Internship proposal

Somatosensory influence on lexical perception

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Background:
In speech communication, understanding of lexical information is changed depending on the context of the sentences. When we hear an ambiguous speech sound, the preceding (and/or following) utterances affect to identify the sound. Given that the context of sentences also depends on the way of articulating speech when we produce it, it is likely that articulatory motion could also affect the way we process lexical information when we perceive the sound. In a more general statement, speech perception is an interactive process with multiple sensory modalities and probably some perceptuo-motor connections (Schwartz et al., 2012). Recent finding demonstrates that somatosensory inputs associated with speaking motion changes the perception of speech sounds (Ito et al., 2009). However, it has never been demonstrated that these effects could go up to the level of lexical access in speech comprehension. Our assumption is that indeed somatosensory inputs could also change the understanding of lexical information. Exploring possible influence of somatosensory inputs on lexical processing could provide new insights about the linkage between speech production and lexical perception, and lead to potential interesting applications in speech learning.

Purpose:
The current project will **examine whether the processing of lexical information can be changed by somatosensory inputs associated with facial skin stretch.**

Method:
1) A perception test concerning lexical information will be carried out.
2) In the test, the auditory stimulations will be presented using Matlab with psychophysics toolbox.
3) As a main tool of somatosensory stimulation, a facial skin stretch perturbation will be applied. The stimulation is generated using a robotic device (SenSable Technologies: Phantom 1.0) controlled with Matlab and custom-made control driver (Fig. 1).
4) The acoustical data and the participant's responses will be analyzed using Matlab for signal processing and R for statistical analysis.

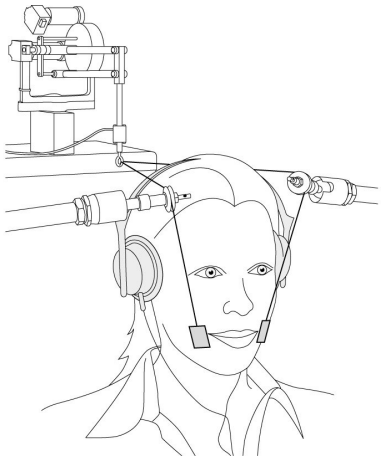
Figure 1

Outputs:
The results will shed very interesting light on the cognitive processing of speech in the human brain. The student will learn an original and sophisticated technique associated with the use of the Phantom system. The internship will combine psychophysical

experiments and use of various software for piloting the Phantom, driving the experiment and analyzing the results with statistical tools. This experiment, if successful, could drive towards further studies and possible developments for speech processing and speech learning. The project is part of a larger ERC Project “Speech Unit(e)s” funded by the European Community.

Reference:

Ito T, Tiede M, Ostry DJ (2009) Somatosensory function in speech perception. Proc Natl Acad Sci U S A 106:1245-1248.

Schwartz JL, Basirat A, Menard L, Sato M (2012) The Perception-for-Action-Control Theory (PACT): A perceptuo-motor theory of speech perception. J Neurolinguist 25:336-354.