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## Effect of masking noise on tongue compensatory movement following a mechanical perturbation

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► **To cite this version:**

Morgane Bourhis, Pascal Perrier, Christophe Savariaux, Takayuki Ito. Effect of masking noise on tongue compensatory movement following a mechanical perturbation. Progress in Motor Control XIV, International Society of Motor Control (ISMC); “Bambino Gesù” Children’s Hospital, Sep 2023, Rome, Italy. hal-04246357

**HAL Id: hal-04246357**

**<https://hal.science/hal-04246357v1>**

Submitted on 17 Oct 2023

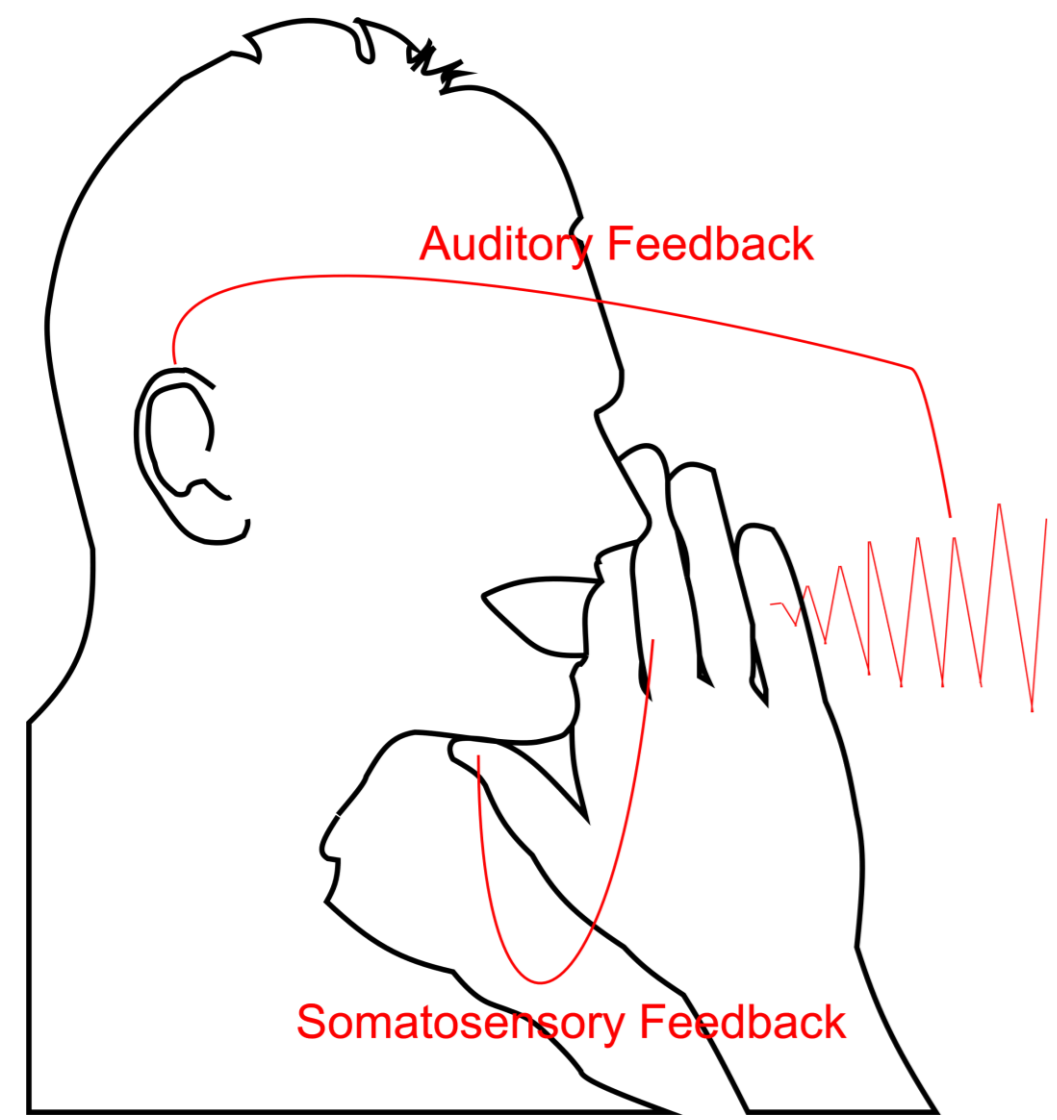
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# Effect of masking noise on tongue compensatory movement following a mechanical perturbation

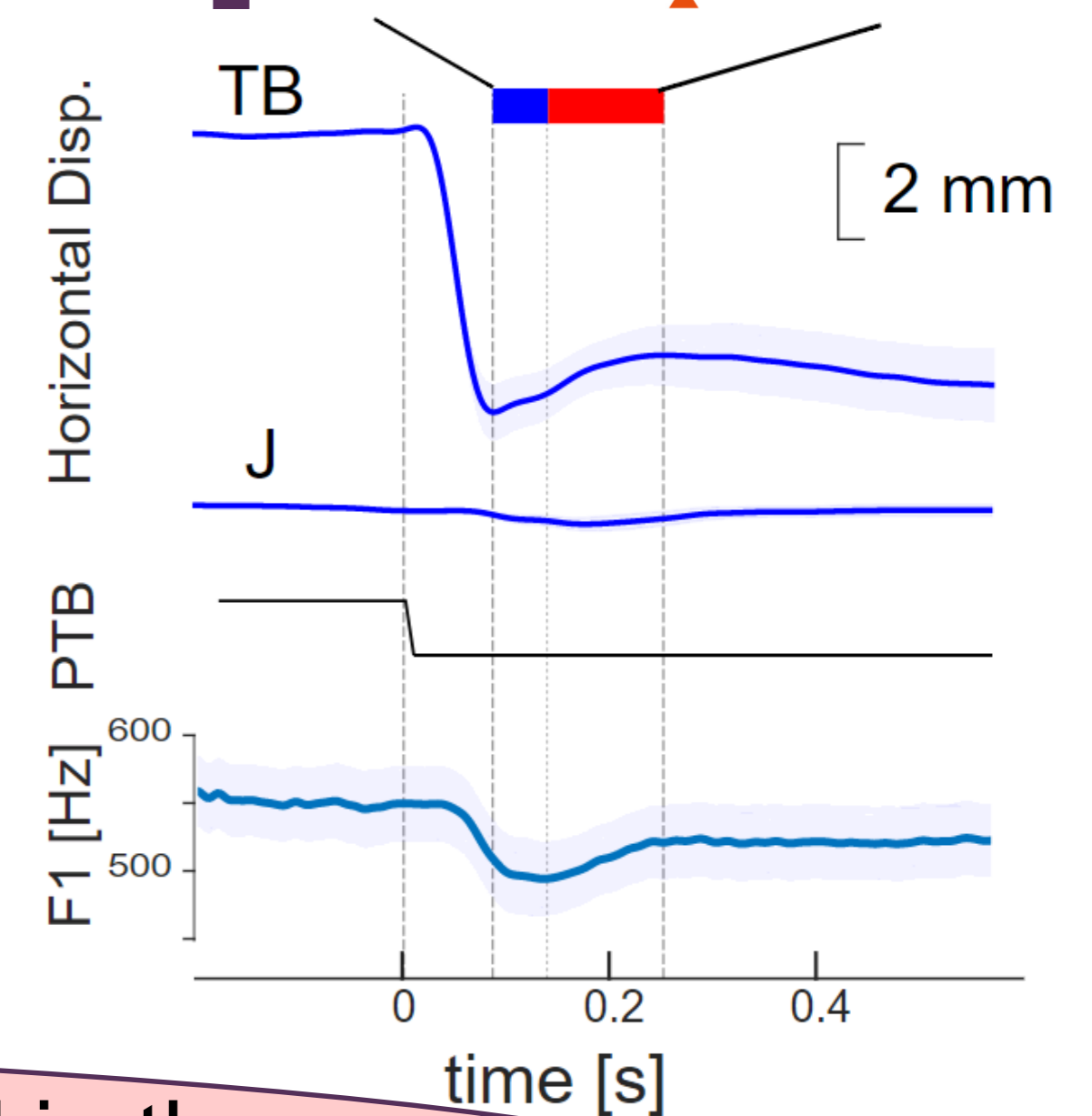
## Introduction

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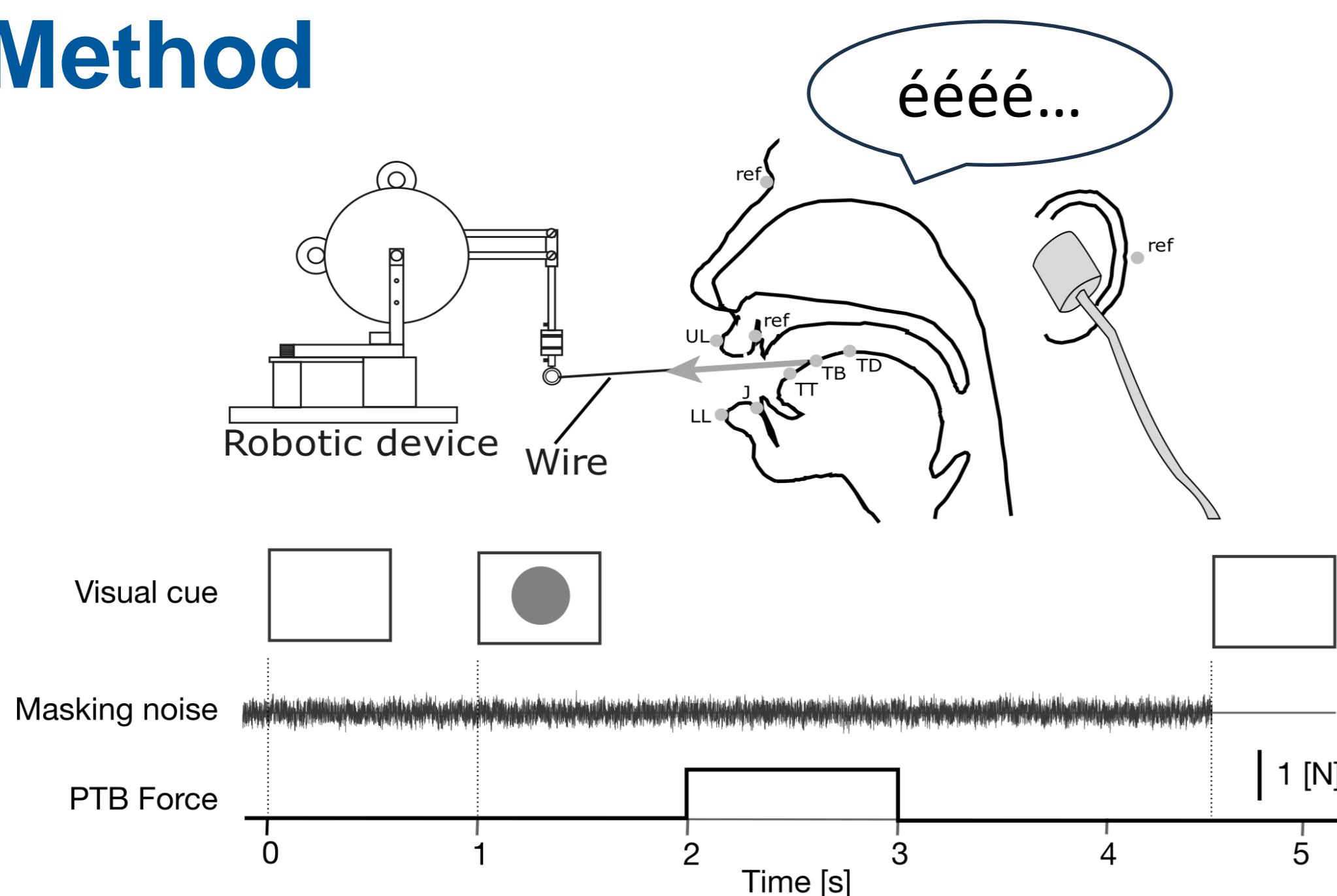
Somatosensory and auditory inputs play an important role in speech production (Guenther and Hickok, 2015). During speech, somatosensory error is corrected even in the absence of auditory error (Tremblay et al. 2003).

The tongue showed quick compensatory response for stabilizing the tongue contour and maintaining the resultant produced sound (Ito et al. 2020). This compensatory response can be driven by somatosensory feedback alone.



Can the compensatory response of the tongue during speech production be changed in the absence of auditory feedback?

## Method



Participants: 12 native speaker of French.

Speech task: sustain whispered sound of the /e/ with 150 repetitions.

Auditory conditions: (1) auditory masking (2) no masking.

Tongue perturbation: 1 N of the force with stepwise shape for 1 [s].

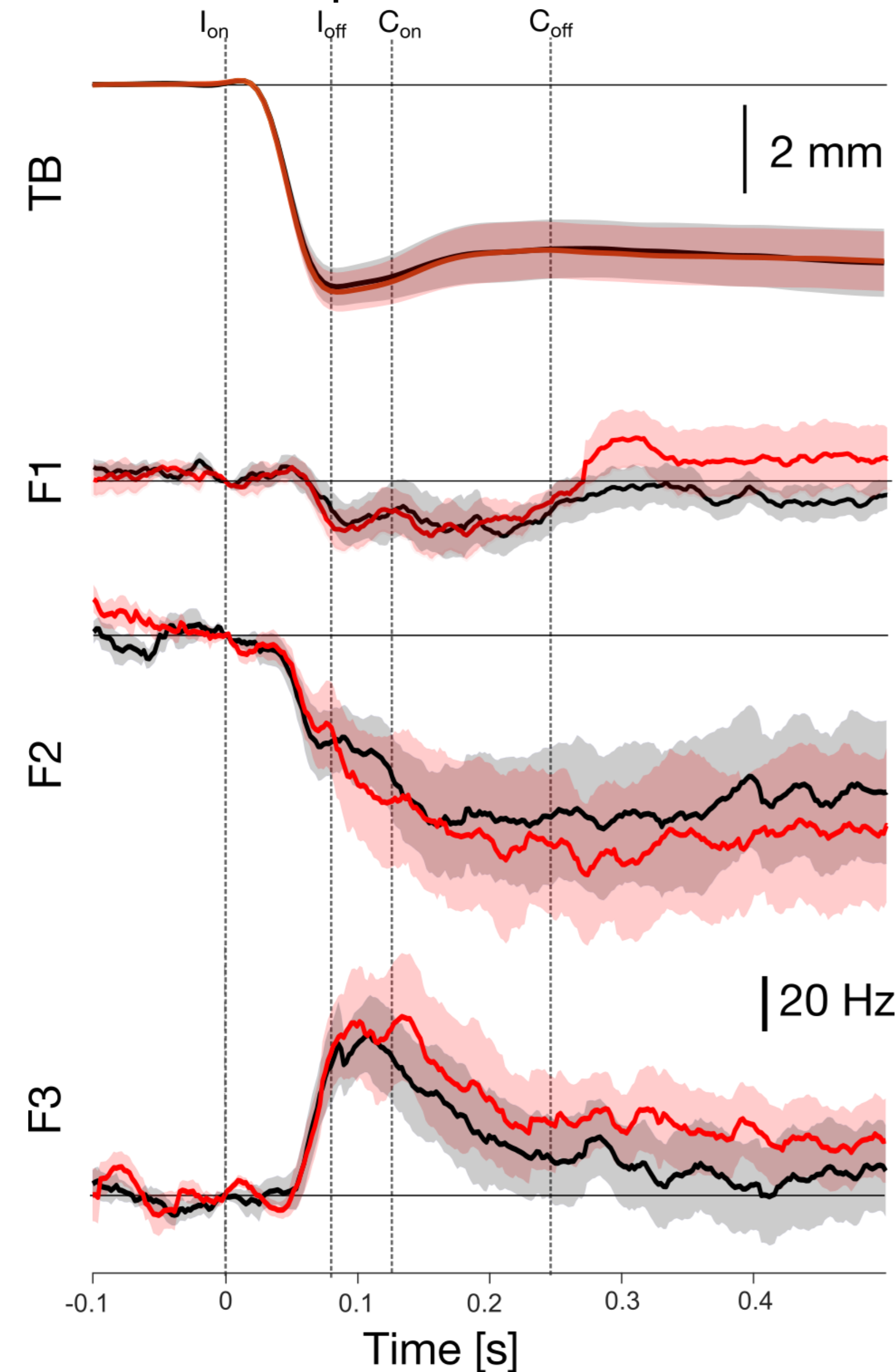
Articulatory measurements: tongue tip, blade and dorsum (TT, TB and TD), jaw (J), upper and lower lip (UL and LL), 4 references (ref: upper incisor, left and right mastoid, and nasion)

Data preprocessing:

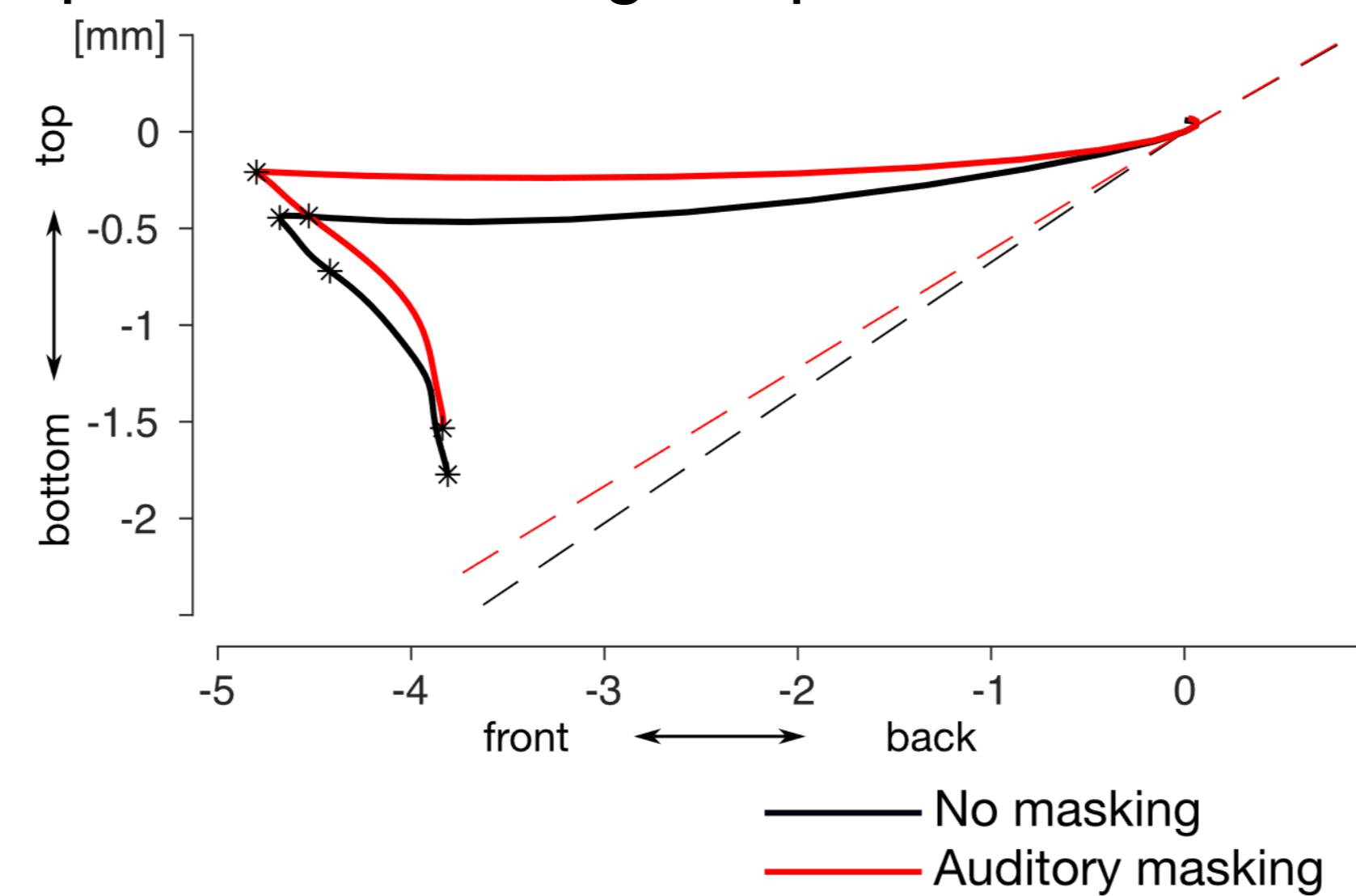
- Movement: (1) Head movement correction (2) Data alignment at the perturbation onset (3) Removal of jaw movement data from the tongue data.
- Speech sound: Extract three formants (F1, F2 and F3).

## Results

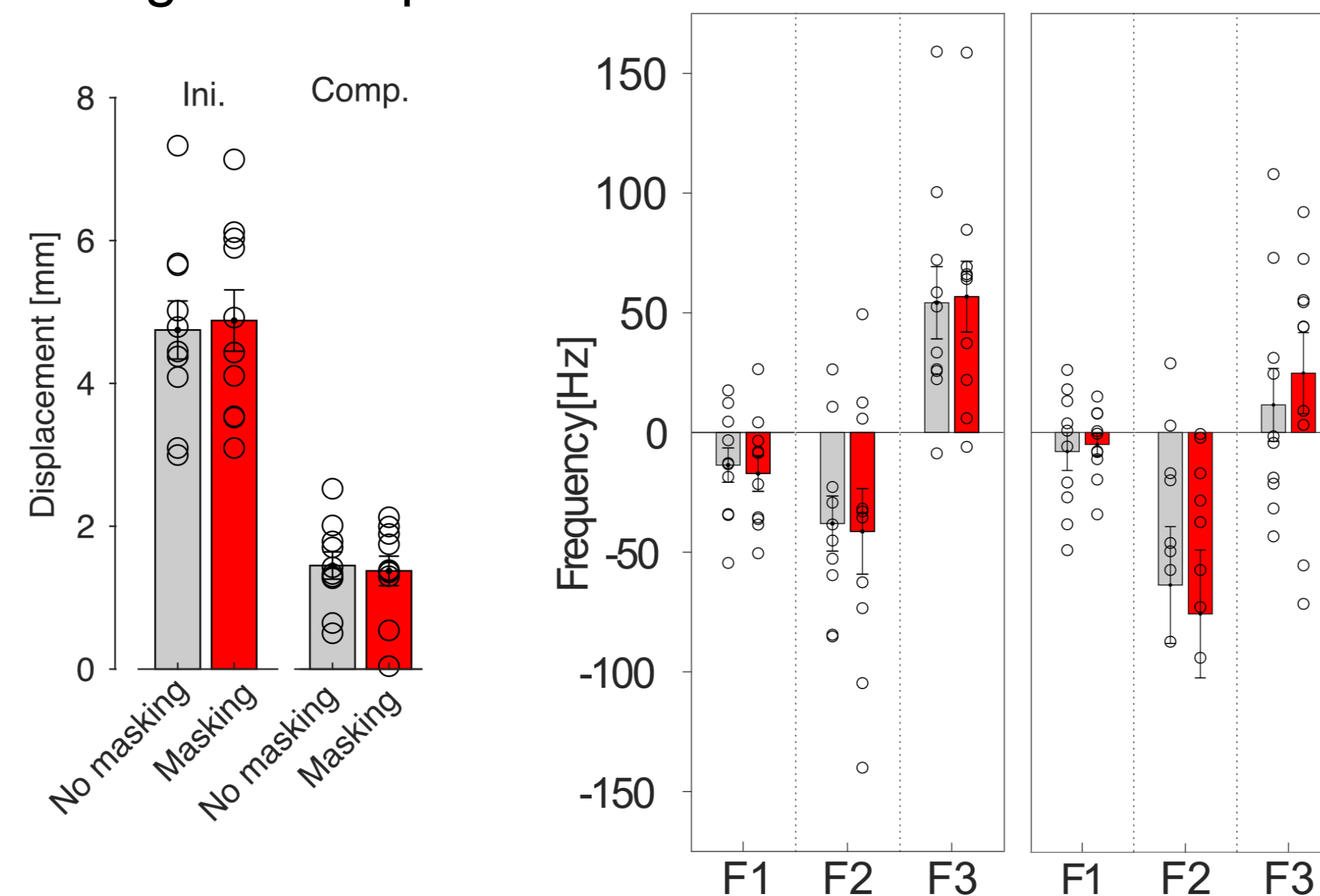
### Horizontal displacement and formants



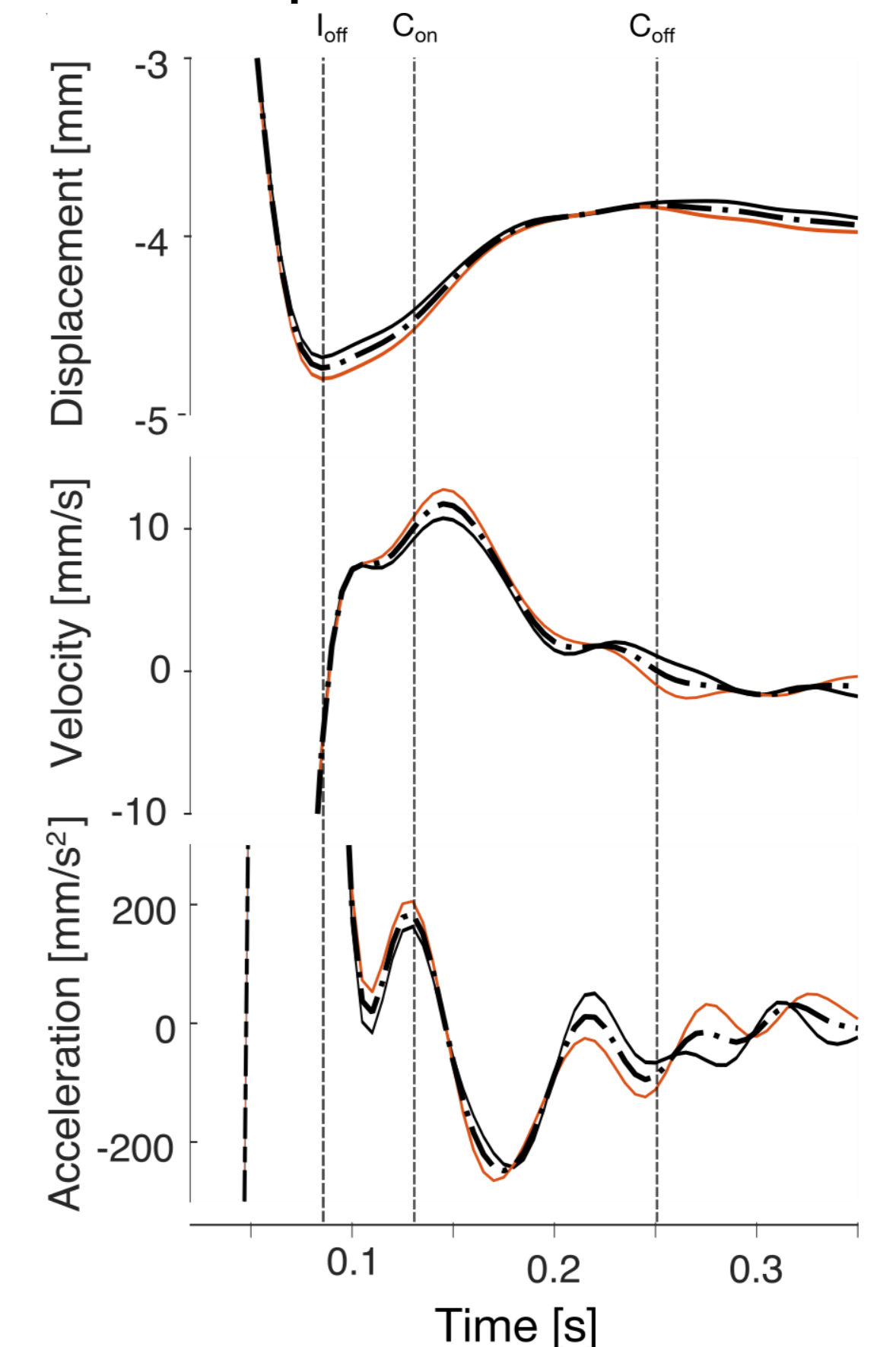
### Displacement in sagittal plane



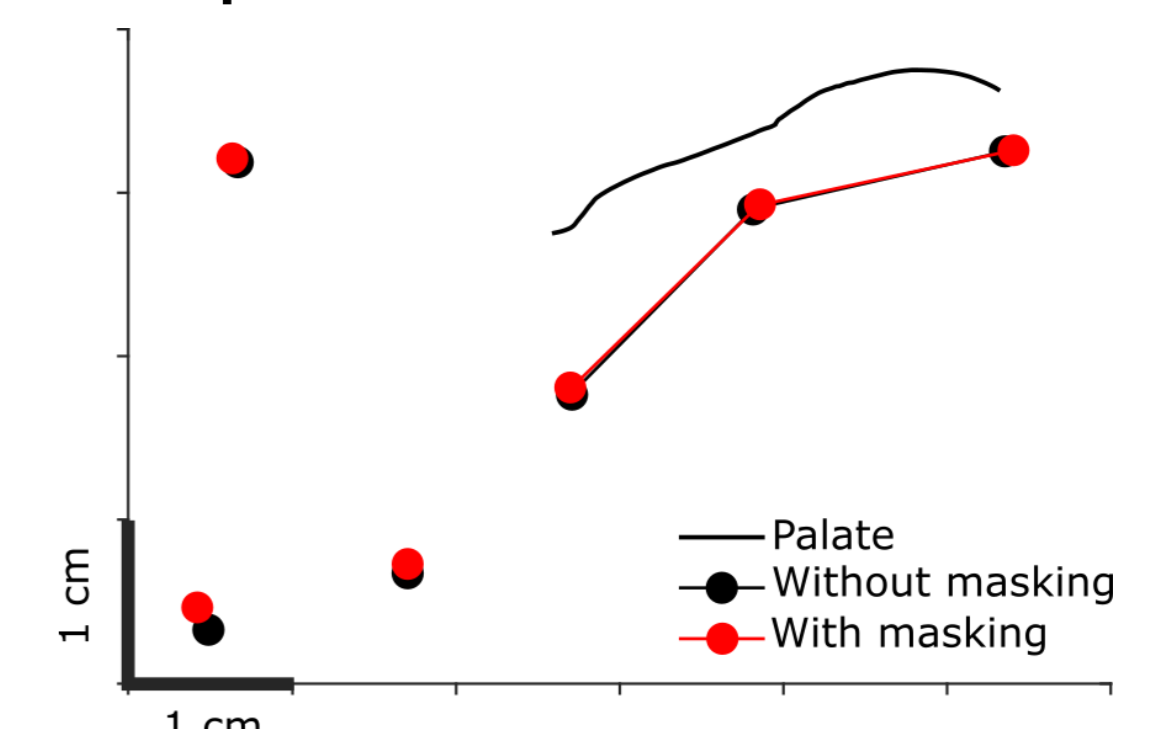
### Changes in displacement and formants



### Focused time points



### Representative articulatory configuration before the perturbation



## Summary

- Compensatory response of the tongue was induced as shown in the previous study.
- There was no significant difference in both displacement and speech sound between two auditory conditions ( $p > 0.1$  in all comparisons).

➔ Little of no contribution of auditory feedback for the current compensatory response.

## Bibliography

Guenther, F. H., & Hickok, G. (2015). Role of the auditory system in speech production. In Handbook of Clinical Neurology (1st ed., Vol. 129). Elsevier B.V. <https://doi.org/10.1016/B978-0-444-62630-1.00009-3>  
 Ito, T., Szabados, A., Caillet, J. L., & Perrier, P. (2020). Quick compensatory mechanisms for tongue posture stabilization during speech production. Journal of Neurophysiology, 123(6), 2491–2503.  
 Tremblay S, Shiller DM, Ostry DJ (2003) Somatosensory basis of speech production. Nature 423:866–869.

## Funding

This work was supported by Agence Nationale de la Recherche (ANR-21-CE28-0022) and National Institute on Deafness and Other Communication Disorders (R01-DC017439).