



## Development of children's communicative adaptation skills

**Context and Questions:** Speakers adapt their articulation to the communicative situation, consistent with Lindblom's H&H theory (1990)<sup>1</sup>: they not only adjust to the acoustic environment (e.g., speech in noise or reverberation)<sup>2</sup> but also to the listener's comprehension needs (e.g., infant- or foreigner-directed speech)<sup>3</sup>. In general, they hyper-articulate and enhance cue clarity as predicted by the probability of perceptual confusion<sup>4</sup>, scaling vocal intensity with ambient noise<sup>1</sup>, raising pitch inversely with a child's age<sup>2</sup>, and reshaping spectral characteristics to match noise type<sup>4</sup>. These adaptive behaviors likely draw on both linguistic and domain-general skills: audiovisual scene analysis; phonetic/phonological knowledge (how to enhance speech clarity in a given language); and inferences about the interlocutor's perception, which in turn rely on empathic and socio-pragmatic abilities.

Children do not exhibit such communicative adaptation skills from the outset ; they develop progressively from roughly around 5 years old <sup>5-61</sup>. This project examines when and how these component skills emerge, and whether they synchronously or sequentially.

**Project :** A face-to-face interaction experiment will be conducted with around forty children, divided into three age groups: 5–7, 7–9, and 9–11 years, and a control group of forty adult speakers. Two situations of speech elicitation will be compared: describing pictures on their own, or playing an interactive game with the experimenter. Speech production will also be compared between a quiet situation – eliciting neutral or conversational speech, and a noisy situation – eliciting a speech hyper-articulation known as the Lombard effect<sup>2</sup>. The audio signal of speech productions will be recorded, synchronously with articulatory movements of the lips (visible) and the tongue (hardly visible), using a motion capture system (Optotrack) and tongue echography. Additionally, perceptual tests will be conducted with the same participants to assess the acuity and boundaries of their phonological representations. Finally, some additional psychological tests or questionnaires will be used to evaluate empathic and socio-pragmatic skills.

**Perspectives :** The questions raised by this project are too broad for a Master's thesis. The internship proposed here will therefore focus on designing and implementing the experimental paradigm and running pilot experiments on a few individuals of each age group. The whole experiment could be pursued in a subsequent PhD project.

**Required skills :** Basic programming and signal-processing skills, with familiarity in speech production and behavioral psychology. Prior experience with Matlab, R, and Praat is desirable, as are strong writing skills.

**Skills developed during the internship:** Theoretical knowledge of social interaction and speech multimodality; Familiarization with piloting a virtual avatar ; End-to-end management of a human-subjects experiment; Skills in acoustic annotations and signal processing, Matlab or Python programming, and statistical analysis.

**Supervision :** The internship will take place over a period of 4–5 months under the supervision of Maëva Garnier and Lucie Ménard.

**Monthly allowance :** €4,35/hour (approximately €650 for a full 30-day month).

### References :

- <sup>1</sup> Lindblom, "Explaining Phonetic Variation: A Sketch of the H&H Theory," in *Speech Production and Speech Modeling*, Hardcastle&Marchal (Dordrecht, 1990).
- <sup>2</sup> Garnier et al., "Influence of Sound Immersion and Communicative Interaction on the Lombard Effect," *Journal of Speech, Language and Hearing Research* 53, no. 3 (2010): 3.
- <sup>3</sup> Kitamura et al., "Universality and Specificity in Infant-Directed Speech: Pitch Modifications as a Function of Infant Age and Sex in a Tonal and Non-Tonal Language," *Infant Behavior and Development* 24, no. 4 (2001): 4.
- <sup>4</sup> Garnier and Henrich, "Speaking in Noise: How Does the Lombard Effect Improve Acoustic Contrasts between Speech and Ambient Noise?," *Computer Speech & Language* 28, no. 2 (2014): 2.
- <sup>5</sup> Kristen Syrett and Shigeto Kawahara, "Production and Perception of Listener-Oriented Clear Speech in Child Language," *Journal of Child Language* 41, no. 6 (2014): 1373–89;
- <sup>6</sup> Melissa A. Redford and Christina E. Gildersleeve-Neumann, "The Development of Distinct Speaking Styles in Preschool Children," *Journal of Speech, Language, and Hearing Research* 52, no. 6 (2009): 1434–48, [https://doi.org/10.1044/1092-4388\(2009/07-0223\)](https://doi.org/10.1044/1092-4388(2009/07-0223)).