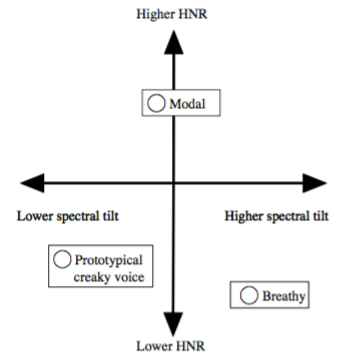
[INTRODUCTORY PARAGRAPH HERE]

Phonation types, more specifically, are the different methods of producing sound through the vibration of the vocal cords (Keating and Esposito 2006: 85). Ladefoged (1971) represented phonation types as falling on a one-dimensional articulatory continuum based on the degree of glottal constriction, an assumption that underlies much of the literature on this topic (e.g. Keating and Esposito 2006, Yuasa 2010, Lancia, Voigt, and Krasovitskiy 2015).

Multiple acoustic measures may be necessary to fully describe the phonation types on this articulatory continuum. Garellek (2016: 20) proposes a two-dimensional acoustic model of phonation types with variation in the degree of spectral tilt and harmonics-to-noise ratio, as seen below:

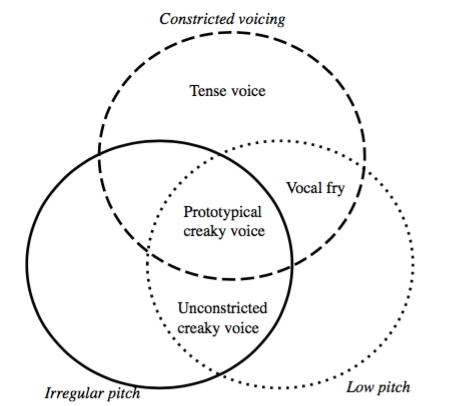
Modal

Most closed (glottal closure)

Creaky

Most open (voiceless)

Breathy

Numerous acoustic factors can be used to further distinguish between different subtypes of breathy, modal, and creaky voice. Creaky voice, for instance, may be best described using three acoustic and articulatory dimensions (Kreiman 2014; Keating, Garellek, and Kreiman 2014; Garellek 2016). Garellek (2016: 8) represents these factors and the resulting types of creaky voice as seen below:

Breathy voice can also result from a combination of different acoustic factors, such as spectral tilt and the harmonics-to-noise ratio, both within and across languages (Keating and Esposito 2006: 86). However, no comprehensive taxonomies of the subtypes of breathy and modal voice have been developed yet.

[PHONATION TYPES AND THEIR ACOUSTIC CORRELATES HERE]

[PREVIOUS EXPERIMENTAL METHODS HERE]

[Statistical methods —>

[Experimental methods: production —> previous experiments have examined both read and spontaneous speech, typically had sample sizes of <= 50 participants, and used manual coding to determine the presence or absence of creaky voice]

* Yuasa 2010:
* Garellek and Seyfarth 2016:

[Experimental methods: perception —>

Previous research suggests that sex may be related to the production of creaky, breathy, and falsetto phonation types. Henton and Bladon (1985: 221) reported that British women produced breathier voice than their male counterparts, and, consequently, that male speakers used creaky voice more frequently than female speakers (1988). Podesva and Callier (2015: 178) contend that this difference may be due to men’s generally lower f0.

However, more recent studies have called some of these conclusions into question. Podesva (2010) and Yuasa (2010) found that, among American English speakers, women produced more creaky voice than men. Simpson (2012: 477) argues that H1-H2, which has been used to validate findings that women produce breathier phonation than men, may artificially inflate these differences. He contends that this occurs because of sex-specific differences in the acoustic realization of nasality.

The roles of demographic factors such as dialect, ethnicity, and sexual orientation in the production of nonmodal phonation types have been studied less extensively than that of sex, but existing literature suggests that they may be related as well. Podesva (2007: 481) drew a connection between falsetto phonation and the performance of gay male identity. Within British males, Henton and Bladon (1988: xx) found that RP speakers creaked more than Northern British English speakers. Ethnicity may also play a role in nonmodal phonation—Alim (2004) and Britt (2011) linked African American identity to falsetto and “strained” voice qualities. Podesva and Callier (2015: 180) noted that listeners could distinguish African American English speakers from white ones, even in the absence of lexical and syntactic features of African American Vernacular English.