

Ingo Titze, Associate Editor

# One More Small Step in Solving the Mystery of the Benefits of Semioccluded Vocal Tract Exercises

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**T**HERE IS HARDLY A SINGING TEACHER or a vocologist remaining who has not discovered the efficacy of using exercises that semiocclude the vocal tract. Everyone's arsenal for attacking adduction, register, voice quality, or pitch problems includes a selection from the large inventory of voiced consonants, lip or tongue buzzes, or phonation into narrow tubes or straws. In an often dramatic way, vocalization becomes easier to produce, more resonant, and more centrally placed in terms of adduction and registration with these exercises.

The scientific explanations supporting the use of these exercises have been slowly emerging. Two basic questions are asked by everyone who doesn't blindly accept hand-me-down clinical or studio recipes: (1) why isn't an open mouth with a vowel like /a/ the best vocal tract shape on which to practice; and (2) what's the point of practicing exercises with vocal tract shapes that either never occur, or occur only briefly, in normal speaking and singing?

As we have developed in detail in our new book, *Vocology: The Science and Practice of Voice Habilitation*, there are at least two major effects of a downstream semiocclusion that can benefit vocal fold vibration.<sup>1</sup> The first beneficial effect, which I have also described in previous writings in this journal, is an acoustic one. Simply stated, a vocal tract air column that vibrates (up and down) above the vocal folds can create a reactive push and a pull on the tissue surfaces so that vocal fold vibration is reinforced. But not all air columns react the same way, and the effect is different at different frequencies. In general, however, a vocal tract that is narrow (semioccluded) in some region along its length (e.g., at the lips or the epiglottis) helps to produce this favorable push-pull.

A second effect, so far less described, is aerodynamic rather than acoustic, meaning that back-and-forth movement of air is not a requirement. A steady back pressure in the vocal tract can help to stabilize vocal fold adduction. As the vocal tract is semioccluded, a steady pressure is maintained behind the semiocclusion. This pressure may help to balance an always strong pressure below the vocal folds in a way that the vocal fold surfaces can be maintained more parallel. As shown in Figure 1, adduction of the vocal folds can result in a convergent, a rectangular, or a divergent glottis before air pressures are

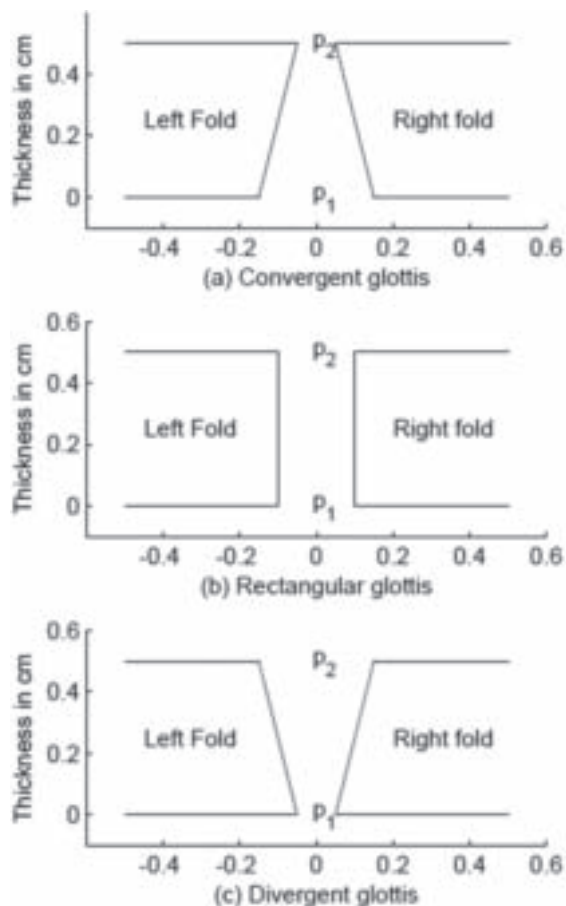


Figure 1. Sketch of vocal fold medial surfaces and pressures that can affect their position.

applied. The rectangular glottis, with parallel vocal fold surfaces, is known to vibrate the best, more so than a glottis with convergent or divergent surfaces of the vocal folds. A steady positive supraglottal pressure  $P_2$ , which pushes against the upper surfaces, can mediate the usually greater pressure  $P_1$  applied at the lower surfaces.

What can maintain a steady positive pressure above the vocal folds when there is not a semioclusion at the mouth or lips? One possibility is a flow resistance above the vocal folds. Alipour et al. have shown that an overall laryngeal flow resistance is comprised of not only the glottal resistance at the vocal folds, but also a resistance at the false folds and another resistance at the aryepiglottic collar.<sup>2</sup> The laryngeal resistance with all structures included was about twice the resistance of the glottis

alone. Thus, a steady positive pressure can possibly be created and maintained above the vocal folds and below the aryepiglottic collar of the larynx. This pressure could be responsible for maintaining a balance of adduction between upper and lower portions of the vocal folds.

Research is currently ongoing to quantify this effect. If the effect is strong enough, we may have an answer to what can replace a semioclusion at the lips or in the mouth when open vowels like /a/ and /o/ are sung or spoken.

## NOTES

1. Ingo R. Titze and Katherine Verdolini-Abbott, *Vocology: The Science and Practice of Voice Habilitation* (Salt Lake City, UT: National Center for Voice and Speech, 2012).
2. F. Alipour, S. Jaiswal, and E. Finnegan, "Aerodynamic and Acoustic Effects of False Folds and Epiglottis in Excised Larynx Models," *Annals of Otology, Rhinology, & Laryngology* 116, no. 2 (February 2007): 135–144.



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