

# Belting and a High Larynx Position

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I HAD A DELIGHTFUL TIME MEETING John-Paul White at the third international conference on the Physiology and Acoustics of Singing in York, England. John-Paul is Travis Professor of Music (Voice) at Oakland University, Rochester, Minnesota. He came up to me and said, “You’re the guy who caused my voice to break!” He was kidding, of course, as he referred to an unexpected register change that he experienced for the first time by singing into a straw. I could easily explain that phenomenon. As a bass (or bass baritone), he generally never experienced the effect of his fundamental frequency crossing the first formant frequency, which he probably kept above about 350 Hz for all singing vowels. But by singing into the straw, the first formant frequency was lowered to about 150 Hz, which meant that there was frequent cross-over between the fundamental and  $F_1$  as he vocalized up and down in pitch. We know now that register breaks can be triggered by this crossing of source and resonance frequencies.

Following this little exchange of ideas, John-Paul wrote to me with another question:

My recent sabbatical study was on the belt voice as it relates to the position of the larynx during belting. In short, it seems that there are a fairly large number of musical theatre voice teachers who are advocating and teaching a purposely high larynx in belting, which is contrary to a traditional approach to healthy voice production. My initial findings (after observing six of the leading voice teachers of professional musical theatre singers, three in New York and three in London, and also observing professionals in a number of performances) are that while the larynx is indeed higher than in a traditional classical approach, good healthy technique still assumes a relaxed and “relatively low” laryngeal position as ideal, and makes compromises as needed from there to achieve the belt quality, or as one of the experts says, “the larynx does rise in belt . . . but reluctantly!” I am interested in doing further research on the subject, but am interested in thoughts from your perspective.

The most compelling explanation for a slightly raised larynx in belt voice is that, acoustically, there is an advantage to having the first formant frequency rise with pitch. Belt voice is characterized by a strong second harmonic (also called the first overtone above the fundamental, which dictates the pitch). If this second harmonic frequency stays below the first formant frequency, it gets boosted by the inertive reactance of the vocal tract. For example, if an  $A_4$  (440 Hz) is belted, the second harmonic is at 880 Hz. The first formant should then be even higher, perhaps 900 Hz. An

open /a/ or /æ/ vowel has a first formant frequency that high, and a few other wide open vowels can reach this value if the vocal tract is shortened by raising the larynx. (The rule is that all formant frequencies increase when a resonance tube is shortened.)


When the first formant frequency can no longer be raised (by larynx raising, jaw lowering, and lip spreading), the highest belt note is reached (usually around C<sub>5</sub>). At that point, the register changes to falsetto, which does not require a strong second harmonic. The second harmonic is weakened because it now is above the first formant frequency, where the vocal tract has compliant reactance.


All of this acoustic advantage of a raised larynx needs to be balanced, however, against some biomechanical disadvantages. A raised larynx crowds the hyoid bone, the tongue, and the jaw. Any tissue that is raised in the neck will displace tissue above it, making articulatory movements more difficult. Belters tend to prefer bright vowels, for which the tongue can be thrust forward and the lips can be spread. Perceptually, the singer trades warmth and dark timbre in the classical style for brightness and power in belt. A balance must obviously be

struck for those who wish to perform multiple styles in a healthy manner.

**Ingo R. Titze** is Distinguished Professor of Speech Science and Voice at the University of Iowa and Executive Director of the National Center for Voice and Speech at the Denver Center for the Performing Arts. His formal education is in physics and electrical engineering, but he has devoted much of his studies to vocal music and speech. Dr. Titze has published more than 500 articles in scientific and educational journals, coedited two books titled *Vocal Fold Physiology*, and has authored two books called *Principles of Voice Production*, and *The Myoelastic Aerodynamic Theory of Phonation*. He has lectured throughout the world and has appeared on such educational television series as *Innovation*, *Quantum*, and *Beyond 2000*. He is a recipient of the William and Harriott Gould Award for laryngeal physiology, the Jacob Javits Neuroscience Investigation Award, the Claude Pepper Award, the Quintana Award, and the American Laryngological Association Award. He is a Fellow of the Acoustical Society of America and the American Speech-Language-Hearing Association. Dr. Titze has served on a number of national advisory boards and scientific review groups, including the Scientific Advisory Board of the Voice Foundation and the Division of Research Grants of the National Institutes of Health. In addition to his scientific endeavors, Dr. Titze continues to be active as a singer. He is married to Kathy Titze and has four children. Mail should be addressed to Ingo R. Titze, National Center for Voice and Speech, 330 WJSHC, Iowa City, IA 52242. Telephone (319) 335-6600.

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