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## Effect of orofacial somatosensory stimulation in speech perception in relation to speech production performance

Monica Ashokumar, Clément Guichet, Jean-Luc Schwartz, Takayuki Ito

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Monica Ashokumar<sup>1</sup>, Clément Guichet<sup>1</sup>, Jean-Luc Schwartz<sup>1</sup>, Takayuki Ito<sup>1,2</sup>

<sup>1</sup>Univ. Grenoble Alpes, CNRS, Grenoble INP, GIPSA-lab, Grenoble, France, <sup>2</sup> Haskins Laboratories, New Haven, USA

## Introduction

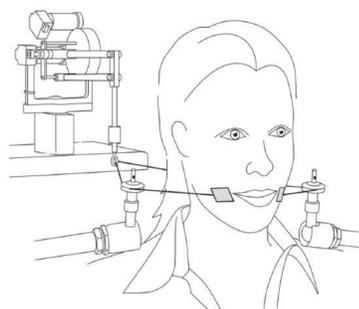
- Speech production and speech perception abilities are closely linked and shaped in relation with individual variability<sup>1,2</sup>.
- This individual variability can be related to differences in developmental trajectories<sup>3,4</sup>.
- Recent studies<sup>5,6</sup> showed that orofacial somatosensory inputs modulate the speech perception and this effect can be also attributed to their role in speech production.
- We thus hypothesized that individual variability of speech production performance can represent the size of somatosensory effect in speech perception.

## Aim

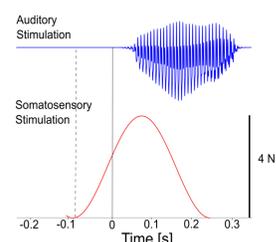
- To examine whether the individual difference of somatosensory effect in speech perception were correlated with individual difference of speech production.

## Methods

- Twenty-two French native speakers participated in both perception and production test.
- **Correlation analysis** was carried out between speech perception and production indexes.
- **Perception index:** Change of categorical boundary due to somatosensory stimulation.
- **Production index:** Difference in the first, second and third formant (F1, F2, and F3) between /e/ and /ø/.
- **Speech perception test with somatosensory stimulation**
- Vowel identification test between /e/-/ø/ continuum.
- The facial skin-stretch was applied when the stimulus sound was presented.



Experimental setup with somatosensory stimulation



Temporal pattern of stimuli

## Speech Production Test

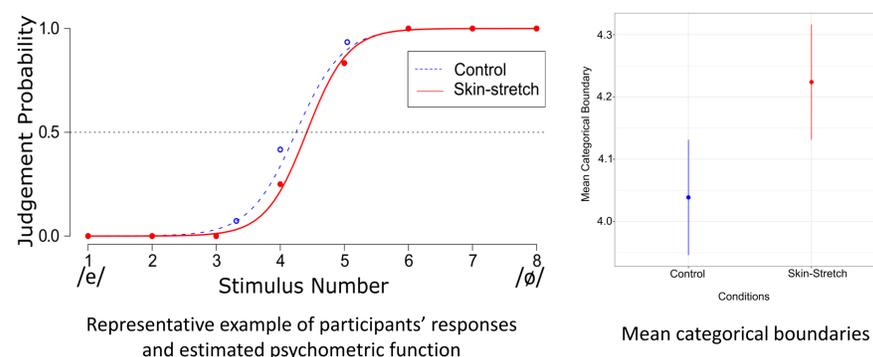
- French words, 'Dé' for /e/ and 'Deux' for /ø/ were recorded using picture naming task.
- Extracted formant frequencies were transferred into the bark scale.



Picture-naming task

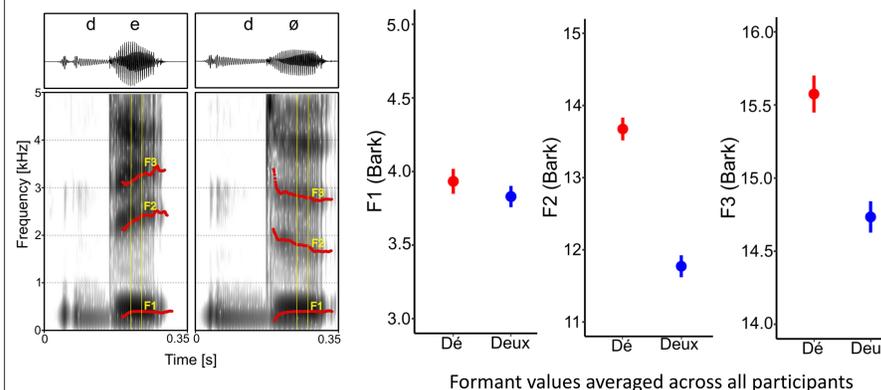
## Results

### Perception result



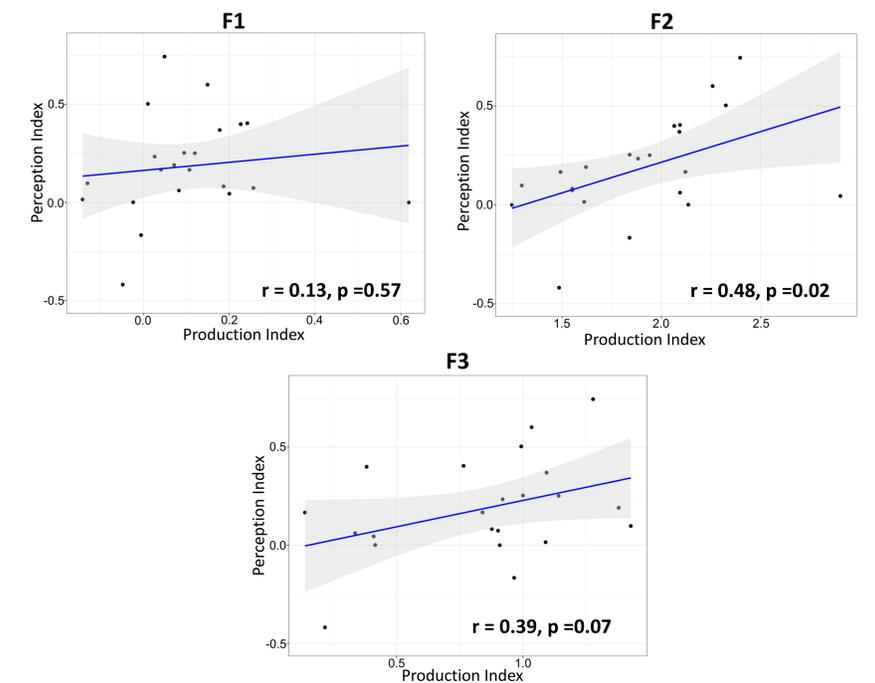
- Categorical boundary was shifted toward /ø/ ( $F(1,21) = 11.52, p < 0.01$ ) as shown in the previous study<sup>6</sup>.

### Production results



- As known in the previous studies, the main acoustical difference between /e/ and /ø/ are seen in F2 and F3, but not in F1.

## Correlation analysis



- More acoustical distance between /e/ and /ø/ can be associated with larger contrast in somatosensory configurations between the target vowels<sup>1,2</sup>.

## Conclusion

- We found that the size of somatosensory effect in speech perception was correlated with the individual variability of their production in the representative formants of test vowels.
- The results suggest that somatosensory effect in speech perception is closely related to their own production performance.

## Acknowledgements

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