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Orofacial Somatosensory Effects for the Word Segmentation Judgement

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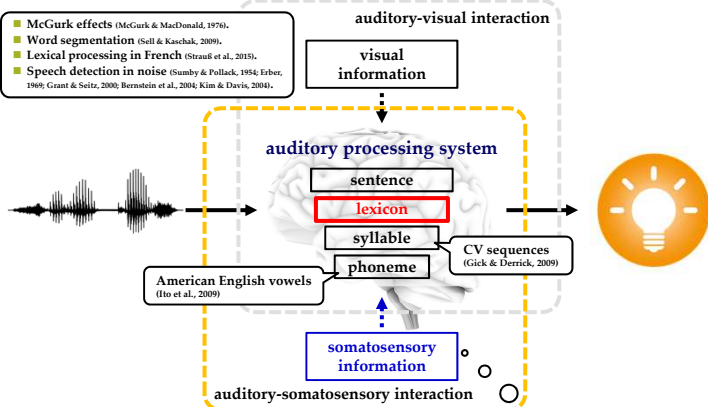
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Summary

- Somatosensory inputs associated with facial skin deformation systematically biased the perceptual judgements depending on the stimulation onset timing, but not depending on the amplitude differences.
- Orofacial somatosensory system could be involved in the process of lexical perception concerning word segmentation.

Introduction

Speech perception is an interactive process with multiple modalities and some perceptuo(multisensory)-motor connections (Schwartz et al., 2012).



How does somatosensory input affect the processing of speech?

Do somatosensory inputs associated with facial skin deformation modify the lexical perception? (Exp. 1)

Do amplitude differences of somatosensory inputs provide different effects in lexical perception? (Exp. 2)

Methods

- Participants : 31 native French speakers.
 - 20 for Exp. 1 and 11 for Exp. 2.
- Identification test.
 - Task : to identify which word you heard ?

"l'attache" vs. "la tache" ?

Pronunciation : /lataʃ/

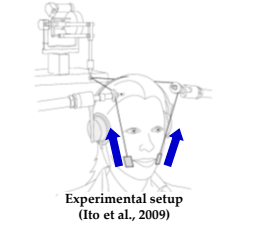
Meaning : "the string" vs. "the stain"

- The judgement probability for "la ____" (e.g. "la tache") responses.
- Stats : Linear Mixed-Effects Model analysis.

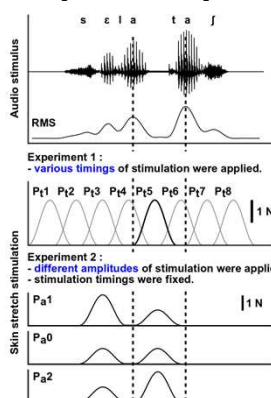
- Corpus : 17 French phrases lead elision.
 - Phrase examples.
 - "l'apesanteur" - "la pesanteur" (/lapɛzɑ̃tœʁ/).
 - "l'attache" - "la tache" (/lataʃ/).
 - "l'affiche" - "la fiche" (/lafif/).
- 3 speaking accent styles.
 - S_{a0} : neutral & natural speech.
 - S_{a1} : accented on the 1st vowel, /lataʃ/.
 - S_{a2} : accented on the 2nd vowel, /lafif/.

■ Experiment conditions for each experiment.

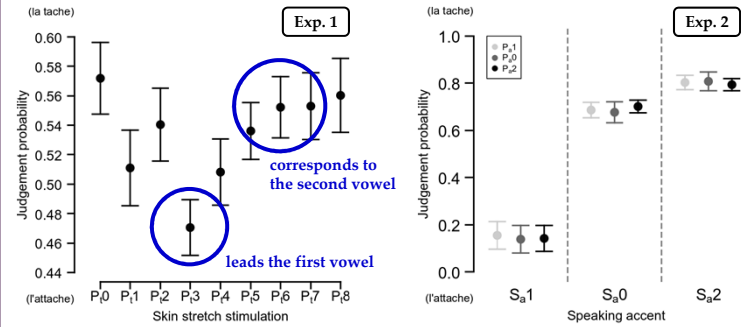
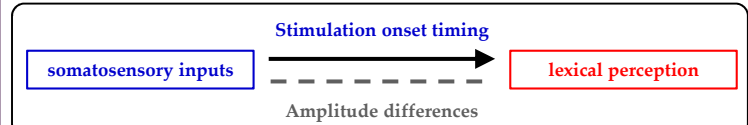
Experiment 1	Experiment 2
S _{a0}	S _{a0} , S _{a1} , S _{a2}
P ₁ -P ₈ & no stimulation condition (P ₀)	P _{a0} , P _{a1} , P _{a2}



■ Temporal relationships.



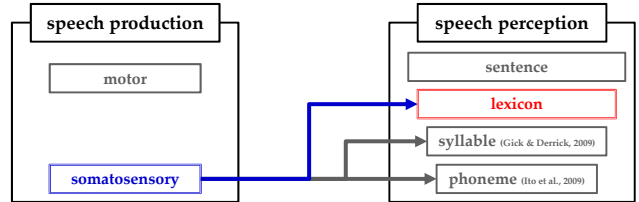
Results



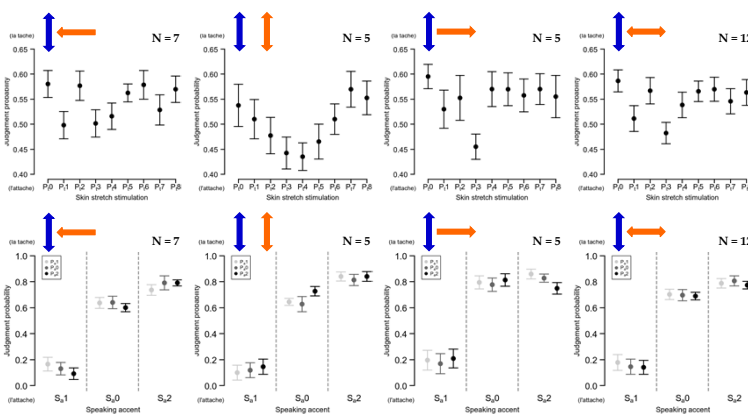
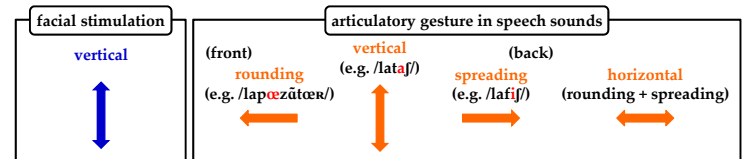
- Significant effect of stimulation timing ($\chi^2(8) = 39.04, p < 0.01$).
 - P₃ << P₂, P₅, P₆, P₇ and P₈ ($p < 0.03$).
 - P₀ >> P₃ and P₄ ($p < 0.04$).
- No effect of stimulation amplitude, alone ($\chi^2(2) = 0.06, p > 0.97$) or in interaction with accent ($\chi^2(4) = 0.39, p > 0.98$).
- Significant effect of speaking accent ($\chi^2(2) = 179.97, p < 0.01$).
 - S_{a1} << S_{a0}, S_{a1} << S_{a2}, S_{a0} << S_{a2} ($p < 0.01$).

Discussion

- Extend the validity of somatosensory effects in speech processing.



- A directional relationship between facial stimulation & articulatory gesture.
 - The phrases were divided into 4 groups based on the 2nd vowel in the phrase.



Somatosensory effects in lexical perception seem compatible with vertical articulatory gesture (Vatikiotis-Bateson et al., 1999).

Acknowledgments

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