

Data collection credit: Research assistants under the direction of Prof. Pat Keating, recordings all made in the soundbooth of the UCLA Phonetics Lab, in 2008.

The following description of how the tone sweeps were recorded is taken verbatim from Keating and Kuo (2012), "Comparison of speaking fundamental frequency in English and Mandarin" *J. Acoust. Soc. Am.* 132: 1050-1060:

*"a. Unprompted sweeps.* First, speakers produced sweeps following the general procedure described by Honoroff and Whalen (2005: 2194), though with slight differences. In our experiment, English-speaking participants were instructed as follows (and similarly for the Mandarin speakers, but translated into Mandarin):

- You will record a series of "ah" sounds in which you let your voice sweep over a wide range of pitches (tones). The goal is to see how wide a range of pitches your voice can **comfortably** cover, without straining.
- Start by taking a big breath
- Say "ah" at a comfortable, normal pitch
- Then move gradually (but quickly) higher until you feel your voice break. Going into "falsetto" is fine.

They then listened to a demo recording of a rising sweep by the first author. After some practice, three rising sweeps were recorded. Falling sweeps were instructed, practiced, and recorded in the same way. Specifically, speakers were instructed to "move gradually (but quickly) lower until you feel your voice break or give out". In the recorded demo that subjects heard, there was no creaky voice, with the lowest pitches instead being very breathy. In the literature, F0 elicitation and/or measurements generally exclude low-pitched glottal creak or creaky voice. However, fluent speech often includes creak. Therefore we elicited a third, new, kind of F0 sweep, which explicitly asked speakers to produce low F0s in creaky voice. Speakers were asked to "move gradually (but quickly) lower, letting your voice "creak", until you can't go any lower". The recorded demo was very creaky, so this presumably helped them to understand what was meant, and later listening to the recordings showed that speakers almost always did creak. This third type will be called creaky sweeps. We refer to all three of these types of sweeps as unprompted, because each speaker determined how to perform his or her own sweeps.

*b. Prompted sweeps.* Based on the discussion in Baken and Orlikoff (2000), the fast-glissando procedure described in Reich et al. (1990) was also used to elicit speakers' F0 ranges. Reich et al. found that this method resulted in larger ranges than other methods that they compared. In our experiment participants heard, and simultaneously imitated, two rapid tone glides. The glides were 4-sec sawtooth waves whose F0s varied linearly as in Table I, with different 2-octave ranges for men and women per Reich et al.'s specifications. Speakers were instructed to imitate the tone glides as follows: "You are asked to imitate those sweeps as much as possible. It's not expected that any single voice can cover the whole range, but do the best you can. You should imitate the tones *while listening to them.*" They then clicked on an icon for a tone glide, and practiced imitating it. They recorded three rising sweeps followed by three falling sweeps. We refer to these two types of sweeps as prompted, meaning that each speaker heard and imitated a tone glide prompt for each production."