

ESR 6. Auditory-somatosensory integration in speech perception and speech production performance

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Orofacial somatosensory inputs modify the perception of speech sounds (Ito et al., 2009; Trudeau-Fisette et al., 2019). Such auditory-somatosensory integration likely develops along speech production acquisition. Thus, the somatosensory effects in perception might vary depending on individual characteristics of speech production. To address this hypothesis, we here investigated relationships between auditory-somatosensory integration in speech perception and speech production performance. Somatosensory effects in speech perception were examined using a vowel identification task with somatosensory stimulation as done in Trudeau-Fisette et al., (2019). In the test, the participants were asked to identify the presented sound as /e/ or /ø/. When the stimulus sound was presented, somatosensory stimulation was applied as facial skin deformation in backward direction, likely favoring /e/ responses, considering that a horizontal articulatory movement is key in the contrast between /e/ and /ø/. The perceptual boundary between /e/ and /ø/ was obtained respectively with and without somatosensory stimulation. Amplitude of auditory-somatosensory integration in speech perception was quantified as the difference in the categorical boundaries between these two conditions. Speech production performance was quantified by evaluating differences in the first, second and third formant frequencies (F1, F2 and F3) between /e/ and /ø/ produced by the participant. We confirmed that orofacial somatosensory stimulation significantly increased the amount of /e/ responses as found in Trudeau-Fisette et al., (2019). We found that amplitude of auditory-somatosensory integration in speech perception was correlated with a difference in F2 and F3, but not in F1, in speech production. This suggests that the acquisition of large formant differences between target vowels in speech production can lead to a large effect of somatosensory interaction in speech perception. This supports the idea that speech production ability is related to the development of auditory-somatosensory integration in speech perception.

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2. Trudeau-Fisette, P., Ito, T., & Ménard, L. (2019). Auditory and Somatosensory Interaction in Speech Perception in Children and Adults. *Frontiers in Human Neuroscience*, 13, 344. <https://doi.org/10.3389/fnhum.2019.00344>