

Phonation and Voice Quality

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One of the most intriguing aspects of phonetic science is the number of distinguishable layers within the speech signal. Within even a single segment, such as a vowel, speakers control vowel quality, duration, F0, speech style, and so forth. Listeners, in turn, have learned to pay attention to these different acoustic layers in order to extract meaningful information from the speech signal. Phonation type is one of these important layers. There has been significant progress in our understanding of phonation and voice quality over the past twenty years. This is attributable both to increased interest in speech prosody at lexical and higher level domains and to recent advances in the articulatory and acoustic analysis of voice quality. At the word level, languages may use phonation type to mark meaningful lexical-phonological contrasts (see Gordon and Ladefoged (2001); Edmondson and Esling (2006); DiCanio (2009); Esposito (2010); Garellek and Keating (2011), among others). At higher levels, phonation type may be used to delimit prosodic phrases (see Pierrehumbert and Talkin (1992); Huffman (2005); Garellek (2015), among others). The papers within this session not only highlight the lexical-phonological and prosodic uses of phonation, but also demonstrate novel techniques that are being used to explore its production and perception.

In a study on Shanghai Chinese, Gao and Hallé discuss how breathy phonation is used as a perceptual cue for lower register tones by native listeners. While tones here are distinguished mainly by F0, the authors found that phonation type facilitated perception as a secondary cue. Listeners responded similarly to natural speech stimuli and to stimuli created using articulatory resynthesis, demonstrating the viability of this approach for research on phonation perception. In a study on Shanghai Wu, Zhang and Yan examine the production and perception of what has been described as a phonation contrast in the language. While they found that speakers more consistently relied on vowel F0 as a cue to this contrast, when the contrast occurs on fricatives, they also relied on spectral tilt. Moreover, when tone sandhi resulted in tonal neutralization, spectral tilt emerged as a stronger cue in production and perception. Their results indicate that the cues to phonation type are multidimensional and weighted differently as a function of context.

With respect to the demarcative uses of phonation type, Bissiri and Zellers examine the degree to which F0 and creaky phonation perceptually integrate for German listeners. When creaky phonation was longer, it was associated with a fall in F0, even when no fall was present. When creaky phonation was shorter, it was more often perceived as marking a word boundary. These results show that the time-course of non-modal phonation type can influence the particular role it plays in a linguistic system. In a study using the Buckeye corpus, Seyfarth and Garellek examine glottal reinforcement of English codas /t/ and /p/. In agreement with previous work, they found that these stops are glottalized more often when they precede sonorants than when they precede other consonants.

One hypothesis for glottal reinforcement is that glottalization serves to enhance voicelessness and prevent coarticulatory voicing from the following segment. After controlling for phrasal position and creak, the authors found that glottal reinforcement was indeed more frequent preceding voiced obstruents than voiceless obstruents, lending support to this hypothesis.

A common thread throughout these papers is the question of how F0 and phonation type cohere in speech production and perception. As Bissiri and Zellers discuss, these layers function independently when glottalization is short, but are integrated when glottalization is longer. Each may cue lexical-prosodic contrasts as well, as shown in Gao & Hallé and Zhang & Yan's work. The papers within this session also

reflect novel phonetic methods for the analysis of phonation type. While it is now easier than ever to investigate the production of voice quality (see Shue et al (2009)), articulatory synthesis and large-scale corpus phonetic methods highlight the newer tools that are advancing research not only in this sub-field, but for phonetics as a whole.

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