THE PERCEPTION OF SURPRISE QUESTIONS IN ESTONIAN

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Research questions

- Which acoustic features correlate with the perception of surprise?
- Does the context of surprise influence the recognition rate of surprise questions?

Experiment

- 24 string-identical **information-seeking questions** (ISQs) and **surprise questions** (SQs)
  - 12 with the question word *mis* 'what NOM' (e.g. *Mis loom see on?* 'What animal is this?')
  - 12 with the question word *mida 'what* GEN' (e.g. *Mida sa teed?* 'What are you doing?')
- Produced by six female participants
- Online perception test in the PCIbex environment
- Upon hearing each stimulus the participants had to decide whether the speaker's intention was to ask for information or express surprise
- Participants were 52 native speakers of Estonian (44 F, 7 M, 1 NB; mean age 42, from 24 to 69)

Summary

- The study examines the perception of surprise questions as compared to information-seeking questions.
- An online perception experiment using natural stimuli from 6 speakers.
- 52 participants evaluated whether the speaker intended to ask for information or to express surprise.
- The overall correct identification score for information-seeking questions was 84% and for surprise questions 55%,
- Higher perception rate of surprise questions is above all related with a longer duration, a wider pitch range, and a lower mean pitch of the utterance.

Results

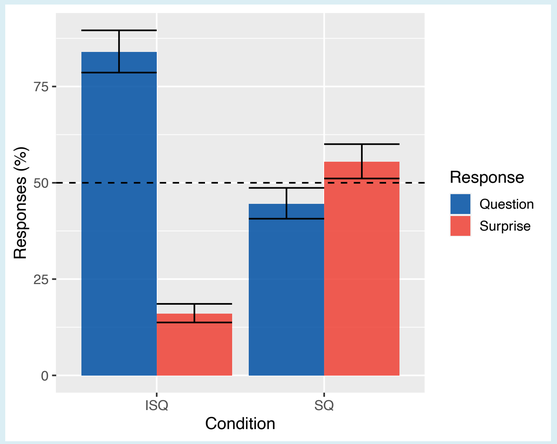

FIG 1: The overall average results

- The information-seeking questions (ISQs) were recognised (correctly) as questions asking for information in 84% of the cases
- The surprise questions (SQs) were recognised as expressing surprise in 55% of the cases

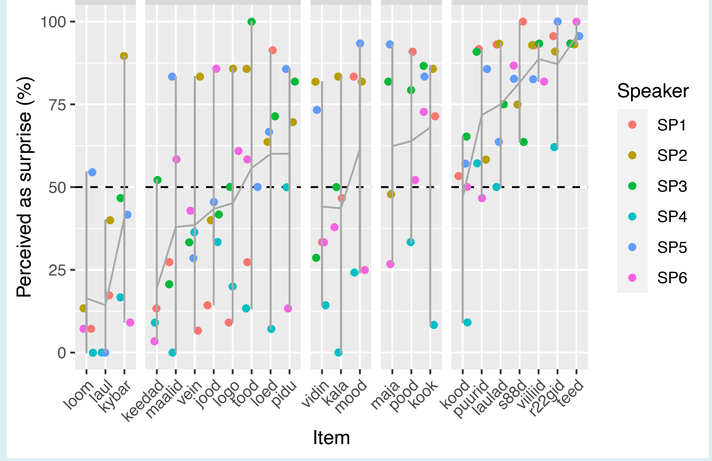

FIG 2: The frequency of surprise condition items perceived as expressing surprise grouped by the context type

- There was a large speaker- and item-dependent variation in the perception of SQs
- The perception of surprise was the highest in the case of *counterexpectation* combined with *disapproval* (75%)

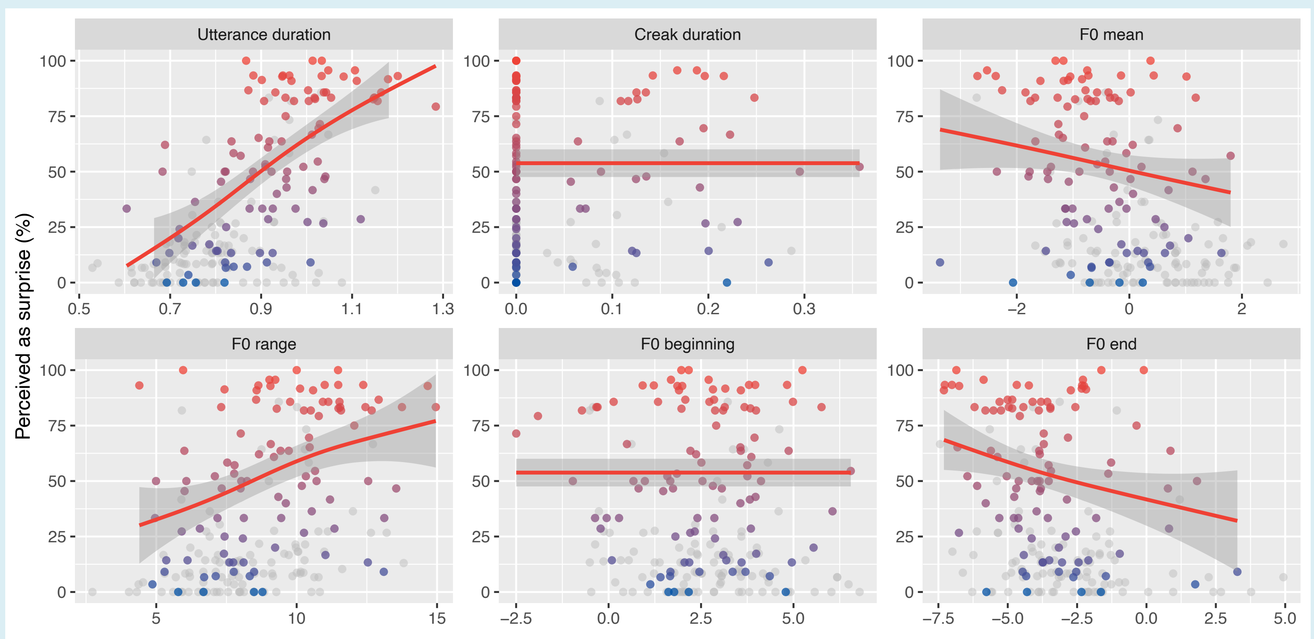

FIG 3: The perception of surprise questions as a function of different acoustic features of the stimuli

- A strong positive correlation between the perception rate of surprise and *utterance duration* and *the F0 range* of the stimuli
- A negative correlation between the perception rate of surprise and *the F0 mean* and *utterance-final F0*
- No correlation between the perception rate and *utterance-initial F0* or *the duration of creaky voice*

Conclusions

- The acoustic feature that is most robustly related to the perception of surprise questions in Estonian is the longer duration of the utterance.
- Also, pitch-related features, such as a wider F0 range and a lower mean F0 contribute to the accurate perception of surprise questions.
- Surprise questions seem to be perceptually more distinct from information-seeking questions when they also express a judgment.

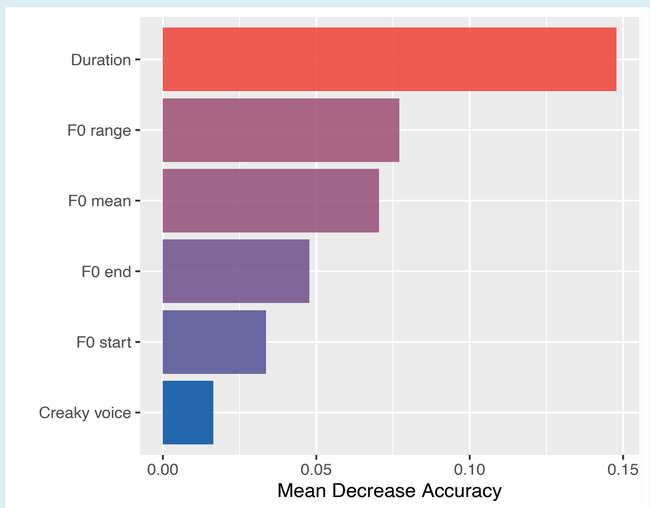

FIG 4: The effect of the acoustic features on predicting the perception of surprise tested with a random forest model

The prediction accuracy of the model was 81% (error rate 15% for question and 28% for surprise)