

Maria Lialiou¹, Aviad Albert¹, Alexandra Vella², Martine Grice¹

¹University of Cologne, ²University of Malta

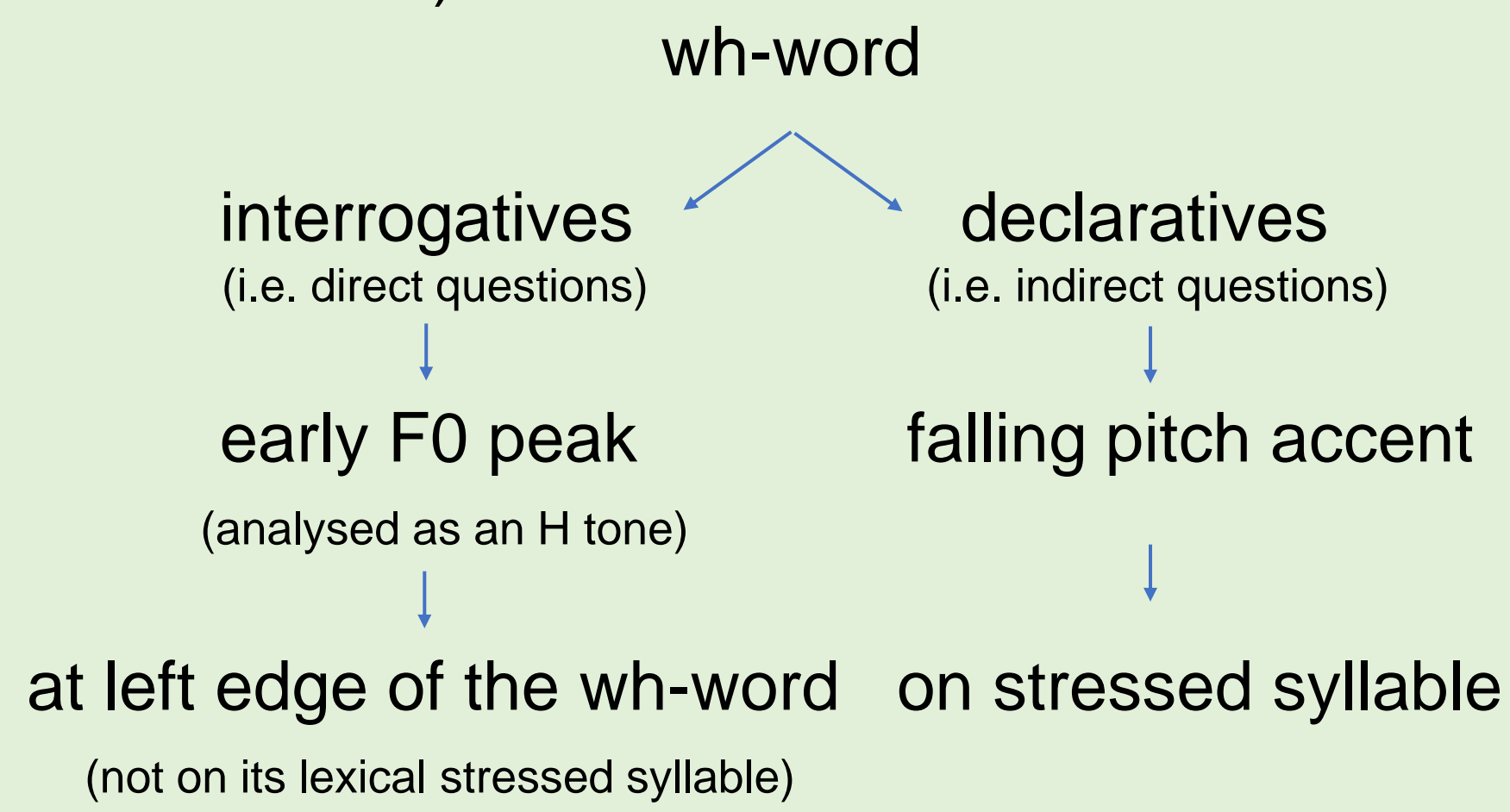
m.lialiou@uni-koeln.de, a.albert@uni-koeln.de, alexandra.vella@um.edu.mt, martine.grice@uni-koeln.de

1st International Conference on Tone and Intonation (TAI2021), Denmark, 6-9 December 2021

Introduction

Background Maltese is a Semitic language with lexical stress & regular pitch accents. However, pitch accents and edge tones can alternate on the same phonological constituent as a function of sentence modality [1;2;3;4].

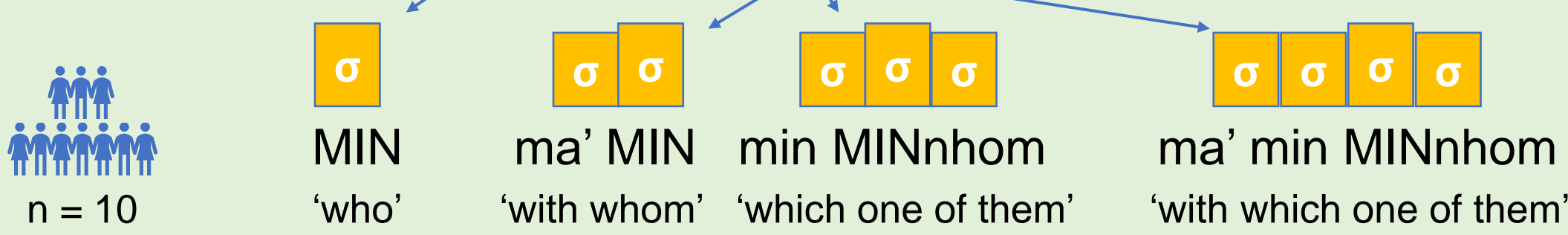
Recent work [2] investigated wh-words in different positions in the phrase across modalities (interrogatives and declaratives):



Objective

We investigate the characteristics of the two different tone bearing positions (word-initial & stressed syllable) in Maltese wh-words by systematic observation of their prosodic strength.

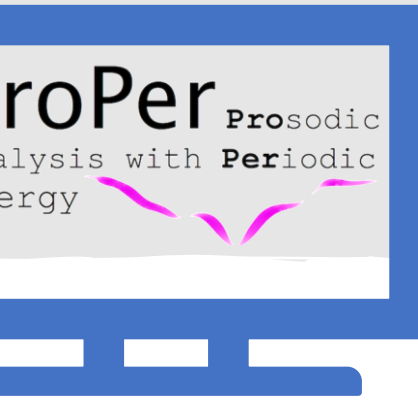
We use Maltese simple and complex wh-words



embedded in

direct question (interrogative)	<i>Mar j-ghum ir-Ramla ma' min minnhom?</i> 'With which one of them did he go swimming to Ramla?'
indirect question (declarative)	<i>U staqs-iet-ni, mar j-ghum ir-Ramla ma' min minnhom.</i> 'And she asked me with which one of them did he go swimming to Ramla.'
quoted question (narrow focus)	<i>Iva, mistoqsija ohra li ghandna bzonn insaqsu hija ma' min minnhom.</i> 'Yes, another question we need to ask is with which one of them.'

We ask whether there are acoustic indications for a prominence cueing function of
 1) falling pitch accents on the stressed syllable in indirect & quoted questions, and
 2) word-initial (early) H peaks in direct questions



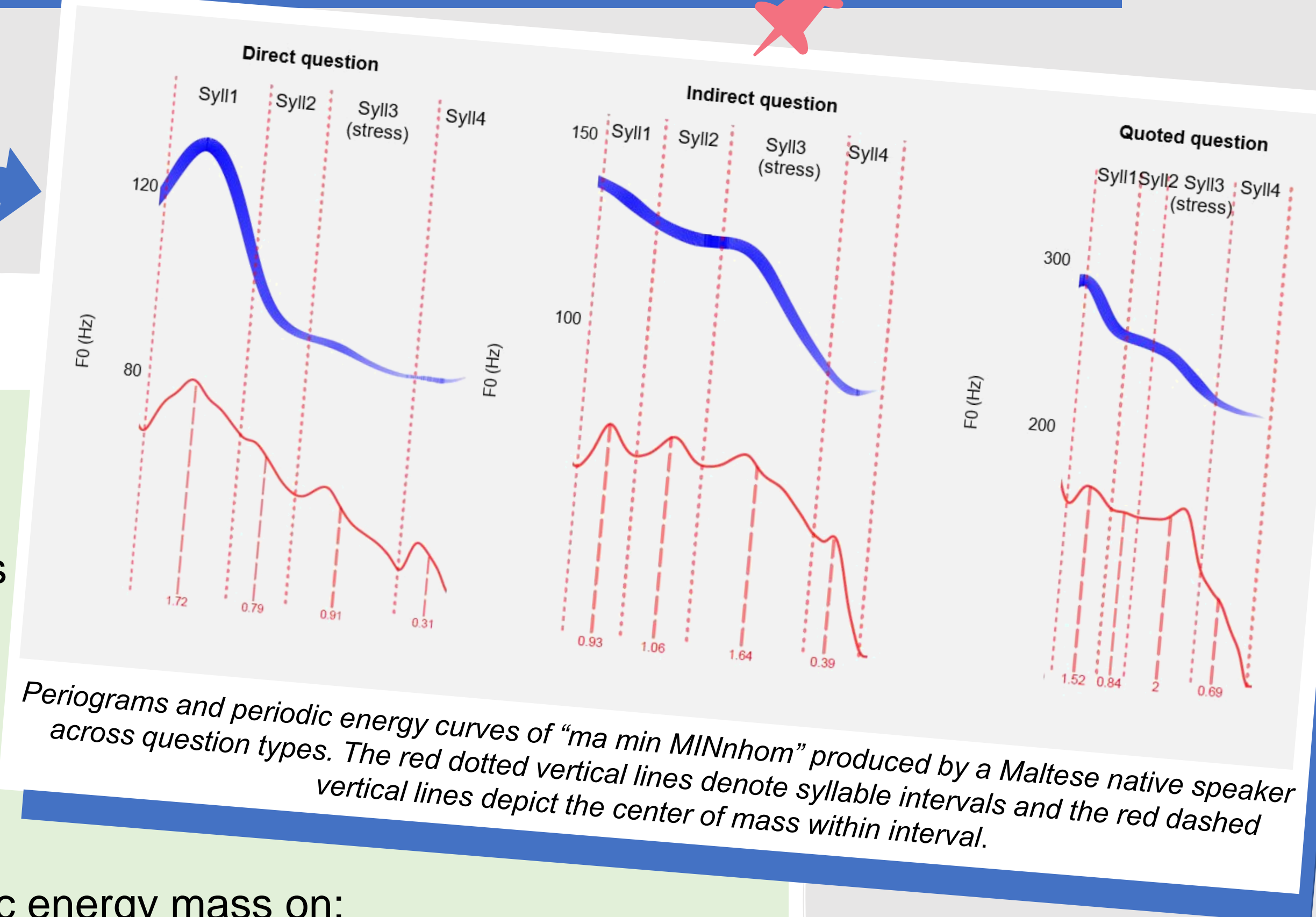
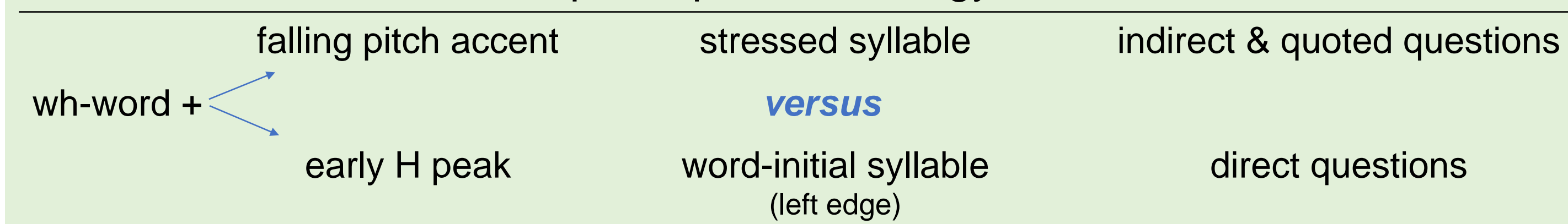
Methodology

We follow an acoustic analysis based on continuous periodic energy [5;6;7].

We measure the periodic energy mass as the sum integral of duration and power (i.e., the area under the periodic energy curve).

Periograms

Our data observes and compares periodic energy mass on:



Periograms and periodic energy curves of "ma min MINnhom" produced by a Maltese native speaker across question types. The red dotted vertical lines denote syllable intervals and the red dashed vertical lines depict the center of mass within interval.

Results

We find a qualitative & consistent difference between the mass of the initial syllable when bearing the early H peak and that of the stressed syllable that bears a falling pitch accent.

- When an **early H peak** is associated with the **word-initial syllable** (direct question)
 - ✓ no significant difference in mass between word-initial vs. stressed syllables
- Comparing the **word-initial syllable** bearing an **early H peak** (direct question) to the **word-initial syllable** with **no tonal event** (indirect question)
 - ✓ only a modest increase in mass is observed in the word-initial syllable
- When a **falling pitch accent** is associated with the **lexically stressed syllable** (indirect & quoted questions)
 - ✓ distinctively larger mass on the stressed syllable vs. the word-initial syllable
- In the narrow focus (quoted question)
 - ✓ global increase in mass on the whole wh-word
 - ✓ the mass on the **stressed syllable** is significantly greater than in any other position
- In the **monosyllabic case** when the wh-word **MIN** (which is always stressed) bears an **early H peak** (direct questions)
 - ✓ its mass is greater vs. when bearing the falling pitch accent (indirect question)
 - ✓ yet not as strong as it is when bearing the falling pitch accent in narrow focus (quoted question)

Conclusions

The prosodic strength of the initial syllable is

- relatively weak when no tonal event is associated with this syllable (indirect question)
- enhanced when
 - ✓ it bears an (early) H peak (direct question)
 - ✓ it is monosyllable (MIN in direct question) bearing an early H peak
 - ✓ or it is within the scope of the narrow focus (quoted question)
- even when its prosodic strength is enhanced, the mass of the initial syllable is not stronger than that of the stressed syllable

The prosodic strength of the stressed syllable is

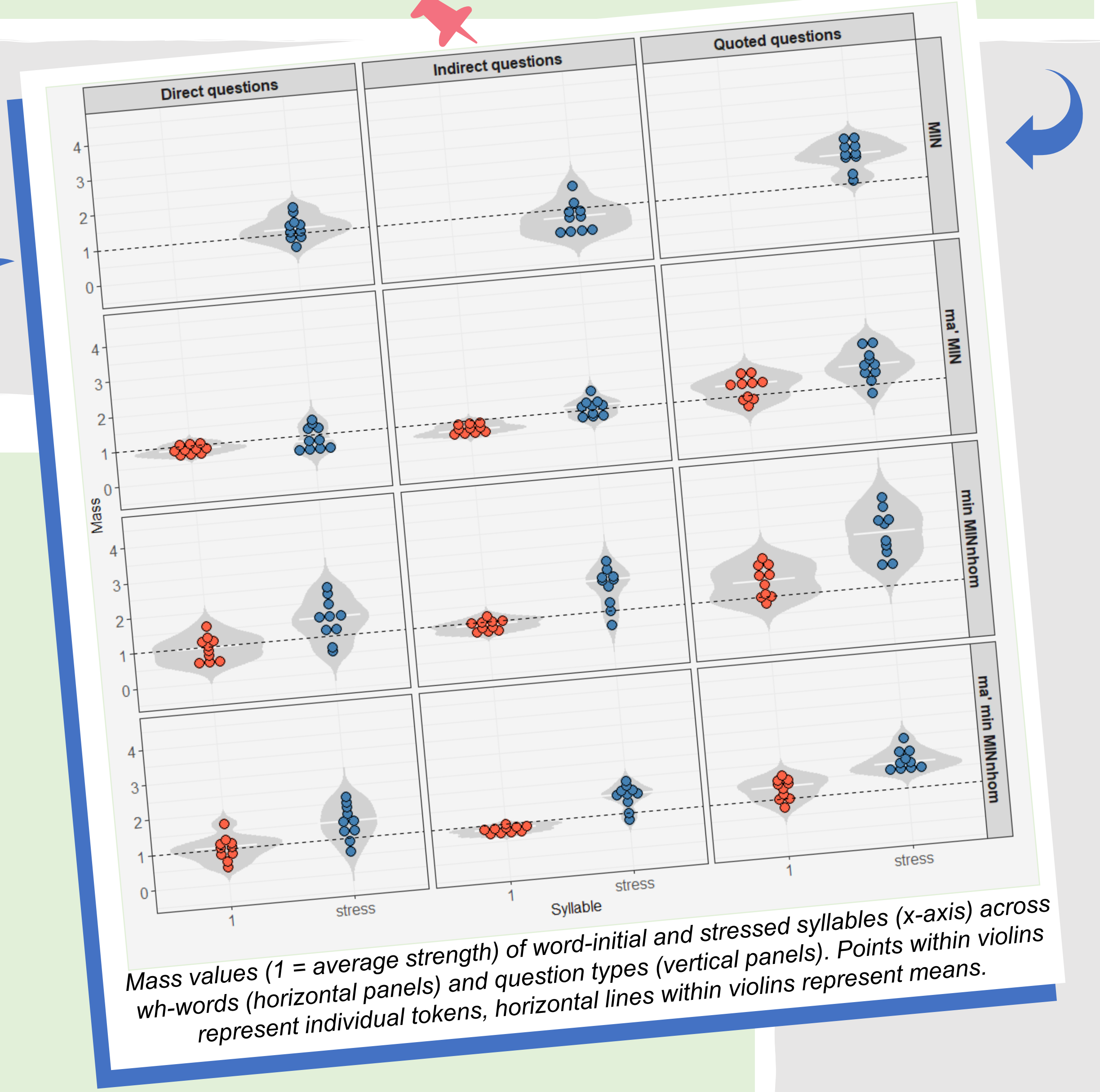
- consistently strong across modalities & boosted in narrow focus (quoted question)
- but when no tonal event marks the syllable (direct question)
 - ✓ its mass does not differ from the mass on word-initial syllable bearing the tonal event

Overall,

- lexical stress seems to preserve some prosodic strength even when the stressed syllable is not marked by a tonal event
- at the same time the tonal event associated with the (unstressed) left edge of the wh-word tends to enhance the prosodic strength of the initial syllable

Thus, we can conclude that

- the increase in periodic energy in word-initial syllable with an early H peak points towards a potential prominence cueing function
- further research is needed to determine whether Maltese allows intonational tones with either head or edge association to serve the function of cueing word prominence [8;9]



Mass values (1 = average strength) of word-initial and stressed syllables (x-axis) across wh-words (horizontal panels) and question types (vertical panels). Points within violins represent individual tokens, horizontal lines within violins represent means.

Acknowledgements

This work was supported by the Collaborative Research Center 1252 Prominence in Language, project A01, funded by the German Research Council.

[1] Vella, A. 1995. Prosodic structure and intonation in Maltese and its influence on Maltese English. Unpublished PhD thesis, University of Edinburgh. [2] Grice, M., Vella, A. & Bruggeman, A. 2019. Stress, pitch accent, and beyond: Intonation in Maltese questions. *Journal of Phonetics*, Volume 76, 100913, ISSN 0095-4470. [3] Vella, A. 2007. The phonetics and phonology of wh-question intonation in Maltese. *Proceedings of ICPhS XVI*, Saarbrücken, 1285-1288. [4] Vella, A. 2011. Alignment of the "early" HL sequence in Maltese falling tone wh-questions. *Proceedings of ICPhS XVII*, Hong Kong, 2062-2065. [5] Albert, A., Cangemi, F. & Grice, M. 2018. Using periodic energy to enrich acoustic representations of pitch in speech: A demonstration. *Proceedings of the 9th Speech Prosody Conference*, Poznan, 1-5. [6] Cangemi, F., Albert, A. & Grice, M. 2019. Modelling intonation: Beyond segments and tonal targets. In Sasha Calhoun, Paola Escudero, Marija Tabain & Paul Warren (eds.) *Proceedings of the 19th ICPhS*, Melbourne, Australia, 572-576. [7] Albert, A., Cangemi, F., Ellison T.M. & Grice, M. 2021. *ProPer: PROsodic analysis with PERiodic energy*. OSF, June 18. <https://doi.org/10.17605/OSF.IO/28EA5> [8] Grice, M. 2021. Commentary: The autosegmental-metrical model of intonational phonology. In Stefanie Shattuck-Hufnagel & Jonathan Barnes (eds.), *Prosodic Theory and Practice*. The MIT Press. [9] Arvaniti, A. 2021. Author Response to the Commentary: Prosodic Typology and the Handling of Variability in Intonation. In Stefanie Shattuck-Hufnagel & Jonathan Barnes (eds.), *Prosodic Theory and Practice*. The MIT Press.