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# Semi-Occluded Vocal Tract Postures and Their Application in the Singing Voice Studio

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**M**ANY SINGING TEACHERS, voice therapists, and acting voice teachers employ semi-occluded vocal tract postures in their teaching. These postures can be divided into three basic types:

- 1) postures where the semi-occlusion remains consistent over time
  - a) singing vowels into a straw
  - b) sustained phonation of voiced fricative consonants, such as /v/
  - c) sustained phonation of nasal consonants, such as /m/
- 2) postures where the occlusion is oscillatory
  - a) lip buzz
  - b) raspberry
  - c) rolled /r/
- 3) postures where the semi-occlusion or occlusion is very transitory
  - a) semi-vowels /j/ and /w/
  - b) voiced stop consonants /b/, /g/, /d/

Many of these semi-occluded or flow-resistant postures are an integral part of what Lessac, Verdolini, Titze, and others have referred to as “resonant voice” training.

There are a number of reasons why these postures have been so widely used. Potential physiologic and acoustic benefits of these semi-occluded vocalizing postures include:

- 1) A high ratio of vocal output to vocal fold vibration amplitude. As Ingo Titze has written earlier in this column, these postures tend to encourage what is known as a high maximum flow declination rate, which is to say the vocal folds cut off the air flow very quickly each vibration cycle. It is this rapid shutting off of the flow that excites higher frequencies. Moreover, these postures achieve this rapid shutting off of the flow with relatively low vocal fold vibration amplitude. The result is more bang (acoustic output) for fewer bucks (low effort and reduced risk of tissue damage).
- 2) Some semi-occluded postures may encourage a narrowing of the epilaryngeal outlet, which may aid the production of the singer’s formant clus-

ter and may aid in matching the glottal impedance with the input impedance of the vocal tract.

- 3) Improved breath management. A vocalist can engage greater thoracic and abdominal “support” without using a pressed phonation.
- 4) Lowered phonation threshold pressure. The positive pressures above the glottis lower the pressure needed to initiate and sustain phonation.
- 5) “Head voice” sensation is encouraged. This may be the most immediately tangible aspect of these postures in the voice training studio. This is due not only to the sympathetic vibration of the oro-facial tissues and sinuses of the face and skull, but also to a coupling of the vibration of the upper surface of the vocal folds with acoustic pressures above the glottis.
- 6) A higher ratio of thyroarytenoid muscle activation to cricothyroid muscle activation during and after use of the semi-occluded postures. This is similar to that which has been found when contrasting “covered” singing with “open” singing.

With these potential benefits in mind, the authors decided to examine what typically happens pharyngeally and laryngeally during each type of semi-occluded posture. Videoendoscopic images of the pharynx and vocal folds were taken of the first author (a voice teacher and tenor) by the second author while the semi-occluded postures listed in the first paragraph above were used as pilots to singing the vowels /i/, /u/, and /a/ on the pitch  $E_3$  (165 Hz).

- /i/ was chosen for its low F1 (in close proximity to H2 at this pitch) and for good access to visualizing the vocal folds
- /u/ was chosen for its low F1 (in close proximity to H2 at this pitch) and as a contrast to /i/ (more lip rounding than /i/)
- /a/ was chosen to complete the series of “corner vowels” and as a contrast to /i/ (tongue less fronted)

The sequence of postures and vowels performed are found in Table 1. Streaming video of the endoscopy can be found at the following URL: [http://streamer.utsa.edu/ramgen/STREAMING2/static/Colfa/MUS/JNix/Nix\\_ASA.rm](http://streamer.utsa.edu/ramgen/STREAMING2/static/Colfa/MUS/JNix/Nix_ASA.rm)

From a voice training perspective, some of the practical benefits of the semi-occluded postures include:

- 1) Sensations of increased or at least a more steady respiratory support. The upstream resistance gives the singer’s respiratory system something to work against.

- 2) Sensations of vibration in the oro-facial area, particularly while doing the voiced fricatives, the nasals, the lip buzz, raspberry, and rolled r.
- 3) Release of habitual tensions in the tongue, lips, and jaw, particularly while doing the oscillatory and transitory semi-occlusions.
- 4) Release of inhibitions. Doing a number of these postures requires the singer to be more extroverted and to do something somewhat ridiculous (i.e., sing with flapping lips).
- 5) Elevation of the soft palate. The positive oral pressure found in many of these postures cannot be generated without the palate being elevated. This is not true of the nasals, however.
- 6) Fronting the tongue. The voiced fricative /z/, the nasal continuant /n/, the raspberry, the rolled r, /j/ glide, and the voiced stop /d/, all front the tongue. This tongue fronting can be used to assist vowels that follow the pilot occlusions.

There are a number of possible uses of the semi-occluded postures in singing pedagogy. One approach is to perform an entire vocalise pattern or a musical phrase in a semi-occluded posture, such as a hummed /m/ or a lip buzz, then immediately perform the same pattern or phrase on vowels/text without the occlusion. One can toggle back and forth between the semi-occluded version and the “normal” version to transfer the benefits and sensations of the semi-occlusion to the vocalise or phrase. Another common approach is to use a semi-occluded posture, such as a raspberry, as a pilot to a vocalise or a musical phrase; once again, alternation of trials with and without the pilot posture can be performed to assist in the transfer of vocal production and sensation from the semi-occluded pilot posture to the sung portion.

One caveat about the use of these postures in singing training: even though from a theoretical standpoint it may be most beneficial to start with the most occluded postures and go towards those which are most “vowel-like,” in the voice studio, one must often start with the postures most familiar to the student—which may only be the glides, stops, and nasals—and gradually move towards employing the more flow-resistant postures, such as the narrow straws.

In 2005, the first author participated in an experimental protocol at the NCVS laboratories in Denver which was led by Drs. Titze, Laukkanen, and Hunter.

**TABLE 1.** The sequence of postures and vowels performed.

Type of Semi-occlusion	Definition	Trials Performed
Sustained semi-occlusion	Semi-occluded postures that can be maintained consistently for several seconds without any appreciable change in vocal tract shape	Straw phonation on /i u a/ Straw /i/ as a pilot to sung /i/ Straw /u/ as a pilot to sung /u/ Straw /a/ as a pilot to sung /a/ Sustained /v/ Sustained /v/ as a pilot to /i/, /u/, /a/ Sustained /z/ Sustained /z/ as a pilot to /i/, /u/, /a/ Sustained /ʒ/ Sustained /ʒ/ as a pilot to /i/, /u/, /a/ Sustained /m/ Sustained /m/ as a pilot to /i/, /u/, /a/ Sustained /n/ Sustained /n/ as a pilot to /i/, /u/, /a/
Oscillatory semi-occlusion	Postures where a regular cycle of pressures are built up behind an occlusion, then released; the cycle of pressure changes is not unlike that which takes place at the glottal level, although at a much lower frequency of pressure oscillations than occurs glottally	Lip buzz Lip buzz as a pilot to /i/, /u/, /a/ Raspberry Raspberry as a pilot to /i/, /u/, /a/ Rolled /r/ Rolled /r/ as a pilot to /i/, /u/, /a/
Transitory semi-occlusion or occlusion	Postures that are very short in duration; can feature a brief complete occlusion of the vocal tract	Glides /ji ju ja/ /wi wu wa/  Voiced stop consonants /bi bu ba/ /di du da/ /gi gu ga/

This experiment used various flow-resistant straws (semi-occlusion type one listed above). Endoscopy was performed during that protocol as well, by Dr. Mona Abaza of the University of Colorado Hospital. Together, these two sessions have served to raise further questions about semi-occluded postures:

- 1) What are the similarities/differences in function *within* types of postures (one type of constant semi-occlusion versus another type of constant semi-occlusion, etc.)? Are there similarities/differences *between* types of postures (constant in general versus transitory in general, etc.)?
- 2) Is there any consistent change in the pharynx/larynx during the transition from semi-occluded pos-

- 3) Which types of postures have the most change in the transition to a vowel?
- 4) Which have the best transfer, and how is “best transfer” defined? Is it the transfer with the least change?
- 5) Is there any variation in the transfer depending on vowel? It might be expected that the transfer would be easier from semi-occluded postures to the low first formant vowels.
- 6) Are there consistent patterns of behavior across genders, voice types, or experience levels as a vocalist? Future studies will include systematic acoustic measurements and electroglottography of the vocal folds while semi-occluded postures are used as pilots to the vowels /i/, /u/, and /a/. Such studies may help reveal:

postures (constant vs. constant, etc.)? This is especially important since one of the principal goals of “resonant voice” training is to achieve the best output while reducing vocal fold impact forces. As flexible endoscopy equipment improves, investigators will be able to see with greater precision exactly what is happening during these postures (it is hard to perform a number of these postures with a rigid scope in use), and the visual observations will be able to augment information gathered through electroglottography.

- 2) Is there any similarity/difference in VFCA and acoustic output between types of postures (constant versus transitory, etc.)?
- 3) Is there any change in VFCA and acoustic output during the transition from semi-occluded postures to vowels?
- 4) Is the change consistent across types?
- 5) Which types of postures have the most change in the transition?
- 6) Which have the best transfer? Is this the least change in VFCA? How can “best transfer” be defined acoustically—via changes in the spectrum, in SPL, etc.?
- 7) Is there any variation in transfer depending on the vowel? What about other factors, such as singer gender, voice type, experience level, and familiarity with the semi-occluded postures?

Ultimately, these studies should prove beneficial to the numerous voice therapists, singing teachers, and performers who choose to use semi-occluded postures in training sessions. They also should provide a clearer understanding of how best to transfer the benefits of these postures into speech and song.

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