

FRENCH REASON-COMMENT (HOW) QUESTIONS: A VIEW FROM PROSODY

ABSTRACT

This paper discusses some semantic/pragmatic aspects of French questions starting with *comment* 'how' and having an interpretation of reason (similar to reason 'why'), and investigates if and how these properties are reflected by prosody. With reason-*comment* questions, the speaker doubts that the proposition characterizing the event described in the question can be true, and asks the hearer to help her to revise her expectations about it, by giving her some reasons that make the existence of the event conceivable. The speaker's doubt is often accompanied by additional emotions, such as indignation, exasperation, etc. In order to analyse the prosody of these questions, we conducted a production experiment comparing the reason and the manner reading of *comment*-questions. Results confirmed that prosodic cues allow distinguishing the two interpretations. In utterances with reason reading, the expression of questioning force is important, though accompanied by expressions of expectation disconfirmation and surprise.

Keywords

French, Question, Ambiguity, Prosody

1 Introduction to the reason reading of *comment* 'how'

In the present paper we describe some aspects of the meaning and form of French questions introduced by the wh-word *comment* 'how' that have a reason reading. The wh-word *comment* in French can be interpreted as a manner, means, or instrument phrase adverb (cf. Van de Velde, 2009, a.o.) and be used in questions that ask about a manner of being,¹ or a manner of an event (1a), about a means (1b), or as a sentence adverb (cf. de Cornulier, 1974, a.o.) and be used in questions that inquire about the reasons that open the possibility for the proposition characterizing the event described in the question to be true (1c).

(1) Comment tu pourrais refuser sa proposition?

¹ As in (i) :

(i) A: Comment est ton professeur ? B: Très sévère.
How is your teacher ? 'Very strict'

how you could to.refuse his proposition

‘How could you refuse his proposition?’

a. Avec tact.

‘With tact’

b. En envoyant une lettre.

‘By sending a letter’

c. Je sais, mais j’ai déjà accepté un poste aux Etats Unis...

‘I know, but I’ve already accepted a position in the USA...’

Indeed, it is not rare to have in a language a wh-expression with the meaning of ‘how’ that alternates with an expression whose meaning is ‘why’ (cf. Collins, 1991; Ochi, 2004; Stepanov and Tsai, 2008; Radford, 2018, a.o.). Such an alternation is observed in the highest layer of the syntactic structure of a sentence (see Ko, 2005; Tsai, 2008, a.o., and Fleury and Tovenà, 2019 for French). Other examples of *comment*-questions with a reason interpretation are provided in (2).

(2) a. Comment pouvez-vous vivre ainsi ? (Desmets and Gautier, 2009)

how can-you to.live like.this?

‘How can you live like this?’

b. Comment oses-tu sortir comme ça ? (Desmets and Gautier, 2009)

how dare-you to.go.out like that

’How dare you go out like that?’

c. Comment peux-tu quitter un homme aussi adorable?

how can-you leave a man so lovely

’How can you break up with such a lovely man?’

Although the alternation is widespread, the reason reading of these ‘how’ questions has no unique common distinctive features across languages. There is an interesting feature that nonetheless shows up in several languages, which is the presence of a negative expressive colour. For example, questions with ‘how’ in Cantonese convey a form of emphatic negation in conversational discourse where the speaker disagrees with some other party (Cheung, 2008). In French, *comment*-questions with reason interpretation convey the information that the situation described by what we will call the (*pseudo*) *prejacent*, following Fleury and Tovenà (2018), is (often negatively) surprising for the speaker, who asks about its possible

causes.² The speaker inquires about the possible explanations for such an event, or even about the possibility of such an event taking place, because she thinks it is impossible or unbelievable, given her knowledge of the world and her expectations, that the event will take or has taken place.³ In (2c), the description of the addressee’s boyfriend as a sweet man makes it explicit why the speaker finds the breaking up event unexpected: to her knowledge, there is no ground for the event to occur.

Note that *reason-comment* always triggers an inference of unexpectedness relative to the event, while this inference is not necessarily found in a question introduced by *raison-pourquoi* ‘why’. Even a question introduced by ‘why’ can express unexpectedness, especially if the sentence contains some of the elements that are discussed in Section 2.1 (cf. (3), containing the high degree adverb *aussi* ‘so’). Yet, with *pourquoi*, the speaker just wants to know the cause of the unexpected event; with *reason-comment*, the speaker asks the hearer how she should reconsider her expectations, so as to produce a new candidate set of possible worlds representing the reality and where the event is not ruled out.

(3) Pourquoi as-tu quitté un homme aussi adorable?

‘Why did you break up with such a sweet man?’

Moreover, while a question with *pourquoi* can be answered by a sentence introduced by *parce que* ‘because’ (for instance, (3) could be answered by: *Parce qu’il m’a trompée* ‘Because he cheated on me’), the answer of a *reason-comment* question cannot be introduced by *comment*, or any other conjunction (for instance, (2c) could not be answered by: **Comment il m’a trompée* ‘*How he cheated on me’). Another interesting difference is that *pourquoi* ‘why’ is not acceptable with the modal *pouvoir* ‘can’, which is frequently associated with *reason-comment*:

(4) ?? Pourquoi peux-tu quitter un homme aussi adorable?

why can-you to.break.up.with a man so sweet

‘Why can you break up with such a sweet man?’

² The term *prejacent* – borrowed from the literature on modality – applies to a proposition. Unlike a usual question nucleus, the prejacent does not contain a free variable contributed by the sentence initial wh-expression. Fleury and Tovina (2018) qualify it as *pseudo* because they do not commit themselves to an analysis where the wh-item is a sentential operator. In the rest of the paper, we will just use the term *prejacent*, for the sake of brevity.

³ By convention, we will always use the feminine pronoun when talking about the speaker, and the masculine pronoun when talking about the hearer.

The unacceptability of (4) is related to the fact that *pouvoir* gets an abilitative reading, so that the question has the unlikely meaning ‘Why are you able to break up with such a sweet man?’; on the contrary, with reason-*comment*, the modal gets an epistemic reading: ‘How is it possible that you break up with such a sweet man?’. We account for this difference by pointing out that reason-*comment* is itself interpreted epistemically (‘how is it possible’), so the epistemic reading of the modal arises naturally in a reason-*comment* question.

From the additional meaning of unexpectedness of reason-*comment* derives the emotional load that is commonly associated with these questions, typically of surprise, but also of other emotions depending on the context. Such an effect makes the study of reason-*comment* questions particularly interesting to investigate the encoding of expressivity in language. Disbelief for the violation of expectations can border on negative emotions such as concern, disapproval, or contempt, and from here can ensue a rhetorical reading. For instance (5), which contains the expression *ce type de* ‘this kind of’, which refers to a standard, can be used to build a form of consensus (cf. the impersonal subject *on* ‘one’) with the addressee on condemning the acceptance of a certain compromise.

(5) Comment peut-on accepter ce type de compromis ?
how can-one to.accept this kind of compromise
‘How can one accept this kind of compromise?’

Again, a rhetorical reading is not impossible with *pourquoi*, cf. (6):

(6) Pourquoi devrait-on accepter ce type de compromis?
why should-one accept this kind of compromise
‘Why should one accept this kind of compromise?’

However, the modal is different (*devrait* ‘should’) and the meaning is slightly different too. In the case of *pourquoi*, the question used rhetorically has the obvious answer that no reason exists to accept this compromise; with *comment*, the obvious answer is that the speaker cannot come to terms in any way with the idea that this compromise be accepted. Because of its inherent anti-expectational character, we think that *comment* more easily shifts to a rhetorical meaning. The study of the similarities and differences between reason-*comment* questions and

pourquoi-questions cannot be extended further in the present paper, which has a different goal. We therefore leave a more detailed analysis to future research.⁴

In this paper, we look at the prosody of reason-*comment* questions in order to get some independent evidence for the interpretative account we propose for them. As far as we know, no prosodic study focusing on these particular questions has been undertaken so far. After presenting in Section 2 some morpho-syntactic and lexical properties that disambiguate *comment*-questions with a reason reading from those with a manner or a means reading, and after reviewing prosodic studies on similar questions in French and other languages, such as rhetorical, anti-expectational, and surprise wh- or yes/no-questions, a production experiment is presented in Section 3. The experiment compares the prosody of reason- vs manner-*comment* questions. As we will see in the results and the discussion sections, the quantitative and qualitative analysis confirm that prosodic differences exist between *comment*-questions with a reason reading and *comment*-questions with a manner reading. Results also support our claim that reason-*comment* questions have some questioning force, but at the same time express the speaker's doubt and surprise concerning the possibility that an answer to the question be available at all.

2 Properties and elements of analysis

2.1 Morphosyntactic properties of reason *comment*-questions

Comment-questions mostly admit a manner or means and a reason reading, as noted. However, they may feature functional and lexical elements that mute their potential ambiguity and make their reason interpretation strongly preferred. Sadock (1974) identified a number of factors that promote a rhetorical reading of a question, and Desmets and Gautier (2009) observed their relevance for reason-*comment* questions too.⁵

A first important property that we may observe is that the verb in reason-*comment* questions is very often accompanied by a modal like *pouvoir* 'can' (cf. 2a and 2c), *vouloir* 'want' (cf. 9), or a semi-modal like *oser* 'dare' (cf. 2b). Desmets and Gautier provide examples without the modal, and say that the modal is massively, but not systematically,

⁴ The discussion on the difference between *comment* and *pourquoi* has sprung from some insightful comments and data suggested by Xavier Villalba (p.c.), whom we thank here.

⁵ Desmets and Gautier do not use the term "reason" but call these questions "rhetorical".

present in these questions. The corpus study in Tovena (2020) shows that *reason-comment* combines quite naturally with infinitival questions with no overt modal, cf. (7).⁶

(7) Comment refuser une telle proposition? (Tovena, 2020)
how to.refuse a such proposition
'How to refuse such a proposition?'

If the verb is finite, however, the clauses without a possibility modal are felt to be very formal or obsolete by several speakers we informally consulted. This is an interesting but different research question that we leave aside for the moment. A tensed question without a modal improves if the clause that expresses the prejacent contains a negative, as in (8). Here, we are more likely to have an effect of disfavouring a manner reading than of favouring a reason one. The acceptability of (8) as a reason question can be understood with respect to the fact that negation creates a weak island for the extraction of *manner-comment*, which is a VP modifier; negation does not affect *reason-comment*, which is base generated high (Fleury and Tovena, 2019).⁷ We decided to always include modals and to never include negation in the questions used as stimuli for the production experiment that we will present in Section 3.⁸

(8) Comment tu n'es pas allée à la fête?
how you NEG are NEG gone to the party
'How come you did not go to the party?'

Going back to the presence of modals in *reason-comment* questions, we said that different modals could be present. The modal of possibility *pouvoir* 'can' quantifies existentially on possible worlds. Its discourse function in *reason-comment* questions is to allow the speaker to question the existence of worlds where the prejacent is true, thereby expressing that she finds it impossible to believe that the prejacent is true. The questions in (2a) and (2c), for instance, can be paraphrased as 'How is it possible that you live like this?' and 'How is it possible that you break up with such a lovely man?' respectively.

⁶ Note though that infinitives in questions, exclamatives or relatives are said to convey a modal meaning as well, see Villalba (2019) and the literature quoted therein. Thanks to Xavier Villalba for pointing this out to us.

⁷ The reader is referred to Szabolcsi (2006) for an overview of the vast literature on weak islands.

⁸ The question with *pourquoi* corresponding to (8) is also totally acceptable, without any noticeable difference in meaning with respect to the *comment*-question. However, the use of the latter seems more restraint, and limited to cases in which there is a point of awareness on the part of the speaker, who has just found out about the event described in the prejacent.

When the modal is not *pouvoir*, some semantic nuances are added. The question in (2b) features the semi-modal *oser* ‘dare’, and can be paraphrased as ‘How is it possible that you do not find it improper to go out dressed like that?’ and (9), where the modal is *vouloir* ‘want’ in the conditional mode, could be paraphrased as ‘How is it possible that you have in mind to make the cake yourselves?’. What is considered to be impossible or unconceivable is, in the latter examples, that the addressee has the attitude (‘dare’) or the intention (‘want’) of behaving in a certain way.

(9) [For Léon’s birthday, you and your friends organize a surprise party. Each friend has some chores and two friends want to prepare the anniversary cake. You are astonished because you know well that they cannot cook at all. You say:]

Mais comment voudriez-vous faire le gâteau?!

but how want.COND-you to.make the cake

(Vous ne savez même pas faire cuire un œuf!)

‘But how would you make the cake?! (You don’t even know how to cook an egg!)’

Another frequent morphological feature of reason-*comment* questions is the conditional mode, found for instance in (1), (9), as well as (10) below.

(10) [A friend of yours tells you that she is going to join a big oil company with a bad reputation. You are shocked, since your friend has always been a fervent environmental activist. You say:]

Mais comment pourrais-tu intégrer cette entreprise?!

but how can.COND-you to.join this company

(Tu détestes tout ce qu’ils représentent !)

‘But how could you join this company? You hate all that it represents!’

Its function appears to be that of highlighting the speaker’s incredulity towards the truth of the prejacent. Note that such incredulity is what leads the speaker to ask a reason-*comment* question in the first place. Indeed, it is crucial for us that the prejacent be not presupposed. Reason-*comment* questions resemble in this sense yes/no questions, which ask for the truth of the proposition expressed in the interrogative and are therefore not presuppositional. In uttering reason-*comment* questions, however, though doubting about the truth of the prejacent, the speaker

does not ask about it, but as we said, she asks the hearer to help her to enable the possibility of the prejacent in her epistemic state.⁹

A syntactic factor that contributes to distinguish reason-*comment* questions from *comment*-questions with other readings is the absence of subject-aux inversion, especially when a modal is absent. Strictly speaking, subject-aux inversion is required in formal written French questions, but it has become optional in contemporary French. Other forms of interrogatives without inversion are present in the language and they are more common in everyday speech. It is difficult to directly address the question of whether the small number of subject-aux inversion in reason-*comment* questions is due to the reading at hand or rather it is an issue of register. However, a study on written and oral corpora presented by Tovenà (2020) challenges the claim that this type of use is the hallmark of spoken French. An example of her dataset is (11a). If subject-aux inversion was present in this question, as in the constructed version in (11b), the question would only have a manner reading (hence it would sound strange, since it would ask for the manner of being scared).

(11) a. Comment tu as eu peur? Tovenà (2020)

how you have had fear

‘How come you were scared?’

b. Comment as-tu eu peur?

how have- you had fear

‘How [in what manner] were you scared?’

If the question contains a modal, preferences are much less clear, and both inversion (as in examples 2, 5, 9, 10) and absence of inversion (as in 1 or 12 below) are possible and more or less accepted depending on the question. The only tentative explanation that we can give for this is that the inversion that is triggered by the interrogative does not occur with reason-*comment*, which is generated high and does not bind a variable inside the clause; however the

⁹ As a reviewer points out, the idea that reason-*comment* questions are not presuppositional goes against Fitzpatrick’s (2005) claim that the only truly presuppositional questions in English are *how come* questions, whose meaning is similar to *why* and thus resembles that of French reason-*comment* questions. We would like to point out that reason-‘how’ questions, though common in many languages, come under very different forms and by no means behave in the same way crosslinguistically. Our intuition is that *how come* is rather similar in meaning to French *comment ça* (literally ‘how that’) or *comment ça se fait que* (literally ‘how is it done that’), which do not have the same, though similar, meaning as reason-*comment*.

modal, it being a functional head, can move for independent reasons, namely to get the desired epistemic interpretation.

In the reason questions used as stimuli, we could not be consistent in our choice of this property, for two reasons. As we will see in Section 3.2.1, our stimuli contained both questions that were ambiguous between a manner and a reason reading, and non-ambiguous questions, namely whose linguistic form favoured one or the other reading. In the former case, in order for the question to be ambiguous between the two readings, the absence of subject-aux inversion was not always convenient, and we decided to have half of the stimuli with inversion and half without it. As for the non-ambiguous questions, our idea was to construct them in a way that maximizes the accessibility of the reason or manner reading without context. But all these questions contained a modal, and not all of them seemed more natural without inversion in the reason reading. On the contrary, most questions have been constructed – following native speakers’ intuitions – with inversion. We will return to non-ambiguous questions in Section 3.2.1.

Another typical feature of reason-*comment* questions, also observed by Desmets et Gautier, is the presence of high degree expressions such as *tel* ‘such’, *aussi, tellement* ‘so’. In (1c), the adjective *adorable* ‘sweet, lovely’ is modified by the adverb *aussi* ‘so’. Another example is (12), which contains the degree adjective *telle* ‘such’:

(12) [You brother tells you that his boss has offered him a position in the firm with a salary rise but that he is going to refuse it. You are very surprised because you know that he needs money at the moment. You say :]

Comment tu peux refuser une telle proposition?!
how you can to.refuse a such proposition
‘How can you refuse such a proposition?’

High degree expressions indicate the maximal endpoint of a scale (or its proximity), with which to form propositions that entail all other alternative answers. They therefore mark the threshold below or above which—the direction depending on the meaning of the verb—the existence of the event described by the prejacent is considered as not probable.

The expectation disconfirmation by the speaker who utters a reason-*comment* question can also be signalled by some explicit marker of contrast in sentence initial position, such as the discourse marker *mais* ‘but’ in (9) or (10), which makes the contrast explicit between the speaker’s expectations and the prejacent she just learned about.

Finally, lexical choices further contribute to disambiguate between a reason and a manner reading. In (13), for instance, the reason (13a) and manner (13b) readings respectively depend on the minimal lexical variation *entourloupe* ‘dirty trick’/*démarche* ‘procedure’.

(13)a. Comment puis-je endosser cette entourloupe ?

how can-I shoulder this trick

’How can I shoulder this dirty trick?’

b. Comment puis-je endosser cette démarche ?

how can-I shoulder this procedure

’How can I shoulder this procedure?’

In Desmets et Gautier’s view, the features discussed in this section strongly contribute to a rhetorical interpretation of *comment*-questions, following Sadock’s (1974) claims for English. Our view is different. Let us note right away that there is no unique and consensual definition of rhetorical questions in the literature, although they are generally taken to be a typical example of non-information-seeking questions. Rhetorical questions are often claimed to be associated with no degree of uncertainty as to the answer (in some cases of opposite polarity, in others just corresponding to one the available alternative answers) on the part of the speaker (Sadock, 1974; Rohde, 2006; Caponigro and Sprouse, 2007; Biezma and Rawlins, 2017, a.o). Under this view, it is obvious for the speaker that the hearer already knows what is being stated, and the proposition corresponding to the implicit answer is assumed to be in the Common Ground (Stalnaker, 1974).

In the examples of reason-*comment* questions discussed in the above, the speaker’s attitude is totally different. The implicit answer is not assumed to be in the Common Ground. The speaker does not ask for some explicit acceptance from the hearer of the implicit answer, but rather asks the hearer to help her to revise her expectations and eventually accept the possibility of the prejacent. For instance in (10), the speaker does not ask for her friend to accept the claim that it is impossible for her to join the oil company; the question does not have a known answer for both speaker and hearer, and it is not a trivial question like a rhetorical one is. Rather, the speaker wants her friend to help her to come to terms with the possibility of her joining the oil company, despite what she knows about her friend’s caring about the environment and hating oil companies. Some explanations, some justifications are needed by the addressee, which will make her behaviour no longer in overt contradiction with the speaker’s expectations (she needs money; she wants to discover the secrets of that

company to better fight it; the company is not so bad as we thought, etc.). In conclusion, while some reason-*comment* questions with certain morpho-syntactic or semantic properties may eventually be interpreted as truly rhetorical, most of them are not, and the rhetorical use cannot be considered as the basic use of these questions.

2.2 The prosody of *comment*-questions

The morphosyntactic and lexical features described in Section 2.1 do not exhaust the set of factors that can be exploited to set apart the two interpretations of *comment*-questions. One may notice that the question in (12) ends with the punctuation mark ‘?!’. Desmets and Gautier (2009) observe that written *comment*-questions with a reason interpretation can end with an exclamation mark. The authors ascribe its presence to the fact that these questions generate various emotional attitudes, such as surprise or indignation, which are similar to those that are found in exclamatives. What is interesting for us is that the punctuation marks ‘?!’ or ‘!’ record a difference in pronunciation with respect to questions with a manner reading. We therefore hypothesise that the reason interpretation is characterised by specific prosodic cues. In Section 3, we report a production study that we conducted in order to test this hypothesis.

As far as we know, no research on the prosody of ‘how’ questions with a reason reading, neither the French ones, nor the corresponding questions in other languages, has been done so far. There are, however, studies on questions with semantic properties that are similar to those of reason-*comment* questions, such as rhetorical and surprise questions. Before reviewing the literature on their prosody, a few words must be spent on the prosody of canonical, information-seeking French questions. According to Santiago and Delais-Roussarie (2015), French questions display great variability of final contours. A rising contour is canonical in yes/no questions in the absence of subject-aux inversion or other markers of interrogative mood, but both falling and rising tunes are present when some interrogative (morphosyntactic or lexical) marker is present. As for wh-questions, it is often accepted that they may have a falling contour (Delattre, 1966, Delais-Roussarie et al., 2015, Santiago and Delais-Roussarie 2015). Santiago and Delais Roussarie (2015) showed in a corpus-based study, that no matter the type of question, the main pattern found is a falling one, and that only 25% of the wh-questions have a final rising contour. The wh-word is generally associated with a rising movement, encoded H_i or H^* , and the nuclear contour at the end of the sentence is generally $L^*L\%$.

As far as rhetorical questions are concerned, there are some prosodic studies on French and on other languages. For French, Delais-Roussarie and Beyssade (2019) found that information-seeking questions have faster articulation rate, and that in rhetorical wh-questions the duration of the wh-word is longer, with pauses before or after wh-words observed in rhetorical questions only. Moreover, in rhetorical wh-questions there is an f0 compression after the wh-word. Despite the variability of the form of the final contour of information-seeking questions, rises or a high plateau are frequently observed, while falling contours remain frequent in rhetorical questions. Indeed, L-L% contours, often associated to assertion, seem to be more frequent in rhetorical questions (Bartels, 1999; Han, 2002) while questions ending with an H-H% contour can have both readings. For German, Braun et al. (2019) showed that rhetorical questions presented a high proportion of high plateaus (H-%), a longer duration, and a breathier voice than information-seeking ones.

A study on yes/no-questions in Catalan by Prieto and Rigau (2007) is also worth mentioning. In this study, the authors discuss the variability of interpretations and contours of yes/no-questions headed (or not) by the complementizer *que*. Among the *biased* yes/no questions they look at, “anti-expectational” ones are “used when the facts or the situation do not agree with the speaker’s expectations” (Prieto and Rigau 2007:43, cf. ex. 14).

(14) (Que) us n’aneu? Jo em pensava que dinariem junts. Central Catalan
 that you NEG go I REFL thought that we.COND.have.lunch together
 ‘Are you leaving? I thought we were going to have lunch together’

With such a reading, the intonational pattern corresponds to the canonical falling contour found for neutral yes/no-questions in Catalan; however, a bell-form contour (a final prominent rising contour followed by a fall) on the last syllable is possible, though only when the question is not headed by the complementizer *que*. Interestingly, among biased yes/no questions, Prieto and Rigau distinguish between anti-expectational and rhetorical ones, the latter exemplified by *Que no ho saps, que t’estimo?* ‘Don’t you know that I love you?’, namely a question whose answer (of opposite polarity) is well known to both speaker and hearer. Clearly, the questions that interest us for the purposes of this paper are the anti-expectational ones and not the rhetorical ones, since it is the former and not the latter that clearly come close in interpretation to French reason-*comment* questions (leaving aside the obvious differences between yes/no and ‘how’ questions).

Another set of studies, linked to the previous one, which is worth mentioning is about questions expressing surprise. Note that we did not find any specific study on the prosody of surprise, which is conveyed by a variety of linguistic constructions and words. However, surprise is mentioned in the description of different types of sentences. In the description of French-ToBI (Delais-Roussarie et al., 2015), the contour of echo-questions is a rising-falling contour L H*L%, usually produced when the speaker has not understood what her interlocutor said, but it is also said to be used to express surprise. This pattern is close to the one used to express exclamation in French: the nuclear contour (L) H* L% is associated with the last word of the exclamative sentence. The surprise contour goes along with a sentence initial rise Hi. In most cases, the wh-word is also accented.¹⁰ Note that the example of echo-question that Delais-Roussarie et al. (2015) provide is a yes/no question. It is therefore not clear whether they talk about all forms of echo-questions and whether this contour could be relevant also for expressing surprise in wh-questions with *comment*. According to Delais-Roussarie et al. (2015), echo-questions are also used to express a state of incredulity (it is not possible to believe what has been said). The associated contour is a rising tune H*H% with rising pitch accents H* on the last syllable of prenuclear accentual phrases, marking a strong phrasing of the utterance. Interestingly, there seems to be a confusion in the prosodic literature between different emotional attitudes, since the pattern for incredulity mentioned by Delais-Roussarie et al. is attributed by Martin (2009) to surprise (for Martin, surprise is a variant of interrogation, characterized by the distinctive features of +rise +wider and -bell).¹¹ On the other hand, according to Meunier (2019), what expresses surprise (but also indignation) is the presence of an extra-high tone on all accented syllables of the utterance. This goes along with the idea presented by Auchlin and Simon (2004), for whom surprise is part of a positive activation, which contributes to an f0 rising and an augmentation of the tension of the voice. Finally, other phonetic parameters such as voice quality can also contribute to surprise such as breathy voice—see Shochi et al. (2009) for Japanese and Braun et al. (2019) for German—but this has not clearly been shown for French.

It is finally important to mention a recent study (Celle and Pélissier, 2020) that focuses on the prosody of two types of French questions that have some properties in common with

¹⁰ We remind that French is a syllable-stress language, where any non-grammatical word can receive a stress on its final syllable. The final syllable is also the unit where a pitch accent is realized. In the case of *comment*, the second syllable would therefore receive a pitch accent, and the pattern would be Hi H*.

¹¹ For Martin, these are binary features. When the value is positive, the feature [+ rise] indicates that there is rising contour, the feature [+ wider] indicates that the f0 span is wider and the feature [+ bell] indicates that the form of the contour is a rising-falling pattern, that corresponding to an H*H-L% tune.

reason-*comment* questions and that are ambiguous between an information-seeking and a surprise reading. The latter reading is exemplified in (15), from the stimuli of the experiment by Celle and Pélissier. One question is introduced by the wh-element *qu'est-ce que* (cf. 15a), the other question contains the wh-word *quoi* 'what' (cf. 15b).¹² Both constructions, like reason-*comment* questions, express the reaction of the speaker to some unexpected behaviour or situation.

(15) a. [You prepare scallops for New Year's eve and ask your husband to find an appropriate wine. When you are about to eat, you see a 2003 Saint-Emilion on the table, while you were expecting a white wine. You are surprised:]

C'est quoi ce vin rouge ?

it-is what this wine red

'What's this red wine?'

b. [You enter your bedroom and you catch your sister while she is reading your diary. You are surprised:]

Qu'est-ce que tu regardes?

what is-it that you look.at

'What are you looking at?'

Celle and Pélissier found that the prosody was significantly different in information seeking and surprise uses of these questions. Specifically, the pronunciation time for surprise questions was longer, the overall pitch range was larger, and the wh-word was longer and louder than in information-seeking questions. Note that sentence lengthening is a common property of both surprise questions and rhetorical ones (cf. Delais-Roussarie and Beyssade, 2019 and Braun et al., 2019). Celle and Pélissier (2020) then conclude that this property characterizes both expressivity and rhetoricity. We suggest that more generally, lengthening is an expression of markedness. Rhetorical questions, surprise questions, and reason-*comment* questions all share this common property, namely that their interpretation is marked with respect to a more canonical alternative reading.

3 A production experiment

¹² See Munaro and Obenauer (1999) for an interpretative analysis of similar constructions in other languages.

3.1 Working hypotheses

Taking the literature reported in Section 2.2 into account, we put forward our hypotheses concerning the prosody of reason-*comment* questions, to be tested by a production study. As explained earlier, and contra Desmets and Gautier (2009), we do not consider reason-*comment* questions as being always, nor purely, rhetorical, or at least we do not find this labelling useful for capturing the phenomenon. Our position is reinforced by the results of a survey conducted by Brunetti et al. (2020) through a questionnaire on the interpretation of *comment*-questions in context. Participants were asked to rate written questions with respect to their information-seeking potential and their surprise-expressing potential. The results of the questionnaire revealed that reason-*comment* questions are perceived as having an important information-seeking dimension. On a scale from 1 to 6, participants gave a mean score of 3.4 to the information-seeking dimension when the question had a reason reading, and 5.7 when the question had a manner reading. Participants varied greatly in their judgment, their individual mean scores ranging from 1.1 to 5.7. Note that questions were not presented orally in the questionnaire, so the participants could not rely on prosody. Perhaps prosody is crucial for the hearer to clearly understand the degree of rhetoricity of the question. We then expected that the prosodic characteristics of reason-*comment* questions would shed light on their degree of questioning force. In particular, rhetorical questions typically finish with a falling intonation, indicating that the question does not wait for an answer, since the answer is known (Braun et al., 2019; Delais-Roussarie and Beyssade, 2019). We expected that reason-*comment* questions would not be necessarily characterized by the presence of a falling intonation.

Results of the aforementioned questionnaire also led Brunetti et al. (2020) to conclude that participants judged the surprise dimension to be strongly present in questions with a reason reading. Therefore, we expected prosodic cues for surprise to be present in reason-*comment* questions. The questionnaire finally revealed that reason questions were judged as carrying a larger emotional import than manner questions (not limited to surprise). Emotional import, if encoded in language, is naturally expressed by voice (by prosody or by phonetic cues, such as voice quality). Therefore, we expected prosody to be affected by the presence of expressivity in reason questions.

Another set of questions to which we hoped our study could provide an answer concerned the relationship between the morphosyntactic features described in Section 2.1 and prosodic marking. Is prosodic marking enhanced or reduced when the form of the question

unambiguously tells one what the reading is? In order to answer this question, the study included both questions that were ambiguous between a manner and a reason reading—and which are only disambiguated by the context in which they are pronounced—and questions whose form is not ambiguous and that are therefore easily interpreted as having a manner or a reason reading, independently from the context.

Summarizing, our specific predictions were the following:

- Speakers use a different final intonational contour on *comment*-questions with manner vs. reason interpretation. We expected manner-*comment* questions not to differ from canonical information-seeking questions, with more frequently a falling than a rising final contour. As for questions with a reason reading, we expected them to have a different final tune than information-seeking questions, but also to differ in this respect from rhetorical questions.

- The speech rate of questions with a reason reading is longer (Delais-Roussarie and Beyssade, 2019; Celle and Pélissier, 2020), and the duration of *comment* is also longer (Celle and Pélissier, 2020; Braun et al., 2019).

- Marking of surprise is more present in questions with a reason reading than in questions with a manner reading. F0 resetting, a more important slope on the wh-word, and the typical 'bell' contour observed by Martin (2009) are all prosodic cues expressing surprise.

- There are more prosodic parameters related to expressivity in reason-*comment* questions than in manner-*comment* questions.

- In the presence of rich morphosyntactic and lexical information, prosodic parameters used to express reason- or manner-*comment* questions can be altered.

We carried out a self-paced production study in order to test these hypotheses. The experimental procedure was inspired by Braun et al. (2019), with two notable differences. First, we focused exclusively on wh-questions and did not deal with yes/no questions. Second, the questions that were the focus of our study were reactions addressed directly to the person who was the agent or causer of the situation described in the context, while in Braun et al.'s study, the addressee is not directly concerned with the situation. The task of the participants was to read silently a given context presented on a screen and then pronounce aloud the target interrogative sentence, using the prosodic pattern that mostly suited the context.

3.2 Methodology

3.2.1 Material

The material used for this experiment consisted of 28 interrogatives that were divided into two groups. The first group was made up of 14 interrogative pairs that we called *ambiguous*, since the surface form of the target *comment*-question was the same in either a manner or a reading context, modulo the little differences that will be mentioned below. The second group contained 14 questions that we called *non-ambiguous* questions, since they had morphosyntactic and lexical properties that favoured one or the other interpretation (manner or reason). There was a correspondence between the ambiguous and the non-ambiguous sentences, since the 14 contexts used for the first group were also presented for the second group. It is important to clarify that by *ambiguous* we do not mean that a reader could not tell *in context* whether the question had a manner or a reason reading, but only that the form of the interrogative was compatible with both interpretations *out of context*.¹³ In the stimuli, the context accompanying the interrogative was constructed in such a way that it helped as much as possible the reader to give the interrogative the desired interpretation. An example of an item containing an ambiguous question in the two contexts is given in (16).

(16) a. [A friend of yours tells you that she is going to break up with her German boyfriend. You want to know in what manner she is going to do it, since he is in Germany at the moment. You tell her:]

Et comment tu pourrais le quitter? (C'est mieux si tu le lui dis en face)
 and how you could him to.leave
 'And how could you break up with him? (It's better if you tell him to his face.)'

b. [A friend of yours tells you that she is going to break up with her German boyfriend. You are very surprised, for she has always said that he was the love of her life. You say:]

Mais comment tu pourrais le quitter?! (C'est l'amour de ta vie!)
 but how you could him leave
 'But how could you break up with him?! (He is the love of your life!)

An ambiguous question varied minimally in a manner and in a reason context: it was introduced by two different (but both monosyllabic) conjunctions (*et* 'and' for the manner reading and *mais* 'but' for the reason reading) and it ended with two different punctuation marks: a question mark ('?') in the manner reading and a question mark followed by an

¹³ We thank an anonymous reviewer for pointing out to us this possible misunderstanding.

exclamation mark ('?!') in the reason reading. Also, the question was always followed by another sentence (to be read aloud too), which would help the reader to make the context even clearer.

As for non-ambiguous questions, these were constructed in such a way as to favour one of the two readings as much as possible, independently from the context. The reason questions therefore contained some of the morphosyntactic properties discussed in Section 2.1. The lexical choices were also done so as to favour one or the other reading. As an example, the non-ambiguous questions for the pair of contexts in (16a) and (16b) are given in (17a) and (17b) respectively.

- (17) a. Comment vas-tu faire pour le quitter?
how go-you to.do for him to.leave
'How are you going to do in order to break up with him?'
- b. Comment peux-tu quitter un homme aussi adorable?!
how can-you to.leave a man so sweet
'How can you break up with such a sweet man?'

Consider (17b) first. The question contains the epistemic modal *pouvoir* 'can' and, more importantly, there is an adjective expressing a positive property in the nominal expression denoting the man that the addressee wants to break up with, and the adjective is modified by a degree adverb (*aussi adorable* 'so sweet'). As for the manner version in (17a), a verbal paraphrase (*faire pour* 'to do in order to') is used together with the auxiliary of proximal future *aller* 'to go'. This wording ensures that its interpretation relates to how the action of breaking up is to be carried out. Two more examples of non-ambiguous reason-*comment* questions are given in (18). The reason interpretation is here made more explicit by the addition of two modals: the possibility modal and a modal expressing the addressee's attitude towards the content of the prejacent (make the cake, join this company), and whose existence is the object of the speaker's doubt.

- (18) a. Comment croyez-vous pouvoir faire le gâteau ?!
how think-you to.be.able to.make the cake
'How do you think you can make the cake?!'
- b. Comment peux-tu vouloir intégrer cette entreprise ?!
how can-you want to.join this company

‘How can you think of joining this company?!’

To the 28 items, we added 50 fillers constructed following the same context+sentence scheme. The whole corpus of stimuli was divided in two experimental lists. Each list contained half of the different questions and we manipulated the type of question (manner or reason) within subjects. Thus, each participant only saw the stimuli of one list. They never had to produce the two possible readings of the same ambiguous or non-ambiguous sentence, but saw the ambiguous question of the pair in only one context and the non-ambiguous question in the other context. We used the same fillers for each list and all trials were pseudo-randomized so that two target interrogatives were separated by at least two filler utterances. Each list, presented in different random orders, was presented three times, in order to test intra-subjects’ reliability. The total made up a block, which is what was presented to a participant. A short pause was added between the lists within a block.

3.2.2 Procedure and participants

The material was presented on a tablet screen. The context and the target sentence were presented on the same screen, the former in italics and the latter in bold and bigger characters.

Participants were asked to read silently the written context and then produce the target question, taking the context into account. Participants could repeat their production in case of mispronunciation and when they were satisfied by their pronunciation, they could scroll the screen of the tablet to proceed to the next utterance. The whole experiment lasted 30 to 40 minutes including two breaks.

12 native speakers of French, undergraduate or graduate students, (6 male and 6 female, with no reported speech disorder) participated in this experiment and received 10 euros as compensation. Some of them were students at the linguistics department of the university.

A total of 721 target utterances were collected for analysis (181 ambiguous manner-questions, 181 ambiguous reason-questions, 180 non-ambiguous reason-questions and 179 non ambiguous manner-questions).

3.3 Analysis

The target sentences were segmented using the EASYALIGN script (Goldman, 2011) prior the phonological analysis of the contours. On the basis of an orthographic representation of the sentence, EASYALIGN provides segmentation into the syllable and the phone level using

a SAMPA (Wells, 1997) transcription. Word and phonetic boundaries were manually corrected by the authors using standard segmentation criteria (Turk et al., 2006) with Praat (Boersma and Weenink, 2020). Syllable duration measurements and mean pitch values on each vowel were automatically obtained using a script with Praat. An example of the segmentation and the annotation of the utterances are given in Figure 1.

<insert Figure 1 here>

Figure 1: Example of the f0 curve and the annotation obtained with EASYALIGN, enriched with a phonological annotation on the first tier.

Since French lacks lexical stress, analysing French prosody is not possible without linking accentuation and intonation on the one hand, and accentuation and phrasing on the other. In French, stress is attributed at the phrasal level, with an obligatory phrase final (primary) stress and an optional initial (secondary) stress. The acoustic cues that characterize stress are pitch excursion and vowel lengthening. For the present work, we focused on the analysis of intonational phenomena on the left and right edges of the utterances. The intonational analysis is based on an acoustic analysis of the pitch accents and the edge tones. For the present study, we focalized on the tunes on the wh-word *comment* and on the final tune. We annotated initial accents because, even though their main function is reinforcing the cohesion of the accentual phrase, they can also have an emphatic or expressive function. We annotated final tunes, because in French they are relevant for indicating the illocutionary force. We followed the guidelines of ToBI labelling developed for French (Delais-Roussarie et al., 2015).¹⁴ Since there is no agreement among scholars on the existence of an intermediate phrase, we used only the accentual phrase (ap) and the intonational phrase (IP) levels. For each target utterance, the annotators also indicated specific use of voice quality such as breathy or creaky voice, as well as the presence of laughter. Phrasal tones were also annotated but are not discussed in the present paper.

3.4 Results

3.4.1 Results of the phonological analysis

¹⁴ We remind that the inventory that is used contains tonal labels that are associated with the accented syllables (Hi and T*) and the boundaries of prosodic phrases (aL, T- and T%), aL on the left edge, - at a phrasal level and % on the right edge. T can be L (Low) or H (High).

For the analysis of the phonological variables, we first coded the outcome variables to be binary. The initial tone variable was coded as 1 when produced with a Hi tone and as 0 when associated with an aL tone. Since the sentence-final tune variable had four levels, one of the levels was coded as 1 and all other levels were coded as 0. For each categorical analysis we ran a generalized linear mixed-effects model using the `glmer` function of the `lme4` package (Bates et al., 2015) in R (R Core Team, 2017), with reading (Reason vs. Manner) and ambiguity (Ambiguous vs. Non-Ambiguous questions) as fixed effects. Participant and Item were included as random intercepts. We also tested the interaction between reading and ambiguity by means of a likelihood ratio test using the `anova()` function in R (Chambers and Hastie, 1992). We then excluded the interaction from the model when it was not significant.

<insert Figure 2 here>

Figure 2: Initial tone produced on *comment*.

The distribution of initial tunes is presented in Figure 2. We observe a greater proportion of Hi tones produced at the first syllable of *comment* in reason than in manner questions. The statistical analysis showed that this difference was significant ($\beta=1.99$, $SE=0.22$, $p<.001^{***}$) for both ambiguous and non-ambiguous questions.

The distribution of the final tunes is presented in Figure 3.

<insert Figure 3 here>

Figure 3: Occurrences of final patterns in ambiguous and non-ambiguous questions.

Interaction between ambiguity and reading in the !H*!H% pattern analysis was significant ($\chi^2(1)=3.89$, $p=.048^*$). In order to analyze the contrasts of the interaction, we used the package `emmeans`. Results of this post-hoc analysis showed that the !H*!H% prosodic pattern was significantly more frequently produced with the reason than the manner reading in ambiguous sentences ($p<.001^{***}$). However, in non-ambiguous sentences, this difference was not significant ($p=.055$). The H*L% pattern was also significantly more frequently produced in reason than in manner questions ($\beta=2.07$, $SE=0.43$, $p<.001^{***}$) and in this case, in both ambiguous and non-ambiguous sentences. The only pattern more frequently associated with manner questions was H*H% ($\beta=3.04$, $SE=0.29$, $p<.001^{***}$), independently from the ambiguity of the context. Finally, the L*L% patterns were more frequently produced in reason

than in manner questions ($\beta=0.47$, $SE=0.17$, $p=.007^{**}$), and more of them were produced in non-ambiguous than ambiguous contexts ($\beta=1.16$, $SE=0.29$, $p<.001^{***}$).

3.4.2 Results of the phonetic parameters

The phonetic variables we took into account were: speech rate, F0 span, and syllable ratio in the *comment* word. For the statistical analyses of these phonetic variables, we performed a linear mixed-effects analysis per variable using the lme4 package in R. We included reading (Reason vs. Manner) and ambiguity (Ambiguous vs. Non-Ambiguous questions), and the remaining two variables as fixed effects. The random effects were the intercepts for participants. The interaction between reading and ambiguity was also tested with a model comparison using the R function `anova()`, and each interaction was excluded from the model which was not significant.

<Insert Figure 4>

Figure 4: Phonetic variables.

Results for the three phonetic variables are presented in Figure 4. Results showed a difference in speech rate: Reason questions were significantly slower than manner questions ($\beta= -0.77$, $SE=0.06$, $p<.001^{***}$). Even if we can observe a tendency for the f0 span to be wider in reason questions when the context is ambiguous, the global f0 span was not significant ($\beta=0.40$, $SE=0.34$, $p=0.23$). However, the duration ratio within *comment*, namely between the two syllables of the word, was significant ($\beta=0.09$, $SE=0.03$, $p<.001^{***}$). More specifically, with a reason interpretation, the first syllable of the word [ko] was significantly longer than the second one [mã], while both syllables had a similar length in the manner reading.

3.5 Discussion

The results we obtained in the production experiment support the hypothesis that prosody allows to distinguish the two readings—manner vs. reason—that are possible for *comment*-questions. However, results are not homogeneous for ambiguous and non-ambiguous sentences.

For ambiguous sentences (cf. the two left bars in Figure 3), the main contour for the manner reading is a rising pattern H*H%, while for the reason reading, it is the high plateau pattern !H*!H%, see Figure 5.

<Insert Figure 5>

Figure 5: f0 curve and annotation of an ambiguous manner-*comment* question with a H*H% final tune (upper picture) and reason-*comment* question with a !H*!H% final tune (lower picture).

!H% encodes a fall to mid contour or a preservation of the pitch level at same level as the pitch accent !H*, which was already at a mid-level. This indicates that the pitch accent is at a lower level than other pitch accents in the utterance, for instance the one found on *comment*, but high enough to be considered as a high tone. Interestingly, Delais-Roussarie et al. (2015) associate this contour to epistemic-biased utterances expressing speakers' attitudes such as doubt. They argue that this contour is used in contradiction statements when speaker and hearer do not share the same opinion. In the light of what Delais-Roussarie et al say, we can explain the presence of this contour in reason-*comment* questions as follows. In reason-*comment* questions there is a contradiction between a proposition (the prejacent) characterising a situation and a set of propositions characterising the epistemic state of the speaker. The speaker needs more information in order to reconcile her vision of the world with the truth of the prejacent. The !H*!H% pattern expresses the contradiction between the speaker and whoever is responsible for the situation characterized by the prejacent. In the stimuli of our experiment, the event for which the speaker asks for an explanation directly involves the addressee. It is either his intention or wish, or something that the addressee is doing that leads to the situation that the speaker cannot conceive as true, given her expectations. In other words, the addressee is the agent, planned agent or causer of the situation described by the prejacent in the context. Given such a dialogical setting in our stimuli, which was supposed to make it more natural for the speaker to question the addressee, we can somewhat imprecisely say that the contradiction is between the speaker and the addressee.¹⁵

As we predicted, the final 'bell' contour H*L% is also significantly more important in the reason condition; however, it is found in lesser proportion than the !H*!H% contour. Recall that H*L% is the contour that some authors like Delais-Roussarie et al. (2015) or Martin (2009) consider as typical in the expression of surprise. An example is given in Figure 6.

¹⁵ We do not exclude that the contour may also express a contradiction that does not involve directly the addressee, but involves the speaker and a third party, since what the contour expresses is the contradiction between the speaker's epistemic state and the proposition expressed by the prejacent. However, this could not be tested with our stimuli.

<insert Figure 6>

Figure 6: f0 curve and annotation of an ambiguous reason-*comment* question with a H*L% final tune.

Finally, L*L% appeared in the same proportion for manner and reason interpretations. Recall that this contour characterizes rhetorical questions and is ascribed to their non-questioning, assertive nature. This contour is also frequently found in regular information-seeking questions; however, manner questions in our experiment are more frequently associated with a H*H% tune. This result therefore supports our hypothesis that reason-*comment* questions are different from rhetorical ones, but also differ from information-seeking ones.

The final tune distribution is quite different for non-ambiguous sentences (see the two bars on the right in Figure 3). Even though the main pattern associated with manner questions remains the rising H*H% tune, for the reason interpretation the more frequent tune is the falling L*L% tune, see Figure 7. The bell form H*L% tune is also less produced in non-ambiguous than in ambiguous sentences, though still in a bigger proportion in reason than manner questions.

<insert Figure 7>

Figure 7: f0 curve and annotation of a non-ambiguous manner-*comment* question (upper picture) and reason-*comment* question (lower picture) with a L*L% final tune.

One may ask why the falling tune is more frequently present in non-ambiguous sentences. There are various possible explanations for this result. One explanation relies on the length of non-ambiguous sentences, which is greater than that of ambiguous ones: speakers could have readjusted the prosodic contour because of rhythmic constraints (Martin, 2009). Another possible explanation takes into account the linguistic material that was used in non-ambiguous questions in order to make the reason interpretation transparent. In Section 3.2.1 we saw that non-ambiguous questions either contained a high degree expression, cf. (17b), or a sequence of modals, cf. (18). These additional elements contributed to the reason interpretation in various ways, either by making it more explicit that the question was about the existence of the prejacent (modal *pouvoir* ‘can’), or by making the contrast explicit between the speaker’s expectations and the prejacent (high degree expressions). A qualitative appreciation of the

prosody of these expressions showed that they often bear a focal accent. We suggest that the speaker manipulates the sentence information structure in order to make the intended meaning of the question clearer, namely to clarify what the question is actually asking. For instance, in Figure 8, focal stress, marked by loud intensity, is on the modal *peux*. The L* is on the pronoun *tu* ‘you’ at the right edge of the prosodic word.¹⁶ What follows the pronoun is deaccented. By focalizing the modal *pouvoir*, the speaker highlights the fact that the question is about the possibility for the prejacent to be true. The addressee believes that the prejacent is true, while the speaker of the *comment*-question is asking for the reasons that make it possible for the prejacent to be true, since she doubts of it. The question can be paraphrased as “Is it possible (that *prejacent*)? If yes, can you give me some reasons for it?” In this sense, the truth of the prejacent is under discussion, and the question is about the possibility of the truth, therefore the possibility modal is focused.

<Insert Figure 8 >

Figure 8: F0 curve and annotation of a non-ambiguous reason-*comment* question with focal stress on the modal verb *peux* ‘can’.

In Figure 9, focal stress is marked by a L* tone on the last syllable of the high degree word *aussi*, followed by deaccentuation. By focalizing the high degree expression, the speaker makes it clear that it is the crossing of that high boundary that is doubted. For instance, in (17b), what is questioned is the truth of the prejacent (the addressee will break up with her boyfriend) *despite its crossing a certain boundary* (the boyfriend is very sweet and therefore it is not likely that someone wants to break up with him).

<Insert Figure 9 >

Figure 9: F0 curve and annotation of a non-ambiguous reason-*comment* question with focal stress on the high degree term *aussi* ‘so’.

It could be the case that the accentuation of these crucial parts of the utterance to get the reason reading had the effect of producing a low final contour. If that is correct, the frequent falling final contour in non-ambiguous questions would not signal the fact that the question already has an answer, but would just be a consequence of the fact that the

¹⁶ Because of subject-aux inversion, the pronoun is grouped in the same prosodic word as *peux*.

semantic/pragmatic aspects of the reason interpretation are already marked – both prosodically and morphosyntactically – elsewhere.

As far as the tune found on the left edge of the sentence is concerned, that is on the wh-word *comment* (cf. Figure 2), we observe that it is the same both for ambiguous and non-ambiguous questions, no matter how the sentence is interpreted: since all content words in French receive a pitch accent on their last syllable and *comment* is a bisyllabic word, there is always a pitch accent on its last syllable, which can be preceded by an initial Hi accent on the first one. However, the proportion of initial Hi accent on the first syllable was higher in reason questions than in manner questions. This result was confirmed phonetically, since the first syllable was significantly longer than the second one with a reason interpretation, while both syllables had a similar length in the manner interpretation. The fact that the proportion of Hi accents in the manner condition is not negligible can be explained by the phonetic composition of the word (the wh-word is beginning with a unvoiced velar consonant [k]), but still, the proportion is higher in the reason condition. This result verifies the prediction that through initial accentuation on the wh-word, reason-questions bear a supplementary prosodic cue of surprise.

Given the difference between ambiguous and non-ambiguous sentences observed above, our prediction about the relationship between the morphosyntactic and the prosodic marking is confirmed: a more transparent morphosyntactic marking does affect the prosody of the utterance. An interesting follow-up question is in what way it affects it. The quantitative analysis showed that ambiguous and non-ambiguous sentences differ in the proportions of final contours, in that non-ambiguous questions presented a lower proportion of the high plateau !H*!H% pattern, and a larger proportion of a falling L*L% pattern. However, the qualitative analysis made us suggest that the difference is an effect of focal stress in non-ambiguous utterances on those morphosyntactic elements that are crucial to get the reason interpretation (degree expressions, modals, or other elements that may be relevant). If this analysis is correct, then prosody and morphosyntax combine together in an effective way, in that prosodic marking is used to highlight the relevant morphosyntactic marking.¹⁷

Speech rate seems another important cue to distinguish manner and reason interpretation, reason questions being produced with a slower rate than manner questions (see Figure 4). As we saw in Section 2.2, this property is shared by other French questions that have a non-canonical interpretation, namely surprise questions discussed in Celle and Pélissier (2020),

¹⁷ Interestingly, in Prieto and Rigau's (2007) anti-expectational yes/no questions, on the contrary, prosody and syntax do not sum up, since a particular prosody is absent when the complementizer *que* is present.

and rhetorical questions discussed by Delais-Roussarie and Beyssade (2019). As we observed in Section 2.2, a longer speech rate could be ascribed to what all these questions have in common, namely the non-canonicity of their reading with respect to a canonical, alternative reading. Nevertheless, our results on the duration of the *wh*-word do not confirm the findings of the cited previous studies, since the *wh*-word is not longer in reason-questions than it is in manner-questions. This difference may simply be due to the fact that the target sentences in Celle and Pélissier's (2020) study were extremely short, cf. (15). Finally, the fact that the f_0 span is wider in reason questions is a tendency that is not statistically verified. However, we are aware that the measurement we took into account for the f_0 span is limited, since it only delimits the f_0 minimum and maximum values and it does not take into account the fact that the intonational pattern can be compressed in high values, or that H% that ends manner questions can be very high.

The qualitative analysis also showed that some target utterances were realized with a particular voice quality. An interesting result is that 41 utterances were realized with breathy voice. This result goes along with the results found by Shochi et al. (2009) for Japanese, which associate this voice quality to surprise, and Braun et al. (2019) for German, where it was an important phonetic cue in distinguishing rhetorical questions. Importantly, Braun et al. (2019) considered breathy voice to signal an exasperated attitude of the speaker when uttering rhetorical questions. In our data, breathy voice was used with 37 *reason-comment* questions against only 4 utterances with a manner interpretation. We believe that breathy voice is an additional way to add expressivity to the utterance.

Eight target utterances (five occurrences for item 5, one for items 6, 10, and 12) were produced with laughter. They all had a reason reading, which is an interesting point if we consider that laughter's main function is to highlight some incongruity (see Mazzocconi et al., 2020 on the functions of laughter in dialogue). The presence of laughter in *reason-comment* questions could signal the speaker's disconfirmation of her expectations. However, the number of occurrences is not high enough to make a generalization.

Finally, even though we do not present a complete study of phrasing of our utterances, it can be noted that phrasal high tones H- were more frequently found in reason-questions than in manner-questions (and in a higher proportion in non-ambiguous utterances). These high tones created a resetting effect, which could again be accounted for as a mark of expressivity.

4 Conclusions

This article presented a first prosodic analysis of French *comment*-questions with a reason interpretation. We conducted a production experiment where *comment*-questions were used in their manner and reason readings, in order to see whether prosody would distinguish between the two, and if so, whether the difference revealed the complex semantic/pragmatic aspects of these questions discussed at the beginning of the article. Results confirmed that prosody clearly sets the two readings apart. Results were in line with our predictions, in particular:

- reason-*comment* questions (at least the ‘ambiguous’ ones) were produced with a specific final tune (!H*!H%), which was different from the rising contour found in manner-*comment* questions and also from the falling contour that one would expect if the interpretation of the question was purely rhetorical;
- differences in the morphosyntactic marking of the sentence, however, affected such a final contour, since ‘non-ambiguous’ questions presented a larger proportion of L*L%. We suggested that this was related to a focal accent frequently falling on those lexical elements that were crucial to get the reason interpretation (high degree terms, modal verbs, etc.). We concluded that prosodic marking does not replace the morphosyntactic marking, but rather highlights it;
- reason-*comment* questions were produced with a slower rate than manner questions, a property shared with other (surprise or rhetorical) French questions. We suggested that what all these questions have in common is the non-canonicity of their reading (which is often associated with a non-canonical syntax), with respect to an alternative canonical reading;
- in reason-*comment* questions speakers used special phonation modes, such as breathy voice or laughter, more frequently than in manner-*comment* questions. We argued that these cues express the emotional import that is related to expectation disconfirmation. The disconfirmation of the speaker’s expectations, which motivates the speaker to ask the question, as well as the surprise effect often associated with it, were also signalled by phonological cues, such as the final bell contour and a high tune on *comment*.

As we said, these are the first findings, as far as prosody is concerned, of the characteristics of French reason-*comment* questions. Nevertheless, our work was not done in the absence of any study that could be related to ours, as seen in Section 2.2. The task was as such more difficult, in that the literature described prosodic results concerning questions that shared *some* properties with reason-*comment* questions, but also important differences in form or

interpretation, which could have an effect on their prosody. The questions studied in the literature varied depending on two main aspects: one concerned what the question asked and its consequent syntactic form (whether it was a yes/no- or a wh-question, whether the wh-expression was an argument or an adjunct, whether the wh-expression bound a variable or not, etc.); the other was the particular interpretive effect that the question produced (whether it was considered as rhetorical, anti-expectational, or other). Such a complexity of factors made it difficult to single out the specificity of reason-*comment* questions, as well as – inversely – to identify the commonalities among all these questions. Perhaps the only generalization we can tentatively make is that all these constructions display prosodic cues (and often the *same* prosodic cues) expressing the speaker’s particular emotional state, the latter being a shared effect of the semantics of all these questions, despite the interpretive differences among them.

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