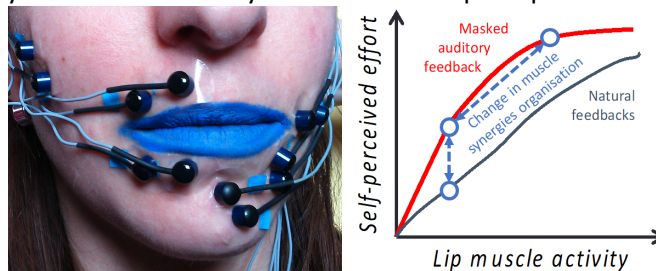


Role of auditory and somatosensory feedbacks in the perception and regulation of speech efforts

Context: Various speech disorders, such as parkinsonian dysarthria, stuttering or dysphonia, are related to an overestimation or underestimation by the individual of the effort of his speech gestures (respiratory, laryngeal, articulatory).

Research question: The internship aims at better understanding the cognitive mechanisms of self-perception and self-assessment of speech efforts, and in particular to determine the relative contribution of auditory and somatosensory feedback to this perception.



Project: The internship will consist in running an experiment inspired from psychoacoustical methods, aiming at establishing the relationship between variations in speech production, characterized objectively from acoustic and physiological descriptors, and variations in self-perceived effort. Among these descriptors, modulation of muscle synergies will be investigated to identify the potential neural adaptations underlying speech production according to the self-perceived effort. Concretely, participants will be asked to produced “parametrized” tasks of speech production (i.e. to vary some aspects of their speech production (vocal intensity, pitch, voice quality, or amplitude of lip movements), while maintaining some other aspects constant) with normal sensory feedbacks, then a masked auditory feedback or using a local anesthetic spray on the lips. That protocol will be recorded in laboratory conditions, during which the effort of each production will be measured both objectively – from acoustic and physiological descriptors (electroglottography, surface electromyography of lip muscles, lip kinematics), and subjectively – from self-ratings on a Borg scale, and squeezing a pressure sensor with a force equivalent to that felt in the lips. Multiparametric mixed models will be used to establish the relationship between the variation of acoustic and physiological descriptors of speech production, variations of self-perceived vocal or articulatory effort. This relationship will be compared for the situation of normal and perturbed feedbacks.

Required skills: At a minimum, basic programming and signal processing skills, knowledge of speech production and behavioral psychology. Prior knowledge of Matlab or Python, R and Praat will be appreciated, as well as good writing skills

Developed skills: Theoretical knowledge on speech motor control; Experimental design and acquisition of physiological data, using various methods of investigation of speech production; Management of a human experiment from A to Z; Processing of acoustic and physiological signals; Scripting in Python, Matlab and R.

Supervision: The project will take place over a period of 4-5 months, supervised by Maëva Garnier and Julien Frère.

Internship bonus: Monthly allowance of about 400 €.

Ph.D opportunity: This master project could then extend to a Ph.D project, involving additional fMRI exploration of the neural basis of this self-evaluation of effort, and comparing it between typical adults and a pathological population, such as dysphonic patients, adults who stutter, or people suffering from Parkinson’s disease.