

## On the perception of voicing in whisper: a cross-modal semantic priming study

Yohann Meynadier, Sophie Dufour

Aix Marseille Univ, CNRS, LPL, Aix-en-Provence, France

yohann.meynadier@lpl-aix.fr

This study focuses on the perception of the voicing feature in whispered words in French. A voiced consonant in whispered voice is produced without vibration of the vocal folds, i.e. the main property of the [+voiced] feature in this language. In French, some studies show that the [+voice] whispered obstruents retain some phonetic properties of their underlying identity, regarding acoustical traces related to their duration (Vercherand, 2010, Meynadier et Gaydina, 2013), to their intra-oral pressure (Meynadier, Gaydina 2013, Garnier et al. 2014, Meynadier 2015) or to their glottal area (Malécot et Peebles 1965, Crevier-Buchman et al. 2009, Meynadier 2015). However, even fewer studies teach us how the voicing contrast could be recognized by French. The few studies examining how French listeners perceive the voicing contrast in whispered speech have produced elliptical and contradictory results with not really comparable methods (Vercherand 2010, Fux 2012, Meynadier et al. 2013).

Here, the perception of the voicing feature of whispered obstruent consonants is examined in two cross-modal semantic priming experiments. In Experiment 1 with visual targets presented at the offset of auditory primes, a priming effect of similar magnitude to that observed in modal voice is found only when the whispered prime includes a voiceless obstruent (e.g. [s] in *dessert* primes CHOCOLAT). No priming effect appears when the whispered prime includes a voiced obstruent (e.g. [z] in *désert*), neither on the target word SABLE (sand) semantically related to *désert*, nor on the target word CHOCOLAT semantically related to *dessert*. In Experiment 2 with visual targets presented 50 ms after the offset of auditory primes, primes with a whispered voiced obstruent facilitate the processing of their respective semantic associated target words (i.e. [z] in *desert* primes SABLE).

Hence, our study shows that the reconstruction of the voiced feature is not immediate during whispered word recognition and requires a certain amount of time. During this time, the listener may extract the phonetic traces needed to recover the underlying voicing of whispered voiced obstruents.

### References

- Crevier-Buchman L., Vaissière J., Henrich N., Vincent C., Hans S., Brasnu D. (2009). Laryngeal behavior in whispered voice: a study using high speed imaging. *The Voice Foundation's 38th Annual Symposium: Care of the Professional Voice*. Philadelphia.
- Fux T. (2012). *Vers un système indiquant la distance d'un locuteur par transformation de sa voix*. Unpublished PhDissertation, Université de Grenoble.
- Garnier M., Bouhake S., Jeannin C. (2014). Efforts and coordination in the production of bilabial consonants. *Proceedings of the 10th Int. Seminar on Speech Production*, 138-141. Cologne.
- Meynadier Y. (2015). Aerodynamic tool for phonology of voicing. *USB Proceedings of the 18th International Conference on Phonetic Sciences*, paper#0497. Glasgow.
- Meynadier Y., Dufour S., Gaydina, Y. (2013). Duration as perceptual voicing cue in whisper. *The 6th Phonetics and Phonology in Iberia Conference*. Lisbon.
- Meynadier Y., Gaydina, Y. (2013). Aerodynamic and durational cues of phonological voicing in whisper. *Proceedings of the 14th Interspeech*, 335-339. Lyon.
- Malécot A., Peebles K. (1965). An optical device for recording glottal adduction-abduction during normal speech. *Zeitschrift Für Phonetik, Sprachw. Und Kommunikationsf.* 18, 545-550.
- Vercherand G. (2010). *Production et perception de la parole chuchotée en français: analyse segmentale et prosodique*. Unpublished PhDissertation, Université Paris VII.