



# Intonational polar question markers and implicature in American English and Majorcan Catalan

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## Abstract

We offer an experimental approach to the study of the types of implicatures generated by polar question intonation in American English and Majorcan Catalan, which is rising and falling, respectively. In a categorization task, we show that discourse context affects whether listeners perceive utterances produced with the polar question markers (PQMs) to be declaratives versus questions. Results from an intention identification task show that PQMs in specific discourse contexts generate pragmatic implicatures, but that the “questioning” meaning of PQMs seems to persist, suggesting that PQMs give rise to conventional implicatures. While some language-specific differences were identified, results suggest that regardless of the direction of the contour, PQMs may generate similar types of implicatures cross-linguistically, and should be investigated with a larger sampling of languages.

**Index Terms:** intonation, polar questions, American English, Majorcan Catalan, pragmatics, implicature

## 1. Introduction

### 1.1. Background and motivation

Rising declaratives in English have been of interest to both researchers and the popular media. The phenomenon, commonly known as “uptalk” in American English (AmEng) is often negatively stigmatized [1]. Previous work has found that rising declaratives generate implicatures, and therefore contribute to what Grice has called the *unsaid* [2], as we can see in (1):

- (1) Sue arrives at the dentist’s office and says to the receptionist, *Hi, I’m Susan King* [+rise] *I have an appointment with Dr. Brooks* [+rise]

In (1), Sue asserts new information (her name/that she has an appointment), but through the rise implicates something more. [3] discuss the use of rises in such contexts as implicating questions such as *Am I in the right place? Is he expecting me?* So while the speaker may have full certainty about the new information she asserts (she is not questioning whether she has an appointment with the doctor) she can *implicate* a question unrelated to the propositional content of the utterance. The idea of *implicit questions* for declarative rises is also discussed in [4] and [5]. Another pragmatic use for rises in AmEng is quite prevalent in narratives, where they have been claimed to be used by speakers to “check in” with an interlocutor to make sure they are following or understanding what is being said [6, 7], as in (2):

- (2) I was rushing that day because I had to get to a doctors’ appointment [+rise] and I ended up forgetting to lock the door.

Here the rise may convey possible implicit questions like *Are you following?* or even *Do you know what it’s like to be rushing when you have an appointment?* Speakers may also use rises to make a syntactically declarative utterance into a question, as in (3):

- (3) A: Maria’s husband was at the party.  
B: Maria’s married?

[6] points out that B’s response will convey to A that this is the first time B is hearing that Maria is married (which can be inferred from A’s assertion). In such cases, A’s commitment to the proposition is higher than B’s and thus B’s utterance is understood as a question [8]. Differently from (1) and (2), the “questioning” indeed relates to the propositional content, and is not implicit. It may also be inferred that B is questioning the veracity or possibility of propositional content [9], and as such a nuance of surprise or incredulity may also be conveyed.

Contexts (1)-(3) suggest that rises in AmEng can be used to question not only propositional content (as in (3)) but information independent of propositional content (as in (1) and (2)). In this paper we provide cross-linguistic experimental evidence that polar question intonation gives rise to different types of implicature, all of which have “questioning” in common. We compare AmEng with Majorcan Catalan (MajCat), a language variety that marks polar questions through an utterance-final fall rather than a rise. We show evidence that both languages exploit polar question intonation in predictable ways, and that such intonation allows listeners to make inferences about the specific nature of “questioning” based on contextual information.

### 1.2. Polar question marking in AmEng and MajCat

[3] use the L\*H-H% label to describe the contour used for yes-no, or polar questions in AmEng. [10] refer to this contour as the unmarked question contour in AmEng and by far the most frequent among rise choices for questions in this variety. L\*H-H% in the MAE\_ToBI system [10] is often the tune of choice for syntactically marked questions such as *Is he tall?*. As noted by [11], this would also be the contour expected for declarative questions like the one in (3). A variety of contours are available for polar question marking in MajCat, but the  $\text{H+L}^*\text{L}\%$  nuclear configuration in the Cat\_ToBI system [12] is considered the unmarked tune ([13]) for polar questions, which are syntactically marked by means of right dislocation of the subject [14]: *Vindrà, l’àvia?* ‘Will the grandmother come?’. Hence, the subject is pronounced in a different tonal

unit and is characterized by tonal compression. However, since MajCat is a pro-drop language, syntactic aspects alone do not always allow a listener to differentiate between question types, and intonation is perhaps the most reliable cue [15], differently from AmEng. Thus, both languages have reliable intonational cues to questionhood, but differ in the reliability of syntactic marking of polar questions. We will refer to the intonational marking of polar questions as polar question markers. Thus  $L^* H-H\%$  would be a PQM for AmEng, as  $\text{;H+L}^* L\%$  would be for MajCat.

### 1.3. Goals and hypotheses

The goal of this paper was to show that PQMs in AmEng and MajCat take on different pragmatic meanings depending on discourse context and information structure (i.e. whether the information is new or old), but that these context-dependent meanings preserve the notion of “questioning” in some way. We designed an experiment to tap into two aspects of meaning for the context types shown above in (1)-(3). This included a sentence type categorization task to determine whether listeners would categorize utterances with PQMs as *Asking* or *Telling* (questions versus statements), hypothesizing that this would vary based on discourse context. We also hypothesized that the presence of a PQM would allow listeners to make pragmatic inferences that go beyond *what is said*, including *implicit questions* as in the case of (1) and (2) but also belief-related information such as surprise for cases like (3). In the sections below we present the methods for the perception experiment as well as the results, discussing the implications of these results and offering a pragmatic analysis of PQMs for the languages investigated.

## 2. Method

### 2.1. Participants

Participants for the study were recruited using social media. A total of 103 speakers of AmEng participated and a total of 40 MajCat speakers participated. Given that participants were recruited through social media, they had varying educational backgrounds ranging from primary school to Ph.D. and varying ages (though none lower than 18 years). For the AmEng participants, 73% were females, 23% were males and 4% did not identify with any specific gender. For the MajCat participants 63% were females, 35% were males and 2% did not identify with any specific gender.

### 2.2. Materials

There were two “New Information” contexts, where the speaker’s utterance constituted new information in the discourse, as in examples (4) and (5):

- (4) Krista received a note on her door that there is a package waiting for her at the concierge. She approaches the concierge desk and says: Hi I’m Krista Stephenson, **I’m picking up a package**
- (5) Krista is talking to her mom: So I need to run to FedEx this afternoon because **I’m picking up a package** so I can just call you when I’m done with that.

We refer to examples (4) and (5) as New Information 1 (NI1) and New Information 2 (NI2), respectively, since in these cases the speaker would be asserting discourse-new information. We included a third context in which the speaker

repeated information that was either explicitly stated or inferred in the preceding turn, as in (6):

- (6) Krista’s boss asks her if she can stop at Starbucks on her way to pick up the package.  
Krista responds: **I’m picking up a package**

We refer to contexts of this type as Repeat Information (RI) contexts.

### 2.3. Stimuli

Targets included four unique segmental strings: (1) I have an appointment, (2) I ordered a pizza, (3) My bag is here and (4) I’m picking up a package (as well as their versions in MajCat). A male speaker and a female speaker recorded the stimuli for each language. The original recordings were made for the NI2 context only. Target utterances were extracted from this context so that the same instance of a given segmental string was used for each of the three contexts. For the NI2 context only, participants heard the speaker produce the entire narrative (e.g. from “So” until “that” for (5), but including the target **I’m picking up a package**) while for the NI1 and RI contexts participants only heard the target and not any other part of the dialogue (i.e. I’m picking up a package). As such, the utterance **I’m picking up a package** was phonetically identical when heard in each context type, in order to avoid the possibility that any differences in the inferences made by listeners would be due to fine-grained phonetic differences. Figures 1 and 2 are examples of the recordings in AmEng and MajCat, respectively.

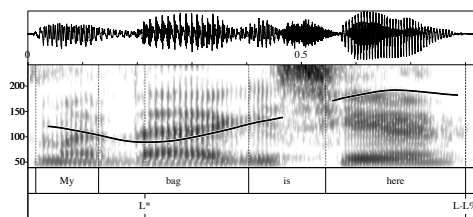


Figure 1: Pitch track and spectrogram for AmEng male speaker’s production of **My bag is here**

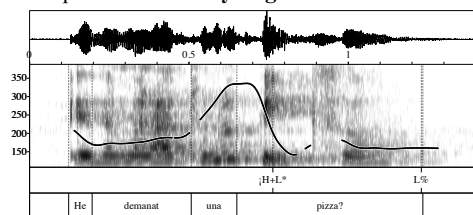


Figure 2: Pitch track and spectrogram for MajCat female speaker’s production of **He demanat una pizza I ordered a pizza**

### 2.3. Procedure

The experiment was created using an online survey format. Two versions of the experiment were created, one in AmEng and one in MajCat. For each trial, participants read a discourse context, such as the ones in (4)-(6) and clicked a button to hear the target stimulus. For example, then, in (4) participants would read the context and then answer the two questions shown in Figure 3 below. No punctuation was used after the target in the written contexts since this would influence participants’ sentence type categorization.

24. When Krista says "I'm picking up a package" she is... \*

☐ Telling the concierge something

☐ Asking the concierge something

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25. In addition to your answer above, is there any other information Krista is conveying? \*

☐ No additional information

☐ Expressing surprise

☐ Wants the concierge to check if he has the package

☐ Making sure the concierge is following what she is saying/knows what she means

☐ Other additional information

Figure 3: Screen shot of presentation of target questions

### 2.3.1. Sentence type categorization task

Participants first categorized utterances as *Asking* vs. *Telling* (see Figure 3). We predicted that since propositional content for NI1 and NI2 contexts conveyed new information, participants would categorize PQM-marked utterances more frequently as *Telling* for these contexts, but that these would be categorized as *Asking* more frequently for the RI context, since the propositional content had already been asserted by another individual.

### 2.3.2. Intention identification task

The intention identification task allowed participants to provide information about possible implicatures generated by PQM presence. We refer to the options participants chose from as: (i) Request (ii) Following (iii) Surprise (iv) No Additional Information and (v) Other. We present general labels for each of the options here, but as Figure 3 shows, the language used in the options was modified to fit each context specifically. The *Request* option was expected to be most frequently associated with NI1 contexts. For instance, in the context in (4) when Krista says "I'm picking up a package" to the concierge, she implicates that she would like the concierge to look for the package and bring it to her. The PQM would thus implicate a desire or implicit request. We refer to this intention as *Request* here, but the option that participants always saw (as in Figure 3) usually began with the word *wants* and some argument. The *Following* intention made reference to the speaker searching for confirmation that his/her interlocutor was following what s/he was saying. We hypothesized that participants would associate this intention for utterances with PQMs for NI2 contexts (as in (5)). We hypothesized that participants would perceive the utterances produced with RI contexts as expressing *Surprise* given [9]'s claim that repetition of propositional content may convey that the speaker is questioning what has just been said. A pragmatic effect of this could be surprise or incredulity. We also allowed participants to respond that *No Additional Information* (in addition to asking or telling) was being conveyed, as well as the option *Other*, should they have inferred information not included in our options. Participants could choose more than one intention, if they wished to do so.

Participants began with a practice trial prior to beginning the experiment. At test, participants heard the four segmental strings produced with the same PQM for the three discourse contexts produced by two speakers, yielding a total of 24 target trials ( $4 \times 3 \times 2 = 24$ ). There were twelve filler trials including exclamatives, wh-questions and broad focus declaratives, none of which were produced with the same

intonation as the test items. The experiment took between 15 and 20 minutes. After completing the experiment, participants completed a language background questionnaire.

## 3. Results

### 3.1. Results – Sentence type categorization task

Figure 4 shows *Asking* vs. *Telling* responses for the conditions: NI1, NI2 and RI.

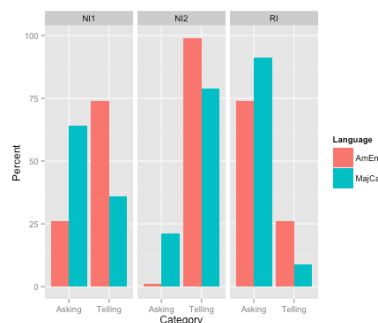


Figure 4: %: "Asking" vs. "Telling" responses for AmEng and MajCat, by Context type

To identify significant differences in the responses of participants, GLMs were fit. The dependent variable had two levels (*Asking* vs. *Telling*). Context was included as a possible predictor (NI1, NI2, RI) along with Language (AmEng vs. MajCat) and Participant. There was a main effect of Context such that utterances heard in RI contexts were categorized as *Asking* significantly more than utterances heard in NI1 contexts [ $\beta = -3.22$ ,  $SE = 0.32$ ,  $z = -24.37$ ,  $p < 0.001$ ] or NI2 contexts [ $\beta = 5.61$ ,  $SE = 0.18$ ,  $z = -31.27$ ,  $p < 0.001$ ]. For the context types that showed more *Telling* responses, utterances heard in NI2 contexts were judged as such significantly more than those heard in NI1 contexts [ $\beta = 2.39$ ,  $SE = 0.15$ ,  $z = -16.27$ ,  $p < 0.001$ ]. The main effect of Language was also significant, with AmEng listeners judging utterances as *Telling* significantly more than MajCat listeners [ $\beta = 1.39$ ,  $SE = 0.28$ ,  $z = 4.92$ ,  $p < 0.001$ ]. Next, the data were subtyped by context to investigate individual effects of language, and separate GLMs were run for each context type. MajCat listeners were found to judge utterances as *Telling* significantly less than AmEng listeners for both the NI1 condition ( $p < 0.001$ ) and the NI2 condition ( $p < 0.001$ ). We point out that there is considerably more variation found for the NI1 condition when compared to the other conditions. As shown in Figure 4, language-specific tendencies were the opposite for the NI1 condition. Finally, no effect of language was identified for the RI condition.

### 3.2 Results – Intention identification task

A total of 3668 identifications were made by the participants. Of these, 34% of the test items were identified as *Requests*, 22% as *Following*, 20% as *Surprise*, 18% as *No Additional Information* and 6% as *Other*. For NI1 contexts, the most frequently chosen intention was *Request*, and 79% of the *Request* identifications occurred for this context type. For NI2 contexts, the two most frequently chosen intentions were

*Following*, with 67% of the *Following* identifications occurring for this context, and *No Additional Information*, with 72% of all *No Additional Information* identifications occurring for this context type. Finally, for the RI context the most frequently chosen intention was *Surprise*, and 94% of the *Surprise* identifications occurred for this context type. As shown in Figure 5 below, these general tendencies were found for both AmEng and MajCat. Figure 5 shows the distribution of identifications for these four most frequently-chosen intention types by Context and Language (including *No Additional Information*, which indicates the lack of any intentional information in addition to *Asking* or *Telling*).

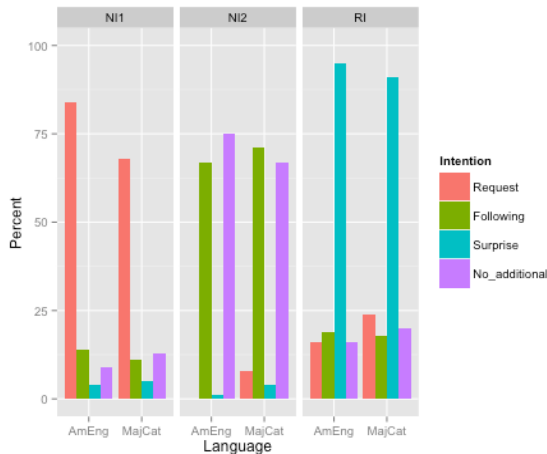


Figure 5: Distribution (%) of most frequently chosen intention types by Language and Context

As stated above, participants' intention identifications for each language tended to be quite similar for the different discourse contexts. Both AmEng and MajCat participants tended to choose *Following* the most for NI2, *Request* for NI1, *Surprise* for RI and *No Additional Information* for NI2. The data were subsetted by context type to investigate individual effects of language, and four GLMs were run for each intention type. Both Language and Participant were included as possible predictors for each model. Since *Request* was the most frequently chosen intention for the NI1 context, the first model had *Request* as the dependent variable (chosen vs. not chosen). There was no significant effect of Language or Participant. Next, two models were fit for the NI2 context, since utterances heard in this context were highly associated with both *Following* and *No Additional Information*. First, a model was fit with *Following* as the dependent variable (chosen vs. not chosen). A significant effect of Participant [ $\beta = -0.00$ ,  $SE = 0.00$ ,  $z = -2.69$ ,  $p < 0.01$ ] was found. For the same context, with *No Additional Information* as the dependent variable, a significant effect of Language was found [ $\beta = -1.37$ ,  $SE = 0.40$ ,  $z = -3.38$ ,  $p < 0.001$ ] as well as Participant [ $\beta = 0.00$ ,  $SE = 0.00$ ,  $z = 1.64$ ,  $p < 0.001$ ]. The effect of Language indicates that MajCat speakers chose *No Additional Information* significantly less than AmEng speakers. Finally, a model was fit for the RI context with *Surprise* as the dependent variable. There was a significant effect of Language [ $\beta = -1.13$ ,  $SE = 3.48$ ,  $z = -3.27$ ,  $p < 0.01$ ], such that MajCat speakers chose this intention significantly less than AmEng speakers.

## 4. Discussion and Conclusions

The sentence type categorization results show clear effects of context for the interpretation of utterances produced with PQMs. Since PQMs by nature mark questions, we expected that they would typically be associated with questionhood, or *Asking*. The only context that favored *Asking* responses was the RI context, as predicted. The clearest context favoring *Telling* responses was the NI2 context, and even more so for AmEng listeners. We found the least amount of agreement among participants for the NI1 context, where both AmEng and MajCat listeners showed more variability in terms of their responses. Interestingly, opposite trends were shown for the two languages; AmEng listeners provided more *Telling* responses in this context, while MajCat listeners provided more *Asking* responses. This might be explained by the fact that AmEng depends more on syntactic marking for question-marking, while intonation is often the only cue in MajCat. Nonetheless, we still find variation for both groups. For those that chose *Asking*, it could be the case that the implicature generated by the PQM is more conventionalized. Future work would need to examine this in more detail.

With respect to intention identification, both AmEng and MajCat listeners infer information beyond sentence type marking for utterances produced with PQMs. Responses indicate that when a speaker asserts new information in NI1 contexts, they may also be conveying a request or desire for some action; when a speaker asserts new information in NI2 contexts they may also be checking to confirm that their interlocutor is following what they are saying; they may express surprise about propositional content that has just been learned in the discourse in RI contexts. The effect of Participant for both *Following* and *No Additional Information* indicates that non-linguistic factors may be at play. We have not considered factors such as gender, which have been shown to be important in making pragmatic inferences related to intonation [16]. Other social/cognitive factors such as empathy could be at play as well [17]. We leave open the possibility that such predictors would be important to consider for these data. For *Surprise* meaning, while MajCat listeners chose it quite frequently for RI contexts, they did so significantly less compared to AmEng listeners. MajCat listeners perhaps need additional phonetic cues (e.g. pitch expansion and/or breathy voice) to more predictably perceive surprise. It is also interesting that AmEng listeners chose *No Additional Information* more frequently for NI2 contexts. Assessing the non-linguistic factors that may be at play in predicting how listeners make specific inferences when a PQM is present could be quite revealing, especially in light of the stigma associated with uptalk in AmEng. It could be that those that negatively stigmatize the linguistic behavior are not aware of the implicatures that PQMs can generate. In any case, the data show that listeners from two languages that mark polar questions intonationally, albeit with opposite tunes (rising vs. falling), use discourse context to perceive sentence type, and that PQMs generate implicatures that go beyond what is said in the Gricean sense. Crucially, the questioning meaning associated with PQMs, while not always directly related to the propositional content of an utterance, does not disappear in any of the contexts investigated here. While our contexts are not exhaustive, the data suggest that PQMs give rise to conventional implicatures, since their meaning does not seem to be canceled. More exhaustive tests will be necessary to evaluate to what extent the questioning nature of PQMs survives in different contextual environments.

## 5. Acknowledgements

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## 6. References

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