Using Spectrography to Explore Voice Quality in Choral Singers

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“It must be experienced to understand”

(Noble as cited by Tocheff, 1990, p. 34).
“A primary difficulty in conducting empirical research on the phenomenon of voice compatibility matching is that there are, as yet, no objective criteria or standardization for the process. Each conductor’s method is largely idiosyncratic, i.e., not replicable by others”

(Daugherty, 2005, p. 9).

“Differences between listeners in perceptual strategy are so great that the fundamental assumption of a common perceptual space must be questioned.”

(Kreiman and Gerratt, 1996, p. 1787)
Acoustic Components of Choral Sound

Amplitude/Carrying Power

Vibrato (Rate and Extent)

Tone Color/Timbre

Considerations for Recording Sound Samples

Five cardinal vowels (closed) from front to back of mouth: [i e a o u]

Microphone level and placement consistent from singer to singer

Pitch in mixed registration
Amplitude and Carrying Power

Categorized by the presence of the singer’s formant:
- Consistently Present
- Inconsistently Present
- Not Present

_Singer’s formant:_ cluster of at least two of the third, fourth, and fifth formants, between 2300 Hz and 3500 Hz.

(Vennard, 1967; Johnson, 1978; Ternström and Sundberg, 1989; Titze, 1994; Miller, 2008)
Vibrato Rate and Extent (Titze, 2008)

Rate
• Slow vibrato: 0 - 4.5 Hz
• Medium vibrato: 4.5 - 6.5 Hz
• Fast vibrato: > 6.5 Hz

Extent
• Acceptable Vibrato: 0 - ±50 cents
• Wide vibrato: > ± 50 cents

Vibrato Rate and Extent, Measured by VoceVista
Female Voice, D, [a], 7th harmonic isolated

Between 4 and 5 cycles/second
Tone Color/Timbre

Multiparameter Measurement:

- Characteristic amplitude
- Presence of singer’s formant
  - Vibrato rate
  - Vibrato extent
- Breathiness
Looking Ahead

• Creating a tool for use by choral directors

• Using this tool to inform voice matching and choral formation

• Hope to automate analysis
SELECTED REFERENCES