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On the syntax/pragmatics interface: Expressing surprise and disapproval

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Abstract: In this work we consider Italian special questions expressing surprise and question-exclamatives expressing surprise-disapproval. Both sentence types are introduced by the adversative particle *ma*. In order to better understand the role of prosody and gesture in these structures with respect to syntax, we run some experiments of sentence production and sentence elicitation. The results point to an integrated model of the three components: syntax prosody and gestures. We will show in fact that the appropriate prosody and gesture are triggered by a dedicated projection in the syntactic structure, which is read off at the interface with the sensorimotor component.

Keywords: special questions, surprise, surprise-disapproval, prosody, gesture, syntax

1 Introduction

This work is elaborated in the theoretical framework of the *Minimalist* approach to language, as developed by Chomsky (1995, 2000, 2001, 2008) and scholars. In this model, the syntactic representation of a sentence interfaces with the sensorimotor component, which yields its phonological and prosodic form, and with the conceptual system, which gives rise to its interpretation. According to this theoretical hypothesis, therefore, there is no direct link between the interpretation of a sentence, i.e., its meaning, and its phonological and prosodic realization, i.e. the sound corresponding to its representation. The relation between the two is necessarily mediated by syntax.¹

¹ We will not discuss here the pros and cons of such a view, because an exhaustive discussion would go far beyond the scope of this work, let us just point out that this theoretical framework has proved useful, both heuristically and theoretically.

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In this work we study two types of special questions in Italian: counter-expectational questions expressing surprise and questions-exclamatives expressing surprise-disapproval. By means of these sentences the speaker wants to express her feelings and possibly have an explanation for what she experiences. These sentences are characterized by a peculiar syntax, but also by a special prosody and a typical gesture pattern.²

We propose, in the minimalist spirit, that the special emotional interpretation associated with these sentences, realized by means of typical prosodic and gestural patterns, is triggered by a peculiar syntactic representation. Such a representation, however, is not *ad hoc*, but follows from very general considerations, holding for syntactic structures across languages.

2 Expressing surprise and surprise/disapproval: The data

In this section we are going to illustrate counter-expectational yes-no questions (see Vicente 2010; Giorgi 2016, Giorgi 2018) and surprise-disapproval question-exclamatives.³

With respect to counter-expectational questions, consider the following scenario: I know that you are on a diet and decided to eat only fruit. One day I see you eating a big hamburger. I am surprised and utter (1):

- (1) Ma non mangiavi solo frutta?
But not eat-imp-2s only fruit?
'But weren't you eating only fruit?'

In the same vein, consider the following scenario: I know that you are allergic to cats, one day I see you with a big cat in your arms. I'm surprised and say:

- (2) Ma non eri allergico ai gatti?
But not be-impf-2s allergic to cats
'But weren't you allergic to cats?'

² For an analysis of co-speech gestures in a generative perspective, see Schlenker (2018).

³ On special questions see Bayer and Obenauer (2011), Obenauer (2004, 2006), Munaro and Obenauer (1999), Munaro and Poletto (2003), Obenauer and Poletto (2000), Hinterhölzl and Munaro (2015).

These sentences would be infelicitous, and even ungrammatical, if not accompanied by the correct intonation, which, as we will show in Section 4.1, differs from the one of a normal question in an interesting way. In this perspective, we can say that intonation is crucial in assigning the correct interpretation.⁴

Many languages have special questions for these cases. Beside Italian, similar constructions are found in English, German (Dal Farra et al. Forthcoming) and Armenian among the others.

Consider now surprise-disapproval question-exclamatives. A possible scenario is the following one: I see Gianni wearing his best trousers kneeling in the dirt in the garden. I think that he will ruin his trousers. I am annoyed and utter sentence (3):

- (3) Ma cosa fai?!
- But what (you) do-pres-2ps
- ‘But what are you doing?’

Or equivalently, the following one. Gianni should study math, but I see that he is reading comics. I am annoyed and utter:

- (4) Ma cosa leggi?!
- But what (you) read-pres-2ps
- ‘But what are you reading?’

4 For a detailed analysis of the syntax of counter-expectational questions, see Giorgi (2016, 2018), in particular, for the discussion of the imperfect and of negation. Note that the imperfect is an *anaphoric verbal form*, as amply discussed in the literature on the topic, hence, in the ‘normal’ cases, if a temporal reference is not provided in the previous context – either in the same sentence or in the discourse – the sentence is ungrammatical, as in the following case:

- i. *(Ieri alle tre) Mario leggeva un libro
(Yesterday at three) Mario read-impf a book
(Yesterday at three) Mario was reading a book’

If *ieri alle tre* (yesterday at three) is not realized, or provided by the context, the sentence is ungrammatical. Therefore, counter-expectational questions, featuring an imperfect with no temporal reference, should be judged ungrammatical, contrary to facts. The explanation of their grammaticality comes from a fine-grained syntactic analysis of these rhetorical constructions. Giorgi (2018) also argues that the negation appearing in these contexts is not an expletive one, but negates the predicate, once the counter-expectational components are accounted for. We will not address these issues again in this work.

These sentences as well are accompanied by a typical intonation and gesture pattern. As we will better see in Section 4.2, their intonation is not exactly an interrogative one, hence the double characterization as question-exclamative.

Both cases are to be viewed as rhetorical questions, or *special questions*, in that they are not interpreted as simple requests of information. As said above, on the one hand, the speaker expresses her feelings and, on the other, she requires an explanation for the unexpected or annoying behavior. Both types share the property of being introduced by adversative *ma* (but), with the difference that surprise-disapproval questions are open questions and feature an overt interrogative phrase, whereas counter-expectational ones are yes-no questions, with an empty interrogative operator.

Let us now briefly discuss the presence in these sentences of the adversative particle *ma* (but). Normally, sentences can be introduced by an adversative particle only in contexts such as the following:

- (5) Maria è ricca, ma non è felice
Maria is rich, but she is not happy

If *Maria è ricca* (Maria is rich) is not realized, the clause *ma non è felice* (but she is not happy) cannot stay by itself and the sentence is ungrammatical. The first part *Maria è ricca* (Maria is rich) can also appear as part of a dialogue, uttered by a different speaker, as in the following example:

- (6) A: Maria è ricca.
Mary is rich.
- (7) B: (Sì,) ma non è felice.
(Yes,) but (she) is not happy.

In sentences (1)-(4) there is no overt antecedent for the adversative particle and they turn out to be grammatical only because they are associated with a typical intonation, which makes them special questions.

Therefore, according to what we discussed above concerning the absence of a direct link between prosody and interpretation, the syntax of these constructions must include a trigger to be read off at the sensorimotor interface on one side, and at the interpretive one, on the other, properly connecting sound and interpretation. Such a trigger is therefore responsible both for the special interpretation and the special realization of these sentences.

3 The syntactic structure

In this work, we capitalize on the syntactic proposal discussed in Giorgi (2018), based on two main syntactic hypotheses: (a) *ma* (but) is a discourse head, therefore external to the sentence, signaling adversativity; and (b) the sentence is in the scope of an evaluative head.

The first hypothesis is based on word order data concerning the left periphery, i.e. that part of the sentence appearing in Italian on the left of the subject.⁵ Interrogative phrases, topics and Focus appear in the left periphery, as in the following cases:

- (8) Cosa hai mangiato?
What have.2s eaten
'What did you eat?'
- (9) A Paolo, Gianni gli ha dato un libro
To Paolo, Gianni to him-has given a book
'Gianni gave a book to Paolo.topic'
- (10) LA MELA Gianni ha mangiato
The apple.focus Gianni had eaten
'Gianni ate the apple.focus'

The *wh*- phrase, the topic and the focus can never precede *ma* (but), independently of the intonation assigned to the sentence:

- (11) *Cosa ma hai mangiato?
What but have.2s eaten
- (12) *A Paolo, ma Gianni gli ha dato un libro
to Paolo, but Gianni to him-has given a book
- (13) *LA MELA ma Gianni ha mangiato
The apple.focus but Gianni has eaten

⁵ We are not considering here the phenomena connected to subject inversion. Note that in Italian interrogative sentences subject inversion is obligatory. For this reason, in order to avoid intervening factors, in interrogative sentences we always use empty subjects.

On the other hand, *ma* precedes the rest of the sentence, with the appropriate intonation, for instance the surprise-disapproval one, as in (14), or simply an corrective-exclamative one, as in (15) and (16)⁶:

- (14) Ma cosa hai mangiato?
But what have.2s eaten
'But what did you eat?'
- (15) Ma a Paolo, Gianni gli ha dato un libro!
But to Paolo, Gianni to him-has given a book
'But Gianni gave a book to Paolo.topic!'
- (16) Ma LA MELA Gianni ha mangiato!
But the apple.focus Gianni has eaten
'But Gianni ate the apple.focus!'

Note also that *ma* cannot be embedded, appearing only at root level, again irrespectively of intonation, as illustrated by the following example:

- (17) *Gianni sperava che ma Mario partisse
Gianni hoped that but Mario would leave

On the contrary, left peripheral phrases can all be embedded, as shown by the following sentences:

- (18) Gianni si domanda cosa hai mangiato
Gianni wonders what you ate
- (19) So che a Paolo, Gianni gli ha dato un libro
I know that to Paolo, Gianni to him-has given a book
'I know that Gianni gave a book to Paolo.topic'

⁶ Note that sentence (16) in Italian improves if the focused phrase appears on the right, as in the following case:

- i. Ma Gianni ha mangiato LA MELA!
But Gianni has eaten the apple.focus
'But Gianni ate the apple.focus!'

We will not consider this issue any further in this work. What is relevant for our discussion here is that sentences (11)-(13) are considerably worse than (14)-(16).

- (20) Ho detto che LA MELA Gianni ha mangiato, non la pera
 I said that the apple.focus Gianni had eaten, not the pear
 'I said that Gianni ate the apple.focus, not the pear'

This evidence points to the conclusion that *ma* is not part of the left periphery. Therefore, we can hypothesize that *ma* is not part of the sentence at all, but qualifies as a *discourse head*, connecting two parts of a discourse.⁷

Consequently, going back to examples (1) and (3) above, we propose the following structure⁸:

- (21) [_{DIS-P} ... [_{DIS} ma [non mangiavi solo frutta]]
 but weren't you eating only fruit?
- (22) [_{DIS-P} ... [_{DIS} ma [che fai]]
 but what are you doing?

The dots in (21) and (22) represent the implicit part of the discourse, i.e., the speaker's expectations. The implicit part plays the same role as the overt

⁷ Note that, as discussed in Giorgi (2014), hanging topics exhibit the same pattern, i.e. they appear on the left of the left periphery and cannot be embedded. Hence, Giorgi (2014) concludes that they form with the following sentence a discourse. Consider for instance the following sentence, minimally contrasting with example (9) above:

- i. Paolo, Gianni gli ha dato un libro
 Paolo, Gianni to him-has given a book
 'Paolo, Gianni gave a book to him'

In this case, the preposition-less phrase *Paolo* is a hanging topic. Sentence (i) cannot appear in embedded contexts, again minimally contrasting with example (19):

- ii. *So che Paolo, Gianni gli ha dato un libro
 I know that Paolo, Gianni to him-has given a book

Giorgi (2018) points out that a hanging topic can precede *ma*, as in the following example:

- iii. Ma, Paolo, Gianni non gli aveva dato un libro?
 But Paolo, Gianni not to him-had given a book
 'But Paolo, didn't Gianni give a book to him?'

This is indeed expected under the hypothesis that both *ma* and hanging topics give rise to complex discourse structures. We refer the reader to the mentioned reference for further discussion.

8 Another argument in favor of our hypothesis comes from cross-linguistic evidence, in that the equivalent of *ma* in a Verb Second language such as German, *aber* (but), does not trigger Verb Second. This shows that *aber* is external to the sentential structure. For a discussion, see also Dal Farra et al (forthcoming).

adversative antecedent provided in examples (5) and (6) above. In surprise questions the speaker's expectations are not met in the real situation.

We further hypothesize, following Giorgi (to appear), that the emotional value connected to these constructions is due to the interpretation at the sensorimotor interface of an empty evaluative head having scope on the whole sentence – headed by the interrogative operator – giving rise to the following structures:

Evaluative adverbials in fact, according to Cinque's (1999) hypothesis, occupy a high position in the hierarchical structure of the sentence and appear on the left of the subject, hence in the position we propose in (23) and (24). Consider for instance the following example⁹:

- (25) Fortunatamente Gianni è riuscito a prendere il treno
Luckily Gianni managed to get on the train

Fortunatamente is an evaluative adverb and precedes the rest of the sentence. We therefore propose a uniform structure for both (1)-(4) and (25).

Finally, we will show below in Section 4, that some speakers introduce a swear word in surprise-disapproval contexts, as in the following example:

- (26) Ma che cazzo fai?
But what the fuck are you doing?

Note that the swear word can only be introduced in rhetorical contexts, and does not appear in normal requests of information. We propose that in this case the swear word lexicalizes the *Eval* projection and the *wh-* raises to *Eval*, incorporating it. This conclusion converges with the analysis of the position of the *wh-* in

⁹ Note that adverbs can appear in other positions as well, especially if pronounced with a comma intonation (Selkirk 2005). We will not discuss this issue in this work and follow Cinque (1999) hypothesizing that the basic position for evaluative adverbs is the one on the left of the subject.

special questions provided by Obenauer and Poletto (2000), according to which the *wh*- occupies a higher position with respect to the normal cases.¹⁰

4 The experiments

To collect detailed data about their realization, we addressed the issue of counter-expectational and surprise-disapproval questions from an experimental point of view, devoting particular attention to their prosodic and gestural components. As said above, these sentences, in order for to be felicitous, need to be accompanied by the appropriate intonation and co-speech gesture. Our experiments aimed at eliciting these components, in such a way as to highlight their interactions.

4.1 Counter-expectational questions

In the case of counter-expectational questions, two different tasks were used, namely production and elicitation. In the former, participants were asked to repeat some sentences introduced by specific contexts, which were read out loud by the interviewer. After hearing the contexts, participants were presented with the sentences they had to produce. Notice that these were in a written form, in order not to suggest a particular intonation. Moreover, since we did not want to interfere with their prosodic contour, no punctuation was indicated in the written form of these sentences. We asked the participants to utter the sentences in the most natural way, but we did not give them any information on how to express the intended pragmatic meaning, so that the production of both prosodic and gestural contours would be as spontaneous as possible. We did not mention gestures in the instructions.

In the production task, since we were mainly interested in the production of gestures, we also introduced four different conditions in order to check whether the gestural pattern could be affected by different modalities:

¹⁰ See also Giorgi (to appear). Note that swear words can either occupy the position normally occupied by *cosa* (lit: thing) in *che cosa* (lit: what thing) as in the example above in the text, or double it as in *che cosa diavolo fai?* (lit: *what thing devil* are you doing?), or appear without *che* as in *cosa diavolo fai?* (lit: *thing devil* are you doing?). Further work is required for a better understanding of the syntax of these phrases.

- Condition A: both hands were free;
- Condition B: simulation of a phone communication. In this case participants were asked to repeat the same sentences pretending to speak with an interlocutor over the phone. Crucially, only one hand was free and there was no visible addressee. We wanted to test whether participants felt compelled to produce gestures even if the visual channel was not visible to the hearer;
- Condition C: holding a bag. Participants had to produce the same sentences with both their hands “trapped”. In this case we wanted to check whether the gestural component would be carried over by non-manual gestures;
- Condition D: surprise overtly expressed. In this case they had to realize declarative sentences composed by a main-subordinate configuration which were introduced by “*I'm surprised that you...*”.

In the second task, we elicited spontaneous production. The interviewer read 4 specific contexts meant to introduce a counter-expectational value. After each of them, the participants were asked to utter an appropriate sentence as a reaction to that context. In this case, no instruction was provided other than “say it in the most natural way”.

15 Italian speakers (9 females and 6 males) participated in the repetition task. Out of these 15, 6 of them were asked to produce the sentences in all the conditions presented above, whereas 3 participants for each Condition A, B and C were asked to complete the test only under that condition plus Condition D. 8 of the 15 speakers participated also in the elicitation task. In this case, the elicited production was tested first, in order to avoid priming. The age range was between 16 and 64 years, because we were also interested in individual variation and we wanted to check whether there was any difference due to their age. All of the participants took part on a voluntary basis.

There were a total of 6 contexts presented to participants, and 6 consequent counter-expectational questions (or declarative, in the case of condition D) for each condition, except for condition B, which was tested only in only 2 out of 6 sentences.

Participants were videotaped. The first minutes of the test were dedicated to an interview, so that they could get accustomed to the camera. For the analysis, audio files were extracted from the videos, analyzed and annotated with Praat and the ToBI system. Gesture patterns and non-manual components were analyzed and annotated with ELAN.

Our predictions were that in all cases, these sentences would be accompanied by the same prosodic contour. As for the gestural component, we expected participants to produce them in the majority of the cases, especially in Condition

A and B. In case both their hands were trapped, i.e. in condition C, we expected that hands gestures would be substituted by other gestural components. Lastly, in condition D, we expected that the gesture pattern would not be as present as in the other conditions given that surprise was overtly expressed, and sentences were grammatical even without a particular intonation.

As expected, we found a characteristic prosodic contour. In particular, the special value of these sentences is identified by the distribution of pitches. The most common, is a pitch on the verbal form, which is realized with a particular raising contour. The higher tone can be on the nuclear syllable, or even on the post-nuclear one. The raising contour and/or the pitch can be found also on negation, and in some cases on the adversative particle. The pitch is an emphatic one, but crucially it is different from contrastive accents and other focus accents by the greater extension of the maximum, its late position in the accented syllable and by the effect of lengthening of the accented syllable (Dal Farra, Giorgi & Hinterhölzl Forthcoming). Moreover, there is a crucial difference with respect to the intonation of normal questions in Italian, in that the boundary tone is usually not high, as in information-seeking questions, but low, as can be seen in Figure 1.

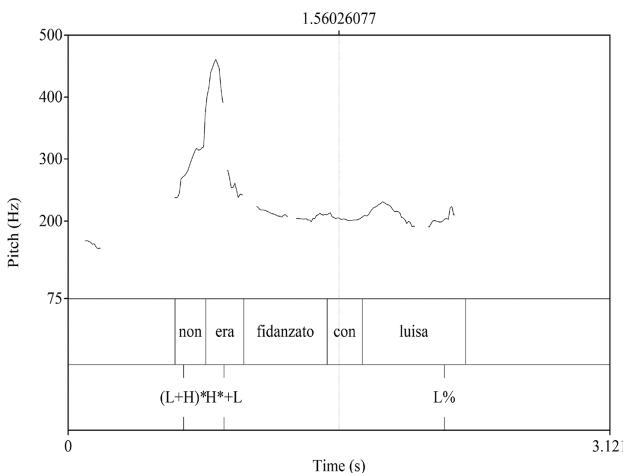


Figure 1: Praat representation of a female speaker uttering “wasn’t he engaged with Luisa?”.

In Figure 1, it can be noticed the raising tone over negation and the verbal form, where the pitch is reached in the nuclear syllable and is immediately followed by a lowering tone. The boundary tone is low.

As for the gestural pattern, with counter-expectational questions we found the following hand gestures. The majority of the speakers realizes these



Figure 2: Realization of *palm-up open hand* gesture.

sentences with the so-called Palm-Up Open Hands (PUOH, Kendon 2004), as can be seen in Figures 2 and 3.

The use of palm-up as a co-speech gesture is usually associated with practical everyday actions such as giving, offering and receiving objects (Kendon 2004). Notice that in this case, the association is not that simple: the speaker is not offering something, she is rather asking for something, i.e. an explanation, which could justify the “betrayed” speaker’s expectations.

The production of gestures can be divided in gestures phases (Kendon 1980; Kita et al. 1998): preparation, stroke, and retraction. The stroke is the main element that can be identified with the strongest movement within the gesture, and the one that expresses the meaning associated with the gesture. It is usually preceded by a preparation phase, i.e. the moment in which hands are moved from



Figure 3: Realization of *palm-up open hand* gesture.

a previous position, usually the resting one, to a visually more prominent position, and a retraction part where the hands return to their resting position. In the palm-up gesture realized in counter-expectational questions it is also important to consider a forth phase, i.e. hold: the moment in which the hands remain static in the gestural phase after the stroke.

In the production of the hand gesture PUOH in counter-expectational questions, we noticed that the preparation phase tends to precede the entire production of the sentence: speakers start to move their hands from the resting position, before the utterance of the sentence begins. PUOH often lasts longer than the sentence itself. In fact, speakers hold the gesture until the very end of the sentence, and the retraction phase starts only when this is already finished.

Other non-manual gestures accompanying counter-expectational questions concern the use of the head and of brows. The head can either be employed in a shake, usually realized over the negation or lasting a bit longer. The head can also nod, or move forward. Brows can either be raised and/or furrowed in different moments of the sentences, as can be seen in Figures 4 and 5, respectively.



Figure 4: Brows raised.

Notice that in Figure 5, the head of the speaker is moved forward and lower to the side than in its base position. Moreover, palm-up is here realized with one hand only, interestingly, the non-dominant one.¹¹

Let's now present the results from each condition in the test. When both hands are free, we find several individual differences in the realization of the hand gesture, which can be summarized in:

- hands: speakers can either use both hands or one hand only. In the latter case we noticed that they can use both the dominant or the non-dominant hand;
- opening of the arms: arms can be closer to the body (see Figure 2) or more spread (see Figures 3 and 4);
- duration of the gesture: it can last longer, even longer than the sentence itself, or be realized in correspondence to only a smaller portion of the utterance.

In 72% of the utterances, speakers realize the hand gesture as palm-up, with the variability explained above. In 13% of the cases, the hand gesture is different,

¹¹ Considerations about dominance could be significant, but further experimental study is required to ascertain its relevance.



Figure 5: Brows furrowed.

whereas in the 15% hands stand still. We also noticed that occasionally the speakers tend to enrich the interpretation of the sentence, which in some cases is not only connected to surprise, but also to disapproval. In these cases, the hand gesture is different and tend to follow the surprise-disapproval gestural pattern, which will be explained below in Section 4.2.

In Condition B we found the same results as above, even though the palm-up gesture is used less frequently, i.e. in the 41% of the cases. Given that the speakers have a phone in their hand, the gesture is realized with one hand only, and both the dominant and the non-dominant hand is used.

As for non-manual gestures, brows furrowing and head shake are used more frequently. Unlike condition A, we found also the movement of the shoulders, in that the shoulders are moved in a higher position during the utterance of the whole sentence.

Condition C provided some interesting results. In this case the hands are trapped, given that speakers are asked to carry a heavy bag. One could expect that participants would not use them at all. In several cases, however, hands and arms were moved in an attempt to produce the PUOH gesture, even if obviously, it could not be completed. As in Condition B, in many cases the speakers also used their shoulders, lifting them during the production of the sentence. Once again, head shake and brows furrowing are used more frequently, than in the first condition. In other words: when the hand gesture is blocked in some way, speakers tend to convey the same meaning by means of different gestures.

As for the last condition, namely surprise overtly expressed, it turns out that PUOH is less used than in condition A, but is still highly produced – in 51% of the cases versus the 74% of Condition A. The hand gesture is realized in different parts of the sentence, mostly on the matrix sentence, but in some cases on the embedded one as well. The same non-manual components are used, and are mostly found on the matrix sentence. Unlike all the other conditions, there are no other hand gestures other than palm-up. This is an expected result, since in this case the interpretation of the sentence is overtly specified, given the presence of the overt surprise predicate.

Interestingly, we found a consistent alignment between prosody and gestures. Such an alignment can be seen in the distribution of the emphatic pitches described above for the prosodic component, and for the stroke of the hand gesture, and/or for the head nod, which is usually realized in correspondence with the pitch on the nuclear syllable of the verbal form. It has already been studied and showed that speech and gesture are synchronized, since the stroke of the gesture falls together with the main accent of the gesture-accompanying utterance (see Kendon 1980; McNeill 1992; Abner et al. 2015 for an overview). The general claim is that the stroke occurs just before or at the same time as (but not later than) the nuclear accent, which was also our observation in these sentences.

The same questions were tested with 8 German native speakers (Dal Farra et al. Forthcoming). The same generalizations hold, in that there is a similar emphatic pitch on the verb and/or on the negation. The palm-up is used as well, even though less frequently and with arms nearer to the body. Even in the German test, pitches and gestures are aligned.¹²

¹² The realization of counter-expectational questions were investigated also in Catalan and Dutch (Crespo Sendra et al. 2013; Borràs-Comes et al. 2011). They reported that these questions are produced with very specific patterns of facial gesture, i.e. eyebrow furrowing, eyes squinting and a downward movement of the head, followed by an upward movement. Unfortunately, they

A crucial result in the repetition task is that, even though participants were instructed to repeat the same words they read, this was not always the case: speakers tend to interfere and make some minor changes in the realization of these sentences. This is especially the case with the omission of the adversative particle at the beginning of the sentence: in several cases, speakers did not realize it – as can be seen for example in the Praat representation in Figure 1.

With the elicitation task, finally, we had participants produce spontaneously the same kind of sentences. In the majority of the spontaneous answers, the sentences began with the adversative particle *ma*, i.e. in 14 cases on 21. Some of the elicited sentences were structurally identical to the ones used in the experiment, namely adversative particle + negation + imperfect verbal form. In these cases, the gestural pattern and the intonational contour appear the same as the ones described above.

4.2 Surprise-disapproval questions

For the investigation of surprise-disapproval questions, we applied the same methodology illustrated above: participants were asked to repeat some sentences introduced by specific contexts, which were read by the interviewer. After hearing the contexts, the participants were presented with the sentences they had to utter. Once again, these were written in order not to suggest a particular intonation, and since we did not want to interfere with their prosodic contour, there was no punctuation in the written form. We asked the participants to utter the sentences in the most natural way. We did not mention gestures in the instructions. In this case, only the modality with both hands free was used.

8 participants (4 females and 4 males) took part in the experiment. They all participated voluntarily. The age range was between 16 and 58 years.

There were a total of 6 contexts presented to participants, and 6 consequent surprise-disapproval questions: every participant had to utter 6 sentences.

Participants were videotaped. The first minutes of the test were dedicated to an interview, so that they could get accustomed to the camera. For the analysis, audio files were extracted from the videos, analyzed and annotated with Praat

did not consider hand gestures. These are also connected to different prosodic strategies than information-seeking questions. In an experiment conducted on the perception of these questions (Crespo Sendra et al. 2013) they show that visual cues play a more important role than auditory ones, and that the role of facial expression is more important than intonation for detecting the target meaning.

and the ToBI system. Gesture patterns and non-manual components were analyzed and annotated with ELAN.

Our prediction was that, as in the case of counter-expectational questions, these sentences would be realized with a specific prosodic contour and gestural component, but that these would be different from the ones found in the first experiment.

As expected, the intonational contour is different. We found that typically, there is a pitch on the verb and/or on the *wh*- constituent. Even in this case, the intonation is different from the one of a normal question, because the boundary tone is low and not high. We also noticed that there is a big effect of lengthening on the last vowels, both nuclear and post-nuclear ones. Consider to this extent the representations in figures 6 and 7:

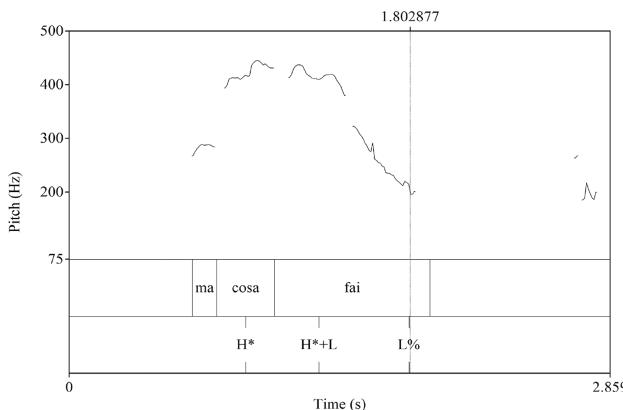


Figure 6: Praat representation of a female speaker uttering “But what are you doing?”.

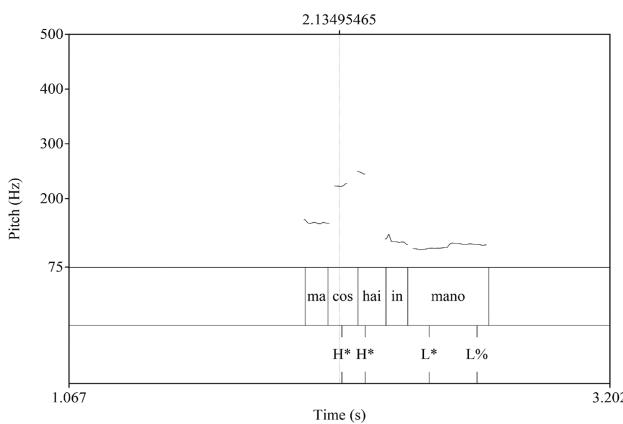


Figure 7: Praat representation of a male speaker uttering “But what do you have in your hand?”.

The gestural component is also representative of the pragmatic meaning of these sentences. We found that hand gestures are especially used, but, as opposed to counter-expectational questions, there is not a single hand gesture characterizing these constructions. Speakers in fact realize one among three different gestures, which we are going to illustrate in a while. In each case, however, the main characteristic is the presence of iterated movement, i.e. hands are rapidly and repeatedly moved from the preparation position to the stroke one.

In the first case, the hands can form a typical palm-up gesture where the hands do not stand still, but are rather repeatedly moved either up and down or from one side to the other. See Figures 8 and 9.



Figure 8: Palm-up gesture with iterated movement.

A second gesture is the so-called artichoke, which can be realized either with one hand or both, and is accompanied by an iterated up and down movement. See Figures 10 and 11.

Finally, a third gesture can be used, i.e. the prayer hands, where the palms are one against the other, and are moved up and down. See Figures 12 and 13.



Figure 9: Palm-up gesture with iterated movement.

Usually, the preparation of these gestures begins after the adversative particle *ma*, and is realized in correspondence either with the *wh*- constituent or with the verb. In some cases it can precede the utterance of the sentence, and its movement can last for the entire sentence.

Non-manual gestures are used less than in the case of surprise questions, and are mainly connected to the use of brows, which are mainly furrowed, and movements of the head which can be moved forward or to the side. The occasional presence of furrowed brows in the cases discussed in Section 4.1 can therefore signal the presence of a disapproval component even in counter-expectational questions.

Given that the hand gesture is always realized with iterated movement, we took the stroke to be the first moment in which the hands form their final shape, i.e. the moment preceding the beginning of the iteration.



Figure 10: Artichoke gesture.

As observed with surprise questions, prosody and gestures are aligned, and a consistent correlation between the stroke and the pitch is found.

Crucially, contrary to what happened in the previous test, no other hand gestures were realized other than the three described above: it seems that participants always assign the same pragmatic significance to these sentences, i.e. the surprise-disapproval one.

An interesting aspect is that in this experiment as well, participants interfered and, even though they were asked to repeat the sentences they read, they made some changes. The most frequent one was the omission of the adversative particle, which confirm the fact that to some speakers these sentences are acceptable without it. A second difference with respect to the written form they were presented with, is that some speakers inserted a swear word in the *wh-* phrase, either following the adversative particle or at the beginning of the sentence, if the particle is omitted, as in example in (27) – see Section 3 above.



Figure 11: Artichoke gesture.

- (27) (Ma) che cazzo fai?
(But) what the fuck are you doing?!

The use of the swear word is connected to the disapproval meaning of these questions, and, as already discussed, it cannot be realized with normal questions.

Concluding, the main result of this experiment is that both the surprise and the surprise-disapproval values of these sentences in Italian are realized with specific prosodic contours and gestural components, which turn out to be aligned. These results are consistent among the participants and seem quite robust.



Figure 12: Hands in prayer.

5 Conclusions

By running the experiments presented here, we studied the realization of special questions, which are different from neutral information-seeking ones. In fact, such questions convey a special pragmatic value that deeply influences their realization: counter-expectational questions express surprise on the part of the speaker, together with her need for an explanation, surprise-disapproval question-exclamatives convey an additional meaning of disapproval. Both sentence types are emotionally marked, and are accompanied by a prosodic contour and a gestural component that are much more evident than in normal sentences. We propose that this is required precisely in order to convey such an additional



Figure 13: Hands in prayer.

emotional meaning. From the point of view of grammar, the prosodic and gestural components make these sentences grammatical, as discussed in Section 3.

The fact that there is an alignment between prosody and gestures also highlights the importance of the gestural component. Our hypothesis is that the input to the sensorimotor component for prosody and gesture realization is unique, in that they both are triggered by the same syntactic property, namely the left-peripheral *Evaluative* head – a prosody/gesture-oriented head, in the sense of Giorgi (2014) – discussed in Section 3. We proposed that this head has scope over the whole sentence. We can now say, therefore, that precisely for this reason, its sensorimotor realization as gesture lasts for the entire duration of the sentence, even if the pitch is necessarily associated only to a portion.

We also noted that the adversative particle *ma* is often spontaneously omitted by the speakers. This is expected, since its role in this case is totally retrievable from the context, in particular by the realization of the emotional content by means of prosody and gesture. Note that the omission of *ma* is not permitted in non-emotional cases, as shown by the ungrammaticality of the following example:

- (28) Maria è ricca *(*ma*) non è felice
Maria is rich (*but) she is not happy

In this case in fact, its adversative meaning would not be retrievable from the context, given that no special sensorimotor realization accompanies the sentence.

Note finally, that our experiments show that people gesture even if this is not *needed*. Namely, we gesture when on the phone, and no audience can pay attention to our gesture; we gesture when the overt emotional predicate is present, hence when there is no ambiguity as to the interpretation of the sentence and there is no grammatical anomaly in its realization. Interestingly, even in these cases, gesture always follows the same pattern.

We can conclude therefore, that gesture, as triggered by the syntax, is a necessary component of grammar, given the very basic consideration that language is multi-medial. Oral languages of course capitalize on the oral component, hence prosody is more strictly codified than gesture. But gesture, though exhibiting a higher degree of variation, or *freedom* so to say, is still quite codified and uniform across speakers.

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Bionotes

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