Can you believe that? Both strength and melody distinguish between non-genuine questions

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Introduction: Closed-interrogative polar questions can serve many purposes in English [1]. When they function as an unbiased request for information, they are typically characterized by a final rising intonation contour. This trend is attested in laboratory conditions [2], in spontaneous conversations [3] and in televised speech [4]. However, when such questions do not serve as an unbiased request for information, but rather as a request for action or as a rhetorical question (for brevity, *non-genuine* questions), the final intonation contour tends to be a fall, a plateau [2], or a combination of the two [3].

While differences between information-seeking and non-genuine questions are relatively well understood, differences between types of non-genuine questions are comparably understudied, and call for a targeted exploration.

Method: We collected audio data from the TV News Archive [5] to explore the prosody of three closed interrogative polar question types, realised with similar lexical strings. The TV News Archive is particularly well suited for extracting specific lexical strings of spontaneous non-scripted speech [6]. The three types differ in their function: (**A**) *can you repeat that?*, which is typically a request for action from the interlocutor; (**B**) *can you believe that?*, which is typically a rhetorical question that signals emphasis; and (**C**) *do you believe that?*. Although type C can be used as a request for information, in our corpus of televised speech it served as a rhetorical device for the introduction of a new topic. For each of the 3 types, we extracted the first 100 valid results, defined as utterances at the end of an intonation phrase, without substantial background noise or overlap among speakers. The first author further examined the original video context to exclude cases used for a different function or with structural differences in prosody (e.g. narrow focus), for a final corpus of 249 cases (A=91, B=86, C=72).

We conducted a prosodic analysis using the *ProPer* toolbox [7]. ProPer uses acoustic measurements of periodic energy and F0 to visualize (via *periograms*) and quantify (via metrics) prosodic aspects of the signal [8:141–158]. Two such metrics are *synchrony*, which measures the slope of F0 within each syllable, and *mass*, which measures the prosodic strength (or weight) of each syllable [9]. ProPer provides normalization of all values into relative scales that allow direct comparisons between different speakers in varying recording conditions.

Results: Fig. 1 shows aggregated synchrony values for all syllables and question types. Synchrony values for the final syllable confirms that non-genuine questions are not characterised by pronounced final rises. That said, requests for action (A, in red) tend toward very slight falling slopes throughout, while rhetorical questions (B, in yellow) and topic introductions (C, in blue) tend toward bi-modal distributions, with a preference for rises.

Fig. 2 shows aggregated mass values for all syllables and question types. Rhetorical questions (B, in yellow) and topic introductions (C, in blue) show a strong increase in mass from the auxiliary verb (*can*/*do*) to the stressed syllable of the main verb (*-peat*/*-lieve*). In requests for action (A, in red) there is no strong increase until the final word. These differences are exemplified in Fig. 3, which shows periograms for two model utterances.

Conclusion: The exploration of 249 closed-interrogative polar non-information-seeking questions form the TV News Archive confirms previous reports that these non-genuine questions do not tend to have predominantly rising final intonation. In addition, differently from rhetorical questions and topic introductions, requests for action are characterised by a shallow increase in prosodic mass throughout the utterance. These results suggest that insights can be gained on the prosody of non-genuine questions by exploring not only melodic but also non-melodic properties, in particular prosodic strength (mass), in real speech samples [10].

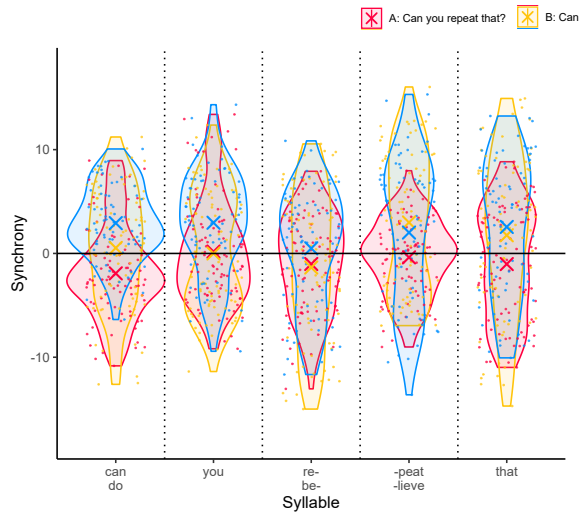

Fig. 1. Aggregated synchrony values. Positive values indicate a rising slope, negative values indicate a falling slope, zero indicates a symmetric contour.

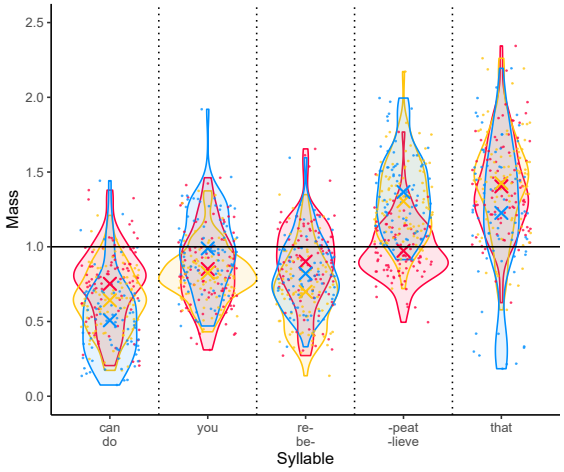

Fig. 2. Aggregated periodic energy mass values. (1 = average syllabic weight relative to each given token).

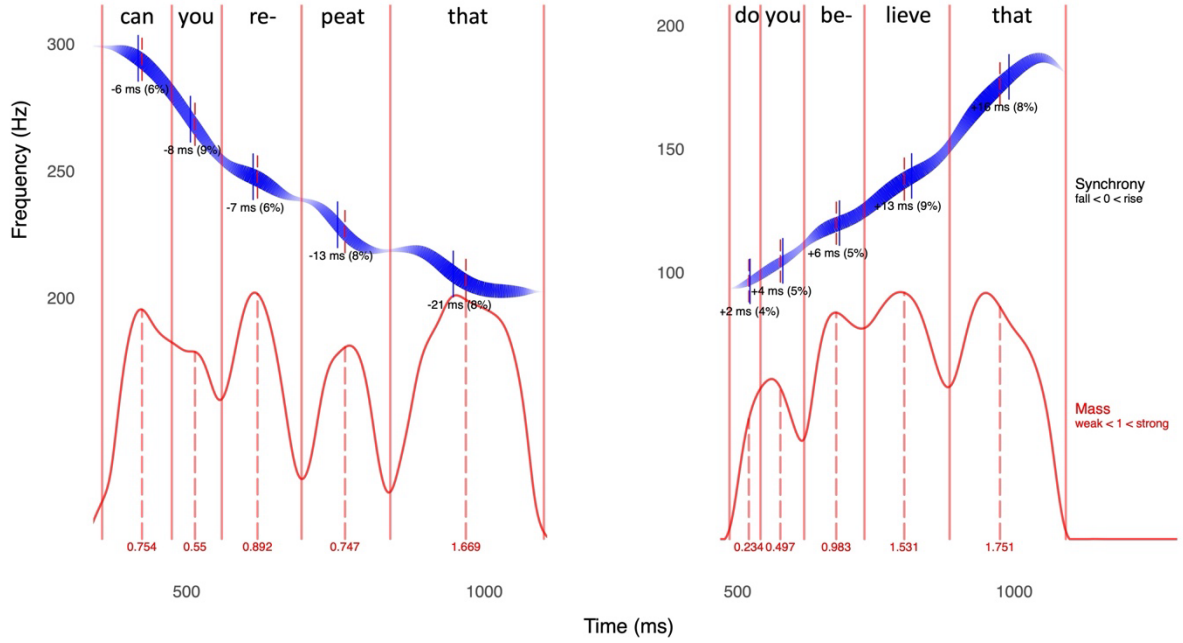

Fig. 3. Periograms for two examples of request for action (left) and topic introduction (right). The blue curve shows the F0, modulated by the periodic energy (red curve below) to reflect F0 strength. Note the values of synchrony in black (calculation of the F0 slope) and mass in red (the relative area under the periodic energy curve) in each syllabic interval.

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