

Learning non-native phonological contrasts through multimodal input: the contribution of the tactile sense

Núria Esteve-Gibert¹, Carme Muñoz², Natàlia Fullana², Ingrid Mora-Plaza², Lena Vasylets², Joan C. Mora²

¹Universitat Oberta de Catalunya, ²Universitat de Barcelona

It is widely accepted in the field of second language acquisition that learners benefit from multimodal information like visual speech gestures (i.e. lip movements) in addition to acoustic information to distinguish and acquire non-native phonological contrasts. A variety of L2 phonetic training studies have shown that listeners improve their perception and production of non-native segmental categories after being trained with audio-visual stimuli (compared to audio-only stimuli) [1-3]. The present study aims at exploring if the multimodal speech information can also be beneficial in the form of tactile cues, and if these tactile cues contribute significantly to the acquisition of L2 phonology.

Previous evidence suggests that tactile information can be processed as a source of linguistic information. [4] found that listeners perceive a stop consonant as aspirated if the acoustic input is accompanied by a puff of air applied to the listeners' skin (simulating the burst of the aspiration). Individuals with auditory deficits are also found to benefit from trainings with tactile lip-reading to acquire segmental categories (eg. [5]). Despite these findings, tactile input is far from being consolidated as a relevant source of phonological information. Our study wants to contribute to this debate by investigating how tactile input can help L2 learners perceiving new phonological contrasts.

We designed two phonetic production training experiments testing two types of tactile input: the production of tactile lip-reading (i.e. placing one's fingers around the lips to 'touch' the lip movements while speaking; in Experiment 1), and the perception of an auditory-tactile association (i.e. touching an object that represents the acoustic properties of a phoneme; in Experiment 2). Experiments are now in the pilot phase and we plan to test 66 L1 Catalan/Spanish speakers in each. Both experiments have a pre-test and a post-test in which discrimination (ABX task) and production (imitation) abilities are evaluated. The stimuli consist of monosyllabic non-words containing a vowel contrast that is non-existent in the participants' L1 (the /æ-ʌ/ contrast). Between the pre- and post-tests participants take part in 3 phonetic training sessions with 3 different conditions (between-subjects): an auditory-only (AO) condition, an audio-visual (AV) condition, and an audio-visual-tactile (AVT) condition. In Exp 1, participants repeat the English native speaker's productions (AO), repeat the target word while looking themselves in a mirror (AV), or repeat the target word while looking themselves in a mirror and touching their own lip movements with their fingers (AVT). No specific instructions of the target lip or tongue positions were given. In Exp 2, what varies is the nature of their exposure to the English speaker: they hear the target words acoustically (AO), they see the native speaker audio-visually (AV), or they see the native speaker audio-visually while holding a specific object with their hands (AVT): a big ball while exposed to /æ/ and a small ball while exposed to /ʌ/. This auditory-tactile association was chosen because a previous test revealed that 38 out of 53 L1 Catalan/Spanish learners of English (a 73%) associate a big ball with the /æ/ phoneme and a small ball is associated with the /ʌ/ phoneme (possibly due to a pairing between object size and vowel length).

The results of these two experiments will reveal if speech information that is perceived through the tactile sense can help L2 learners acquire difficult phonological contrasts, if tactile lip-reading and an acoustic-tactile association are both helpful, and, more generally, if the multimodal nature of speech information can also be extended to the tactile sense.

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