questions were formulated in different ways: with the *wh*-word in sentence-final and sentence-non-final position, with and without subject dislocation, and in simple matrix sentences as well as with subordinate clauses. Likewise, the final fall in non-information-seeking questions cannot be attributed to length (range between 3 and 13 syllables) or speaker preference (three different persons act out different characters). Thus, the explanation might be found on the pragmatic side.

The occurrences were not restricted to specific situations or speakers. They appeared as self-addressed questions in narrative passages (see (18), (20)), but also

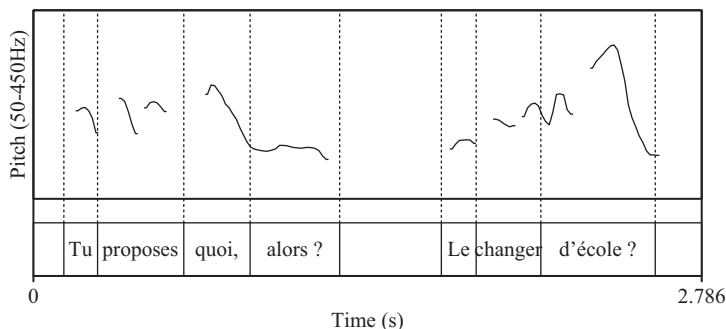


Figure 9. PRAAT picture of 4661, MMAT ('What do you suggest then? Transfer him to another school?').

as reproaches or rhetorical questions in staged conversations (see (21), (22)). They were explications of wondering as well as a means of introducing an ironic or sarcastic remark, but they were always rather pointing out the speakers' thoughts than asking another person for their ideas or knowledge. Since such questions are offered together with an answer, there is no request for turn-taking involved, and the admission of 'not knowing' is put into perspective by the speakers completing the proposition themselves. In fact, from a pragmatic point of view, introductory questions are similar to statements or commands ('Here is what I'm wondering about: ...'/'Consider this question/thought.'). As statements and imperative questions are generally pronounced with a final fall (Delais-Roussarie et al., 2015: 76–81), this might explain our observations in the intonation of this utterance type. Interestingly, even not all of the yes/no-questions that were uttered as answer offers after introductory questions were realised with a rising intonation (see Figure 9).

Apparently, the emotional status (i.e. outrage) or bias ('This cannot be a serious proposal!') of the speaker leads to a strong sentence-final rise-fall. Consequently, one might hypothesise that questions with some assertive meaning would (regardless of their structure) be rather pronounced with a final fall. However, this is not always the case either: As previous studies have shown, even rhetoricity does not necessarily lead to non-rising contours (cf. Beyssade and Delais-Roussarie, 2022). Nevertheless, our results suggest that non-information-seeking wh-in-situ questions are less often rising than their information-seeking counterparts. Therefore, our H4 can be confirmed.

5. CONCLUSION

In this article, we were able to show that morphosyntactic (i.e., the sentence-final or non-final position of the wh-word) and pragmatic factors (i.e., hierarchical vs. non-hierarchical questions and information-seeking vs. introductory questions) influence the final intonation of wh-in-situ questions. Yet, there seem to be other factors that come into play, such as inter-speaker variation.

We established that in French, information-seeking wh-in-situ questions are perceived with all three possible final pitch movements: rises, plateaus and falls. In fact, only in questions that ended in a wh-word, rises were more frequent than falls,

and it remains unclear in which cases a non-rising or falling contour is to be expected. Both structural and meaning-related factors certainly contribute to the prediction of final intonation, yet none of these factors appears to be a definite predictor, and their interaction is extremely complex. For example, wh-in-situ questions were significantly more frequently perceived with a final fall when produced by speakers who dominated the hearer, but this does not mean that hierarchical situations automatically lead to non-rising structures.

Furthermore, for wh-in-situ questions that were directly followed by a self-given answer (i.e., introductory questions), we observed almost exclusively a final fall. However, since our corpus only contained 23 occurrences of hierarchical and 17 occurrences introductory questions, the latter two observations should be tested again using larger data sets.

In conclusion, while pragmatics do clearly affect intonation in French wh-in-situ questions, predicting the exact final pitch movement is challenging. Even in neutral information-seeking questions, there may be a tendency for final rises, but rising, flat, and falling contours are all possible. Inter-speaker variation may be due to personal preferences, age, gender, or other subtle pragmatic factors.

Further studies with larger data sets are needed to establish the relationship between intonation and pragmatics. Production and perception experiments, as well as corpus studies on different interaction types, are necessary to complete the picture. Next, we recommend exploring the impact of pragmatic factors in answered wh-in-situ questions in spontaneous speech, such as podcasts and political debates. Those studies should take into account the three factors we have identified as influencing the final intonation: position of the wh-word (final vs. non-final), social hierarchy and utterance type, i.e., information-seeking vs. introductory questions.

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Competing interests. The authors declare none.

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CORPUS OF AUDIOBOOKS

- [ALEX] Résimont, P. (reader/actor) (2011), *Alex*, written by P. Lemaitre, Audiolib, streaming/download.
- [CNPJ] Buscatto, M. (reader/actor) (2017), *Copier n'est pas jouer*, written by F. Molay, Audible Studios, streaming/download.
- [ESCV] Angade L-H., Lefébure E. and Lévy M. (readers/actors) (2005), *Et si c'était vrai*, written by M. Lévy, Gallimard, streaming/download.
- [JUST] Spitzer N. (reader/actor) (2016), *Juste une ombre*, written by K. Giébel, Audible Studios, streaming/download.
- [LTEA] Basecqz J. (reader/actor) (2016), *Le temps est assassin*, written by M. Bussi, Audiolib, streaming/download.
- [MMAT] Klaus C. (reader/actor) (2015), *Maman a tort*, written by M. Bussi, Audiolib, streaming/download.
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E-BOOK-CORPUS (KINDLE)

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