

Strategies of head nod alignment with pitch prominence in French focus

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Introduction and research background

- Rhythmic, **co-verbal movement of the head** always accompanies speech (Munhall et al., 1994)
- Previous studies suggested that co-verbal head movements are **linked to the production of prosodic features** (Hadar et al., 1984; House et al., 2001; Esteve-Gibert et al., 2017a)
- The current study examines head movement correlates of **contrastive and corrective focus in French** interactive speech ('Take the **ORANGE** dress [not the blue dress]')
- In a similar task, French preschoolers produce contr. focus only through head nods (Esteve-Gibert et al., 2017b)

A three-way approach: EMA, ELAN, Praat

EMA

- Electromagnetic articulometry data from Carstens AG500
- Sensors on **left mastoid**, **right mastoid**, and **nasion**
- A **head nod signal** was generated from sensor positions

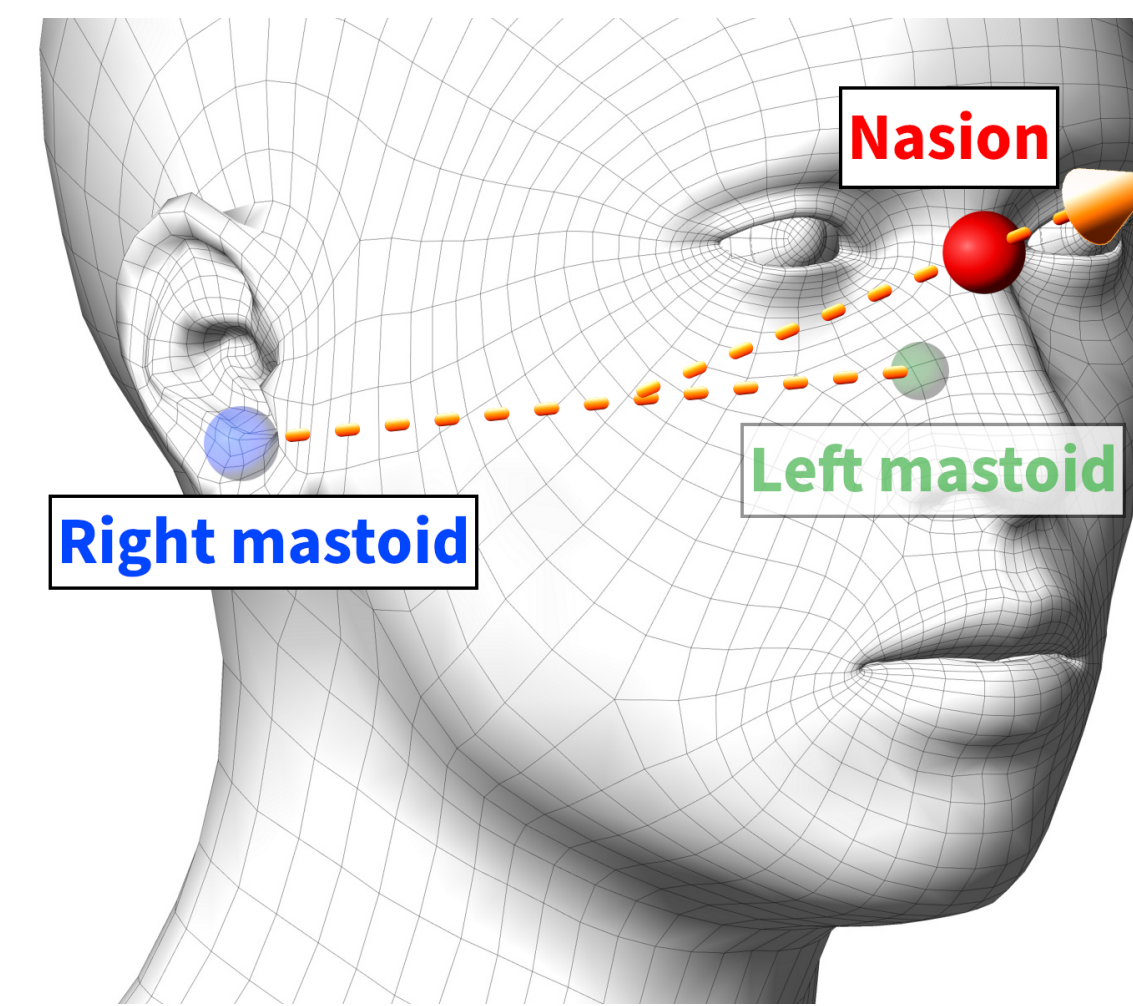
ELAN

- EUDICO Linguistic Annotator used to annotate nods
- Head nods that were **perceived as prominent** were marked
- Word bearing the nod was used for subsequent analyses
- Total: **12** speakers, **116** items (5-20 items per speaker)

Praat

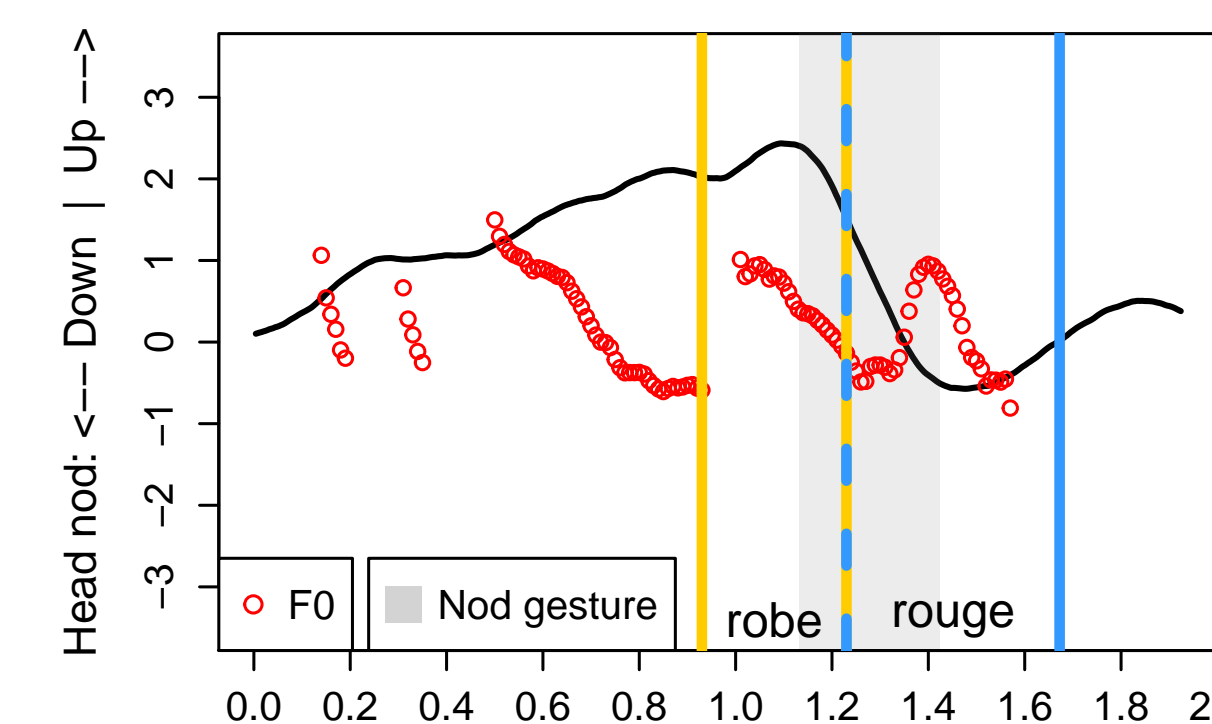
- F0 peaks that were perceived as prominent were marked
- Time of peak closest to ELAN-annotated word was logged

Generating a vertical head nod signal (ϕ)

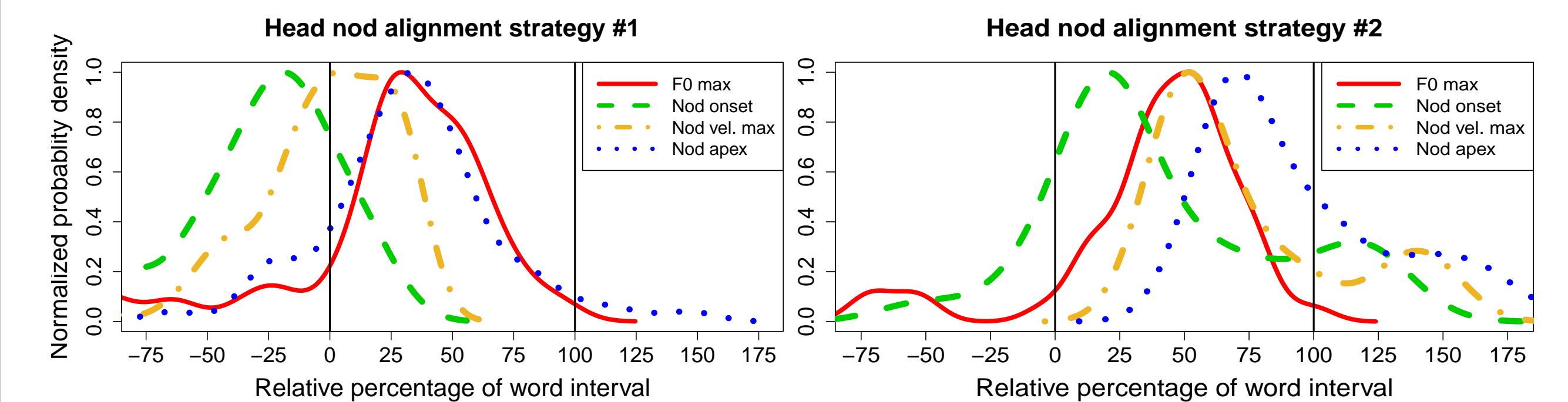


- Vector: inter-mastoid point to nasion
- Vector components \rightarrow spherical coordinates
- z -scaled ϕ : nod signal

- Point of **maximum downward velocity** closest to ELAN-identified word
- 20% velocity thresholds: gesture **onset** and **apex**
- Time normalization \rightarrow % of word duration

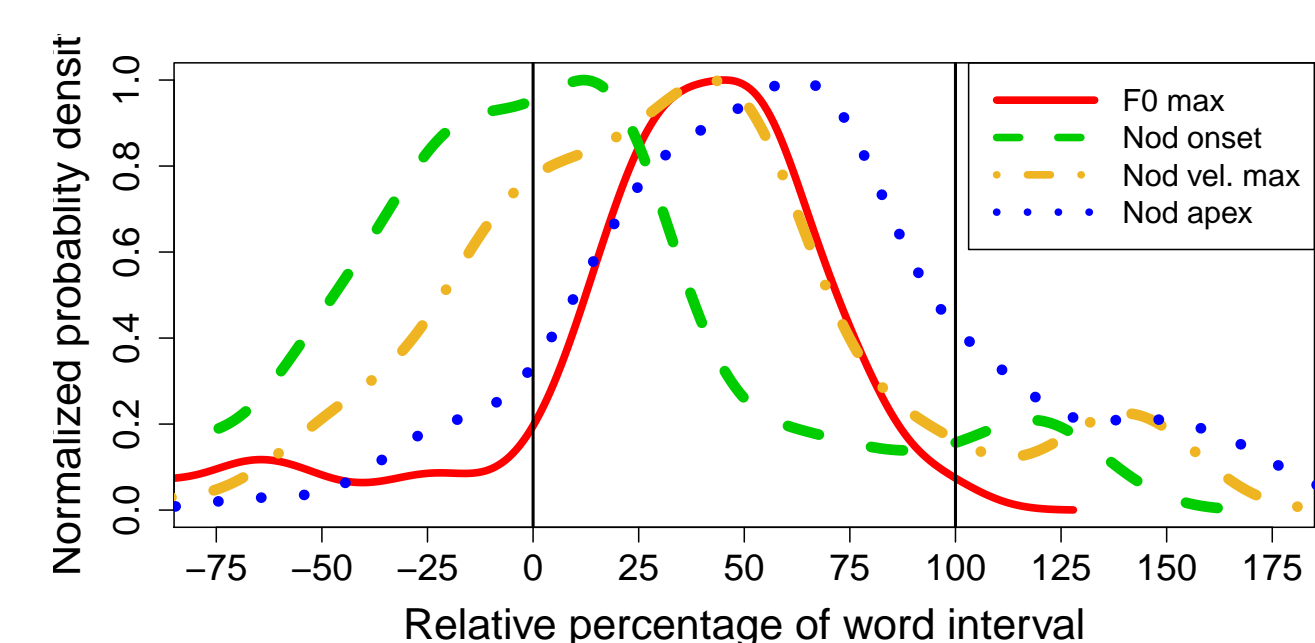


Two strategies of head nod \sim F0 alignment



- Gesture apex** is aligned with **F0 peak**
- Maximum velocity** is aligned with **F0 peak**
- Maximum velocity** is aligned with word start
- Entire gesture occurs within target word
- All speakers produced **both strategies**, but some speakers showed a **preference** for one strategy over the other
- No discernible pattern based on **focus type** or **word type**

Global results for head nod \sim F0 alignment



- Gesture time points: **bimodal... two strategies?**
- k -means clustering (2 groups) of max. velocity
- Group 1: 64 items (55%)
- Group 2: 52 items (45%)
- F0 peak: **unimodal**, aligned w/ word midpoint

Discussion

- Head nods used to **enhance prosodic focus** in French
- Strategy #2: accentual F0 peak targets tend to be **aligned with peak velocity** of the main consonantal constriction trajectory in Italian and French (D'Imperio et al., 2007)
- Strategy #2: greater **kinematic stiffness** (LME, $p < 0.05$)
- Alignment strategy preferences may be **speaker-specific**
- Strategies are **not due** to focus condition or word type

Future research avenues and goals

- Causes of different strategies
- Causes of speaker preferences
- Patterns in θ (side-to-side)
- Chin points
- Refine head nod signal