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A Classical Pedagogue Explores Belting

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Journal of Singing, May/June 2007
Volume 63, No. 5, pp. 545–549

I BEGIN MY FIRST ARTICLE AS Associate Editor of *Journal of Singing* for "Voice Pedagogy" with a disclaimer: I do not teach belting or other contemporary commercial singing techniques. In addition, I do not teach straight tone singing, jazz, world music, extended vocal techniques, or classical literature in languages I don't speak or understand. I have nothing against any of these genres; indeed, I enjoy listening to them and greatly admire the singers and teachers who have mastered them.

My musical background, both as a pedagogue and performer, is firmly rooted in the Western, classical traditions of the seventeenth through twenty-first centuries. With one small exception, pursuit of this music has occupied my entire professional life. Several years ago, I stepped outside my safety zone to sing "Pinball Wizard" from the rock opera *Tommy*, accompanied by a genuine rock band, as the finale to a recital for the 25th anniversary gala of a regional opera company—their "Silver Ball." In spite of my stunning (or was it stunned) rendition, the band did not offer me a gig as their new lead singer, which I took as a sign to stay within my self-designated musical boundaries.

Over the past decade, my teaching has evolved to include courses and workshops in the science of voice pedagogy. Students range from aspiring young singers, voice teachers, voice coaches, and stars of the Metropolitan Opera and Broadway, to speech language pathologists and nonprofessionals who just want to know more about the human voice. Objective study of physiology and acoustics is applied to the subjective aesthetic of vocal artistry to help demythologize singing. Our goal is not to understand *what* vocal techniques are effective, but rather *why* they are successful. Given the diverse wealth of experience students bring to these classes, it is not surprising they want to know more about belting. Predictable questions are raised and potential misconceptions revealed:

- Can belting really be taught?
- Does belting damage the voice?
- Is belting the same as chest voice?
- Does belting require the larynx to be held in an elevated position?
- Is classical vocal training the best way to learn to belt?

My general response to these questions has been a resounding "I don't know! You'll have to speak with the experts and do further research on your own." After taking this tack for a number of years, I decided it was time to explore the issue more directly. Fortunately, I live only a short drive from one of the most successful teachers of belting in the world, Robert Edwin, who most graciously invited me into his studio to study a group of his belters. Based on preliminary observations of music theater majors at Westminster Choir College of Rider University, I sought additional information in three areas:

1. Can closed quotient measures (the ratio of time the glottis is closed during each cycle of vibration) help define registration events in belting?
2. Does the larynx always rise during belting?
3. What measurable acoustic differences exist between belting and classical models of voice production?

METHODOLOGY

Twelve female singers participated in this study, which occurred on the evening of May 19, 2006. Participants ranged in age from 17 to 38 years (average 20.5 years), and had studied singing for 1.5 to 14 years (average 6 years). All were in good health and were reliably able to belt at least to the pitch F_5. Glottal closure patterns related to voice registration were assessed with Voce Vista Professional software from signals generated by an electroglottograph (EGG) model EG2-PC, manufactured by Glottal Enterprises. In addition to acquiring the EGG signal, the EG2-PC tracks laryngeal elevation during phonation. Acoustic measures were acquired using a professional quality headset condenser microphone manufactured by Countryman, processed through Voce Vista Professional and Multi-Speech from Kay-Pentax.

Each participant sang the following tasks:

- B-flat major ascending scale in full belt, ending on $B\flat_4$.
- F major ascending scale in full belt, ending on F_5.
- F major ascending scale in belt/mix, ending on F_5.
- F major ascending scale in head voice, ending on F_5.
- Ascending/descending interval, $A\flat_4$ to $E\flat_5$, all belt and belt/head combinations.

OBJECTIVE OBSERVATIONS AND MEASURES: CLOSED QUOTIENT

Based on previous measures taken in the Westminster Voice Laboratory, supported by Donald Miller's observations,[1] I expected belting to have a relatively high closed quotient. Closed quotient (CQ) can be indirectly and noninvasively measured with an electroglottograph (EGG), a device that employs a pair of transducers placed on the skin of the neck adjacent to the thyroid cartilage. An electronic signal is transmitted between the transducers, which passes through the larynx; as the glottis alternately opens and closes, resistance to this signal varies. This variation provides a reliable estimate of vocal fold movement during phonation. CQ specifically relates to the ratio of time the glottis is closed versus open during each cycle of oscillation; a reading of 0.50 would indicate the glottis is closed for 50% of each cycle.

Belting might best be described as type of voice registration. As such, it requires a specific mode of vocal fold movement (what Garcia called the mechanical principle) and a specific model of resonance. Previous measures at our lab have shown correlations between CQ and registration: heavy mechanism (a.k.a. chest voice) is produced with a CQ generally in excess of 50%; light mechanism (a.k.a. head voice and falsetto) is produced with a CQ below 40% (the zone between 40 and 50% can be ambiguous and might be either a heavy or light source). High CQ requires increased glottal adduction, which might correspond to stronger contraction of the interarytenoid and lateral cricoarytenoid muscles, as well as increased medial compression from activity in the thyroarytenoids.

The difference in glottal closure patterns and closed quotient for belting and head voice are demonstrated in Figure 1. CQ measures in the test group were relatively high, demonstrating the likely use of heavy mechanism through the pitch F_5, as seen in Table 1. As expected in belting, the average CQ rose steadily with ascending pitch (52–59%). In examining the individual results, however, three separate registration strategies become apparent, especially for the highest pitch:

- 3 singers (25%) employed significantly lower CQ than all others, ranging from 36–38% (average of 37%).
- 6 singers (50%) employed moderate CQ, ranging from 52–63% (average of 55.5%).
- 3 singers (25%) employed significantly higher CQ than all others, ranging from 72–86% (average of 80%).

Based on these measurements, it is clear that belting can successfully be accomplished through different technical strategies; 75% of the singers in this study belted with closed quotients within the same general range used by classically trained singers.

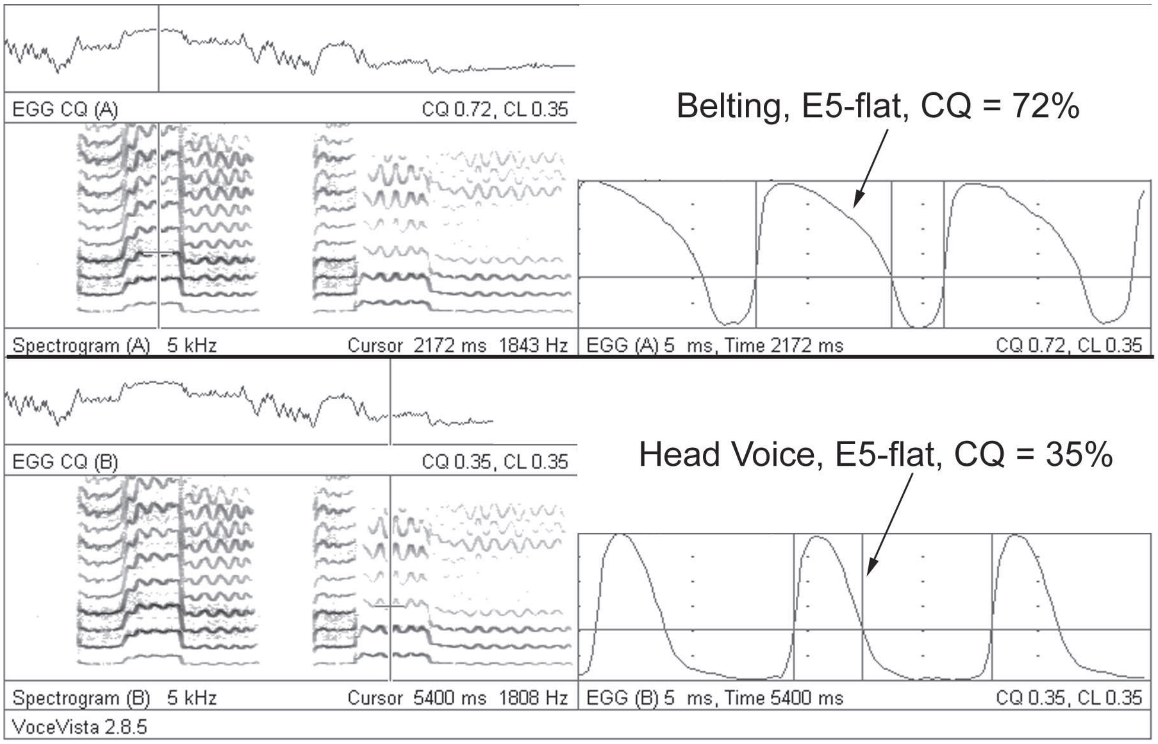

Figure 1. CQ of belt and head voice.

OBJECTIVE OBSERVATIONS AND MEASURES: LARYNGEAL HEIGHT

EGG transducers are placed on the neck, secured with a Velcro band, adjacent to the larynx while the test subject is at rest (not vocalizing). Within a relatively narrow range, laryngeal elevation and/or depression during phonation is displayed by a series of lights on the face of the EGG instrument; if laryngeal movement exceeds this range, EGG signal is lost and CQ measurement becomes impossible.

In our testing, a reliable EGG signal was maintained at all times with all test subjects, indicating a relatively stable laryngeal position with little or no elevation above the resting point. Based on this observation, it is clear that belting does not require laryngeal elevation.

TABLE 1. Closed Quotient, average and range.

Pitch & Mode	Avg CQ	Min CQ	Max CQ
B♭$_4$, belt	**52%**	47%	65%
E♭$_5$, belt	**53%**	31%	71%
E♭$_5$, head	**39%**	26%	46%
F_5, belt	**59%**	35%	86%
F_5, mix	**47%**	26%	70%
F_5, head	**34%**	13%	48%

OBJECTIVE OBSERVATIONS AND MEASURES: ACOUSTIC SPECTRUM

The acoustic spectrum of classical singing is dominated by clear formant zones, including the well known singer's formant that is used to project the voice over the sound of an orchestra. Acoustic energy outside these formant zones is strongly attenuated; little energy is generally found above 4 kHz (the upper extreme of the singer's formant region). The acoustic spectrum of belting is broader with formant regions that are less clearly defined. Figure 2 presents a spectrogram of one test subject alternately belting and singing in head voice. In belt, strong harmonics are found through 10 kHz; in head voice, harmonics above 4 kHz are relatively weak. It is interesting to note that the first two harmonics are actually stronger in head voice than in belting.

Subjectively, the timbre of belting is often described as bright, twangy, and brassy with horizontal vowel sounds modeled after speech (as opposed to the tall, round vowels preferred in the classical model). Acoustic

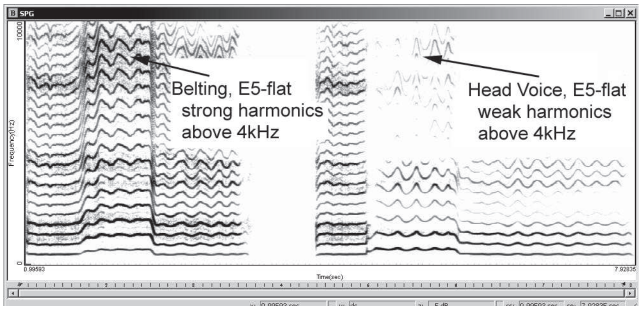

Figure 2. **Acoustic spectrum of belt and head voice.**

measures demonstrate this brightness through increased energy in high frequency harmonics. The source of this brightness could not be reliably determined by the instrumentation used in this study. I would speculate on three possibilities:

1. Narrowing of the pharynx through gentle contraction of the constrictor muscles. In classical singing, the throat is relaxed to its maximum circumference to produce a warmly resonant sound. A narrowed pharynx should produce a brighter, brassier sound akin to the difference in timbre between a trumpet (small bore) and flugelhorn (wider bore).
2. Shortened vocal tract through spreading the lips in a horizontal vowel position or slight elevation of the larynx. Short resonators amplify higher frequencies than long resonators, as in the example of a piccolo versus a flute.
3. High closed quotients help produce a glottal buzz with increased amplitude in high harmonics.[2]

SUBJECTIVE OBSERVATIONS

Almost all of my preconceptions of belting were false. In my naivety, I assumed that belting was nothing more than "bottom-up" voice production that pushed the heavy mechanism (or the glottal configuration of chest voice) beyond its natural upper boundary. I expected the voices to be fat on the bottom, becoming progressively thinner, more pinched and shouted as pitch ascended in a registration model opposite the classical tonal ideal (slender bottom, opulent top). Instead, I heard one singer after another produce a scale that was light and slender on the bottom, increasing in energy and becoming more speech-like through the middle, and ending in a clear, strong, open top. The voices displayed uniform timbre with no apparent vocal seams or register changes.

I had expected belting to be extremely loud; it was not. As Mr. Edwin explained, belters need not project their voices like classical singers, who must employ self-amplification through the singer's formant. In contrast, contemporary belting relies almost exclusively on electronic amplification; as a result, belters are able to sing relatively lightly with little need to apply excess vocal force.

I had also expected to see obvious physical signs of vocal distress. Once again, I was wrong. Clenched jaws, wobbling tongues, tight neck muscles, heaving chests, and elevated larynges were not to be found. I now understand these physical manifestations only are found in *incorrect* belting, just as they only are found in *incorrect* classical singing.

CONCLUSIONS

Recent articles in the *Journal of Singing* have addressed the importance of tonal ideals and imaging in singing (see Volume 63, Numbers 1 & 4 for works by Margaret Cusack and Rudolf Piernay). Studying—and teaching—singing might be compared in this regard to a long journey: If the destination is unknown, how do you determine you have arrived? Prior to the study outlined in this article, I had neither a valid tonal concept of contemporary belting nor a correct understanding of the physical processes involved in its production. I still don't know how to teach someone to belt, but at least I can better appreciate the final product. Perhaps I've taken my first steps on the journey to become a more diversified teacher.

NOTES

1. Donald Miller, "Registers in Singing: Empirical and Systematic Studies in the Theory of the Singing Voice" (Monograph, University of Groningen, The Netherlands, 2000).
2. Johan Sundberg, *The Science of the Singing Voice* (DeKalb, IL: Northern Illinois University Press, 1987).

Scott McCoy is Professor of Voice and Director of the Presser Music Center Voice Laboratory at Westminster Choir College of Rider University, in Princeton, New Jersey. His multimedia voice science and pedagogy textbook, *Your Voice, An Inside View*, is used extensively by colleges and universities throughout the United States and abroad. A long-time mem-

ber of NATS, he has served the Association as Vice President for Workshops, Program Chair for the 2006 and 2008 National Conferences, and master teacher for the Intern Program. He currently holds the office of NATS President Elect. Deeply committed to teacher education, McCoy is a founding faculty member in the New York Singing Teachers Association (NYSTA) Professional Development Program, teaching classes in voice anatomy, physiology, and acoustic analysis. He is a member of the distinguished American Academy of Teachers of Singing.