

# Same person, different voices: Articulatory settings and phonation in French learners of English

## Abstract

The phenomenon whereby individuals perceive a change in their voice when switching languages is a documented but relatively under-explored area that implicates both articulatory and phonatory adjustments. This study addresses two central aspects of language switching: supralaryngeal articulatory settings and phonatory parameters, specifically in French learners of English. Through a combined analysis of articulatory real-time Magnetic Resonance Imaging (MRI) and acoustic measures of fundamental frequency ( $f_0$ ) and voice quality, this research aims to identify specific markers of language switching.

The first focus of the study is on supralaryngeal articulatory settings, which involve language-specific configurations in the vocal tract. Research suggests that each language imposes unique articulatory settings, or baseline configurations in the oral and pharyngeal cavities, that speakers adopt unconsciously, influencing sound production and perceived voice quality (Honikman, 1964; Laver, 1978). Languages differ in their inter-speech postures (ISPs)—the resting positions of articulatory structures, when speakers are not actively producing speech but prepared to do so. Articulatory MRI studies by Gick et al. (2004), Wilson and Gick (2014), Benítez et al. (2014), and Badin et al. (2024) show that ISPs vary significantly across languages, suggesting that bilingual speakers adjust these postures by language.

The second focus examines phonatory adjustments, particularly changes in vocal fold vibration patterns and fundamental frequency ( $f_0$ ), which are critical to voice quality differences across languages (Bruyninckx et al, 1994; Wagner and Braun, 2003; Georgiou and Kaskampa, 2024). Schwab and Goldman (2016) found, for instance, that English-French bilinguals had lower  $f_0$  values in English than in French, likely due to language-specific prosodic requirements. Additional measures such as harmonic-to-noise ratio (HNR) and spectral tilt further illuminate these differences (Georgiou and Kaskampa, 2024). Such phonatory adjustments suggest that bilingual speakers may change these parameters depending on the language being spoken.

To empirically investigate these language-specific articulatory and phonatory changes, this study will analyse MRI data from four bilingual subjects as they read “The North Wind and the Sun” in both French and English, focusing on ISPs and supralaryngeal articulatory settings. Complementing this, an acoustic analysis, with recordings of over 400 English undergraduate students reading sentences in both languages, examining  $f_0$ , harmonic-to-noise ratio, and spectral tilt to identify cross-linguistic patterns in voice quality will be performed. We hypothesize that distinct patterns in ISP and phonation will emerge, corresponding to each language’s phonetic requirements, thus offering predictive insights into the mechanisms of voice modulation in bilingual contexts.

A pilot analysis of the MRIs shows differences in articulation between French and English (see Figure 1). Preliminary results involving 164 speakers show a slight but significant difference in median  $f_0$  values between French and English, with French being higher by 1.6 % (see Figure 2).

**Key words:** French learners of English, Articulatory settings, Phonation, Articulatory MRI, Fundamental frequency ( $f_0$ )

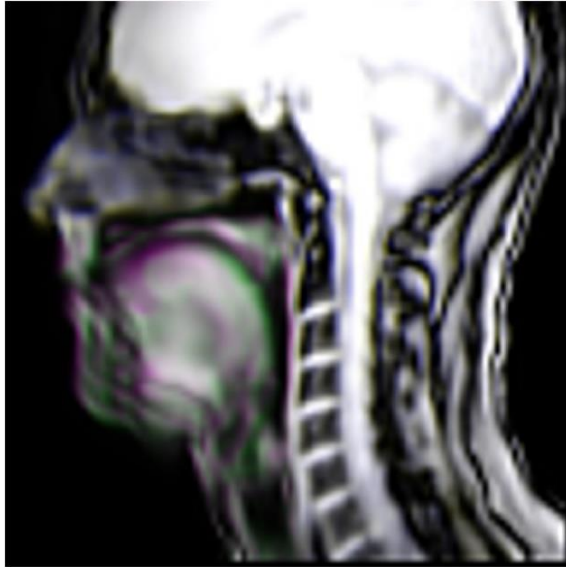


Figure 1: Coloured regions show mismatches between two (French vs English) overlaid mean MRI images while the speaker reads “The North Wind and the Sun” in each language (speech and pauses are included). Red regions show articulator placement in French but not in English; green regions show the opposite.

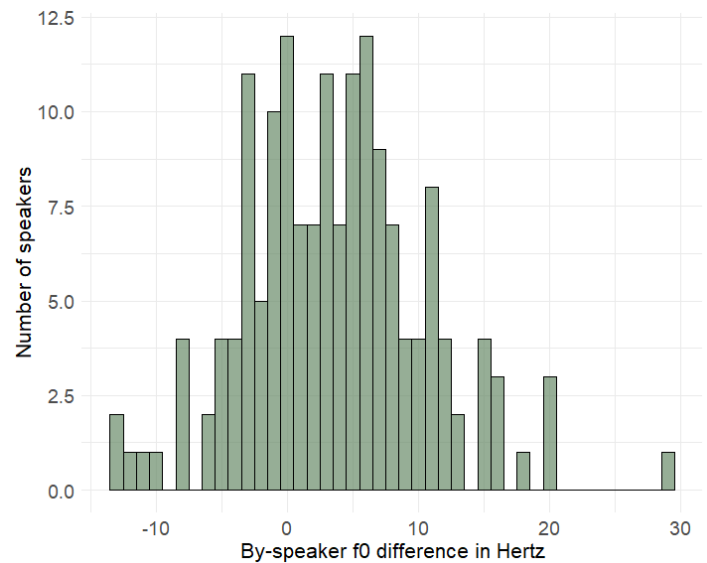


Figure 2: Within-speaker between-language difference in f0 (Hz): median f0 in English minus median f0 in French.

## References

- Badin, P., Sawallis, T. R., Tabain, M., & Lamalle, L. (2024). Bilinguals from Larynx to Lips: Exploring Bilingual Articulatory Strategies with Anatomic MRI Data. *Language and Speech*, 00238309231224790, <https://doi.org/10.1177/00238309231224790>
- Bruyninckx, M., Harmegnies, B., Llisterri, J., & Poch-Oiivé, D. (1994). Language-induced voice quality variability in bilinguals. *Journal of Phonetics*, 22(1), 19-31. [https://doi.org/10.1016/S0095-4470\(19\)30265-7](https://doi.org/10.1016/S0095-4470(19)30265-7)
- Honikman, B. (1964). Articulatory Settings. D. Abercrombie, D.B. Fry, P.A.D. MacCarthy, N.C. Scott and J.L.M. Trim (eds), *In Honour of Daniel Jones*, London: Longman, 73–84.
- Gick, B., Wilson, I., Koch, K., & Cook, C. (2004). Language-specific articulatory settings: Evidence from inter-utterance rest position. *Phonetica*, 61(4), 220-233. <https://doi.org/10.1159/000085159>
- Georgiou, G. P., & Kaskampa, A. (2024). Differences in voice quality measures among monolingual and bilingual speakers. *Ampersand*, 12, 100175. <https://doi.org/10.1016/j.amper.2024.100175>
- Laver, J. (1978). The Concept of Articulatory Settings: An Historical Survey. *Historiographia Linguistica*, 5(1-2), 1–14. <https://doi.org/10.1075/hl.5.1-2.02lav>
- Wagner, A., & Braun, A. (2003). Is voice quality language-dependent? Acoustic analyses based on speakers of three different languages. In proceedings of the 15<sup>th</sup> international Congress of Phonetic Sciences (ICPhS 2003) (pp. 651-654). Adelaide: Casual Productions.
- Wilson, I., & Gick, B. (2014). Bilinguals use language-specific articulatory settings. *Journal of Speech, Language, and Hearing Research*, 57(2), 361-373.
- Schwab, S. and Goldman, J.-P. (2016). Do speakers show different f0 when they speak in different languages? The case of English, French and German. *Proc. Speech Prosody 2016*, 6-10, <https://doi.org/10.21437/SpeechProsody.2016-2>