

# How prosody and context shape the acoustic nature of rhetorical questions in German

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**In contrast to what is known as information-seeking questions (ISQs), rhetorical questions (RQs) usually occur in non-neutral contexts since they are frequently used to challenge, criticize, or persuade the addressee. This pilot study investigating the prosodic realization of two attitudinally loaded *wh*-RQs (*disgust* and *mockery*; e.g., *Who likes lavender?*) in German relative to a string-identical sincere interest control condition (ISQs) indicates that RQs show context-specific acoustic and phonological differences. Overall, the way in which German RQs and ISQs differ from each other as well as from statements suggests that questions represent a coherent bundle of prosodic parameters (i.e., prosodic construction) consisting rather of gradual phonetic parameters than of categorical phonological parameters.**

## INTRODUCTION

Information-seeking questions (ISQs) provide the listener with information that is usually given by the addressee [1,2]. In contrast, rhetorical questions (RQs) imply answers that are known to both the speaker and the listener [3] and hence seek the addressee's commitment with respect to the underlying proposition [4]. For the correct differentiation between RQs and ISQs (especially if they are string-identical), context plays a crucial part.

Isolated from context, *Who likes playing soccer?* could be interpreted as both an ISQ or an RQ, as in German [5, 6]. Regarding RQs, context has been considered as most salient determiner [4, 5, 6] since it facilitates the "understanding of the question as not doing questioning" [7, p.55]. The findings presented by [8] suggest that RQs are, just like ISQs, multi-parametric prosodic entities ([9]).

Prosodically, RQs are not closer to statements than ISQs, even though RQs are often perceived as stating. Both RQs and ISQs differ from statements along the same prosodic parameters, and RQs even more from statements than ISQs with respect to duration and voice quality [8, 9]. A potential reason for this might be the ironic flavor that characterizes many RQs, since irony is a major function of RQs [5,10,11,12]. This ironic flavor might be expressed by an exaggerated prosody. This ironic overtone enables speakers to criticize and persuade the addressee, and even to create humor [12,13,14,15,16,17,18,19].

This pilot study focuses on RQ realizations across attitudinal contexts and respective ISQ realizations and the question whether which prosodic parameters (acoustic-phonetic and phonological) vary as a function of the question-statement difference itself and which parameters show a separate pattern that might be contextually/attitudinally driven.

The multi-parametric prosodic variation of string-identical *wh*-questions is particularly investigated in different contexts triggering *sincere interest* (ISQs as contextual reference condition) or the two RQ types *disgust* and *mockery*. Both disgust and mockery represent typical and at the same time very different

attitudinal/expressive realizations for RQs. The selection of acoustic and phonological prosodic parameters is based on those that turned out to be crucial for both the production and the identification of German ISQ and RQ in previous empirical investigations (e.g., [8,9]).

## METHOD

We designed 6 target *wh*-questions (e.g., *Wer mag denn Lavendel?* 'Who likes PRT lavender?'; *wh*-word, verb, modal particle *denn* – occurring in both illocution types in German [20] – sonorous sentence-final object noun) that could be interpreted as both RQs and ISQs. Each of the questions was paired with short contexts as texts triggering a *disgust*, *mockery* and *sincere interest* attitude on the part of the speaker (Tab. 1). Each context introduced the object noun to make sure that it was prosodically realized as given information in the subsequently realized *wh*-question.

**Tab. 1: Exemplar contexts for RQ/ISQ elicitations.**

Mockery	Disgust	Sincere interest
Your mother tells you that her neighbor read in the newspaper that <b>lavender</b> can be eaten. The other day she observed him sit-ting in the garden and eating the blossoms which <b>you both find extremely funny</b> . You say:	You and your friend walk into a perfumery where a woman instantly offers you a new scent with <b>lavender</b> . But you and your friend find the scent so gross that you quickly continue walking because <b>you are feeling nauseous</b> . You say:	You and your roommates want to plant a small flowerbed in your garden, and you have always dreamt of <b>lavender</b> . <b>You are very interested</b> in whether the others agree with that. You say:
<b>Who likes lavender?</b>		

In total, 90 questions were recorded (5 speakers x 6 questions x 3 attitudes) by 5 voluntary monolingual native speakers of German, who have been recorded in a sound attenuated booth ( $\sigma = 22.6$  years, 2 male). They were presented with the context-question pairs in a Power Point presentation and were asked to read the given context silently followed by the realization of the respective

question. Occurrences of the same question were separated as far as possible from one another. Participants had to realize the question aloud as naturally as possible fitting into the situational context.

## RESULTS

Fig. 1 summarizes (and proportionally for each parameter) to what extent and in which way the question realizations in the three context conditions differ from each other.

**Nuclear accents:** The results showed that sentence-final object nouns in *disgust* contexts were exclusively realized with rising pitch patterns: L\*+H (73%) or L+H\* (23%). In *mockery* contexts, more than every fourth object noun had non-rising pitch patterns like H\* (10%) and L\* (10%). Rising L\*+H was also the most frequent pattern in *mockery*, though (63%, L+H\*: 10%). The variation in nuclear pitch accent patterns was largest in the *sincere-interest* contexts, where the low or falling patterns prevailed (L\*+H: 37%, L+H\*: 10%, L\*: 47%, H\*: 3%).

**Final boundary tone:** In *disgust* and *mockery* contexts, questions were predominantly realized with a low boundary tone (L%: 90% and 97%), whereas questions in *sincere-interest* contexts mainly showed a high final boundary tone (H-^H%: 47%, L-H%: 37%).

**Initial pitch level:** In *mockery* contexts (207 Hz), the level was higher than in *disgust* contexts (195 Hz). Questions realized in *sincere-interest* contexts started on average at an intermediate pitch level (203 Hz).

**Overall question duration:** Questions realized in *disgust* contexts were on average longer (1384 ms) than those in *mockery* contexts (1351 ms). Both of them had longer overall durations than those realized in *sincere-interest* contexts (1141 ms). Similar to the findings in [8], the noun was longest in *disgust* contexts (807 ms), with an intermediate duration in *mockery* contexts (772 ms), and the shortest duration in *sincere-interest* contexts (620 ms).

**Voice quality (VQ: based on vowel midpoints):** *Wh*-words were realized with a breathier VQ in the *sincere interest* (13.3 dB) and *disgust* contexts (13.5 dB) than in the *mockery* contexts (14.1 dB). Regarding the verb, however, VQ was breathier in the *disgust* contexts (11.6 dB) than in the *mockery* (13.3 dB) and the *sincere interest* contexts (13.6 dB). This tripartite difference became stronger within the sentence-final object noun (*disgust*: 14.5 dB, *mockery*: 15.1 dB, *sincere interest*: 16.4 dB).

**F0-shape:** The tonal-target labels L and H were taken to determine and compare the f0 shapes of the rising and falling slopes in the nuclear tunes. Only those nuclear tunes were taken into account that consisted of tritonal LHL sequences. The three f0 values of L, H, and L were measured as well as the two f0 values halfway in between the three tones. On this basis, the range proportion measure ( $R_{prop}$ ) was determined, following [21]. The results showed that nuclear question tunes in *disgust* and *mockery* contexts were characterized by clearly concavely shaped f0 rises with  $R_{prop}$  values well below 0.5 (0.40 and 0.36), followed by more convexly shaped f0 falls (0.69 and 0.76). The opposite was true for the nuclear question

tune in the *sincere-interest* context showing a convex shape with a  $R_{prop}$  value of 0.59, followed by a strongly concavely shaped f0 fall of  $R_{prop} = 0.96$ .

## DISCUSSION

Regarding the general differences between *mockery/disgust* RQs and *sincere interest* ISQs, our results are consistent with [8]. Phonologically, we found, like [8], that the nuclear pitch accent is mainly rising in RQs but falling in ISQs. Regarding the final boundary tone, RQs had a low and ISQs mainly a high boundary tone. This supports what was stressed by [9]: Final boundary tones have a specific meaning, and this is not simply 'question'. Hence, there is no straightforward link between the final boundary tone and sentence mode. This already implies that the prosodic differences between RQs and ISQs do not originate from signaling illocution type, but from different attitudinal stances. Phonetically, both the total duration and the duration of the object noun was greater in RQs than in ISQs. It also accords with [8] that breathiness dominated in RQs as opposed to ISQs. RQ breathiness was strongest on the verb, but the difference to ISQs was strongest on the final object noun.

Our results show that the realization of German RQs is context-specific and that there is not a single stable prosodic RQ profile. Yet, RQs still differ from ISQs along the entire prosodic profile that we analyzed; and the differences between RQs and ISQs were larger than those between the two RQ types *mockery* and *disgust*. Thus, RQs are also not simply "real" questions (ISQs) with prosodic differences, but rather prosodically an entirely different phenomenon. As for the specific nature of this phenomenon, note that, firstly, RQs differ from ISQs along the same prosodic parameters that also distinguish ISQs from regular statements in German [9]. Compared to the latter, ISQs are realized longer, breathier, and with stronger concave rises and convex falls in the LHL sequences of nuclear tunes [22, 23]. RQs seem to exaggerate these differences in terms of being even more question-like than ISQs. This exaggeratedness is also observed in ironic utterances [10-13] where people tend to use a "borrowed voice" instead of their own voice. A similar mechanism could be at work here, e.g. to attenuate the expressed *mockery* or *disgust*. That (esp. *mockery*) RQs started with a higher initial pitch than ISQs supports the idea of an exaggerated RQ prosody (see [9]).

Secondly, note with respect to *mockery* and *disgust* that the prosodic profiles of the realized RQs are not simply one-to-one reflections of the respective emotions, (e.g. [24]). Instead, the corresponding emotion profiles seem to be modified and translated into gradual parallel changes along a parameter profile that distinguishes questions from statements in German.

Overall, RQs and ISQs clearly differ from each other and so do contextual subtypes of RQs. These differences manifest themselves as parallel gradual parameter shifts along the same prosodic profile, which can also turn questions into statements in German.

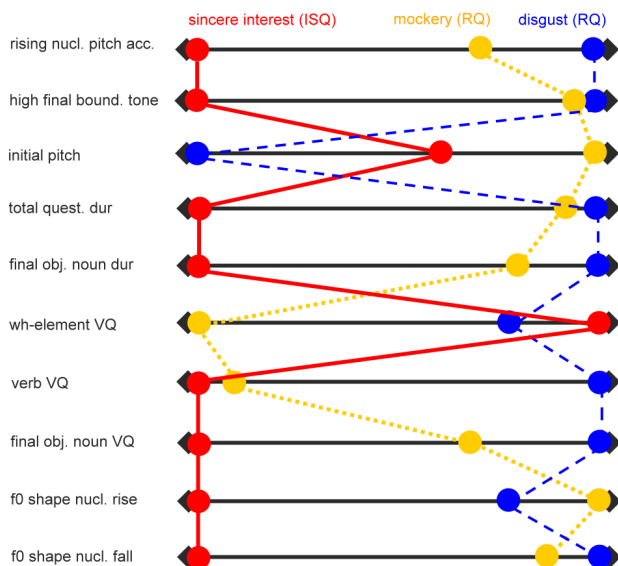


Fig. 1. Value ranges of all parameters from the smallest level or frequency (left) to the highest level or frequency (right). The intermediate level or frequency is displayed proportionally within each value range.

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