

What can we do (more) with ultrasound?

Over the past two decades, the ultrasonographic technique has been widely used in language field work and speech production studies (e.g., Gick, 2002; Allen et al., 2013; Chiu and Sun, 2020). In particular, the postures and movements of the tongue or other articulators such as larynx can be instantly captured by the ultrasound device (e.g., Tsai et al., 2009; Moisik et al., 2014). The 2D images of the tongue postures captured by the ultrasound allow researchers to examine the relationship between acoustics and articulation (e.g., Howson et al., 2015; Hussain and Mielke, 2021), and also to determine the correspondence between phonetics and phonology (e.g., Huang and Chiu, 2022).

In this talk, I will introduce two novel approaches that are different from the aforementioned applications. The first approach touches upon the issue of using ultrasound biofeedback for second language sound acquisition. An experiment was designed to examine how individual's linguistic and spatial knowledge would influence the effect of ultrasound biofeedback training in different vowel dimensions. The results showed that there are common predictors, vowel-corresponding predictors and vowel-specific predictors. The second approach uses ultrafast imaging (~ 3,000 fps) to capture the states of the tongue during phonation. Through the examination of the wave amplitude and velocity, associated with the stiffness of the tongue can then be estimated. The results show that the wave amplitude and frequency measured at the tongue match with those measured from the vocal folds, suggesting that the vibrations of the vocal folds propagate waves and these waves can be transmitted through the tongue. These two approaches are expected to offer different perspectives to the application of ultrasonography to linguistics and speech sciences.

References

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