

Monica Ashokumar¹, Clément Guichet¹, Jean-Luc Schwartz¹, Takayuki Ito^{1,2}

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

Introduction

- Orofacial somatosensory inputs modify the perception of speech sounds^{1,2}. This is related to the role of somatosensory system in production, transferred to perception through sensory-motor relationships in the human brain. Thus, somatosensory effect in perception may vary based on production ability.

Aim

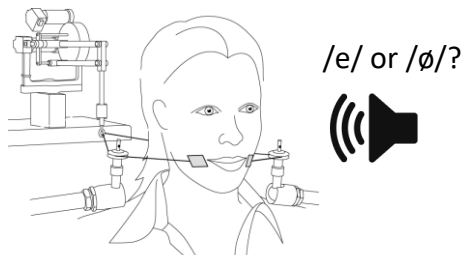
- To investigate the relationships between the somatosensory effect in speech perception and speech production performance.

Methods

- We examined whether somatosensory effect in speech perception was correlated with production ability in corresponding vowels.
- **Participants:** Nineteen French native speakers.
- **Speech Production Test:** French words, 'Dé' for /e/ and 'Deux' for /ø/ were recorded.



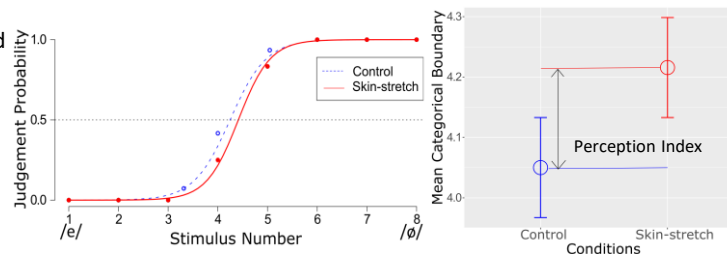
- **Somatosensory effect in speech perception:** Vowel identification test with an 8-member /e/-/ø/ continuum was carried out.
 - Somatosensory stimulation associated with facial skin deformation was applied with the presentation of auditory stimulus.
 - **Perception index:** Difference in categorical boundary between the conditions with and without somatosensory stimulation (Skin-stretch and Control).



Experimental setup with somatosensory stimulation

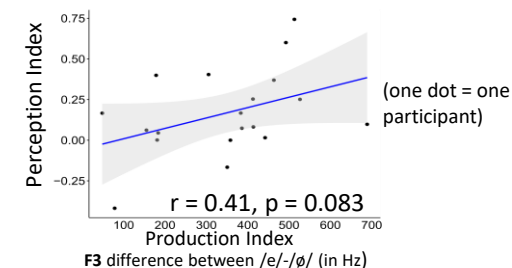
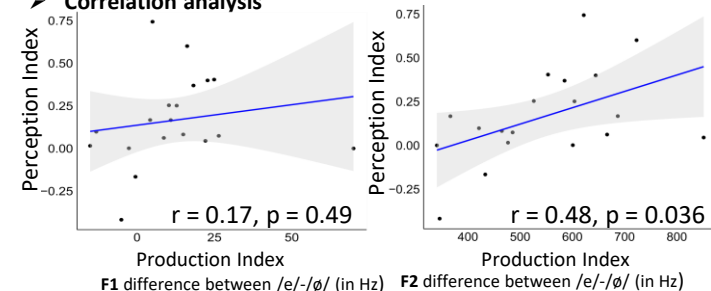
Results

- **Somatosensory effect on speech perception**



- Orofacial somatosensory stimulation significantly increased the amount of /e/ responses ($F(1,18) = 7.42, p < 0.05$)

Correlation analysis



- A reliable correlation with F2 ($p < 0.05$) and marginal correlation with F3 ($p = 0.083$) but no correlation with F1 ($p > 0.4$).

Conclusion

- Results indicated that the participants who have a large difference between /e/ and /ø/ showed large somatosensory effect in speech perception.
- Somatosensory effect in speech perception can be ascribed to speech production performance.

Acknowledgement

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Grant Agreement No 860755

References

1. Ito, Takayuki, Mark Tiede, and David J. Ostry. 'Somatosensory Function in Speech Perception'. *Proc Natl Acad Sci U S A* 106, no. 4 (2009): 1245–48. <https://doi.org/10.1073/pnas.0810063106>.
2. Trudeau-Fisette, Pamela, Takayuki Ito, and Lucie Ménard. 'Auditory and Somatosensory Interaction in Speech Perception in Children and Adults'. *Frontiers in Human Neuroscience* 13 (2019). <https://doi.org/10.3389/fnhum.2019.00344>.

