In Support of Fact-Based Voice Pedagogy and Terminology

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One of the Twentieth Century's most influential voice teachers and our Academy colleague, the late Richard Miller, was an early and passionate advocate for fact-based voice pedagogy. In his landmark 1986 book, *The Structure of Singing,* Miller wrote "… the best way to maintain 'traditional' voice technique is to use language which communicates concrete concepts regarding efficiency. As in any field, the transfer of information is possible only if a common language exists between writer and reader, teacher and student."

The American Academy of Teachers of Singing (AATS) honors and respects the history of voice pedagogy and the work of voice pedagogues who, throughout the centuries, have labored nobly to improve the singing of countless students. As in all disciplines, however, the appearance of new data, discoveries, and insights can have a profound influence on the profession. For example, in the world of chemistry, credit is given to Frenchman Antoine-Laurent Lavoisier (1743-1794) for helping to establish, with much struggle, the precise language necessary for chemists to work more in unity. The "father of modern chemistry" wrote, "We think only through the medium of words." Science intruded on the vocal arts over a century and a half ago with the work of Spaniard Manuel Patricio Rodriguez Garcia (1805-1906). His early efforts using the laryngoscope to view the vocal folds of singers helped establish some fact-based understanding of "the invisible instrument."

Now, building on the efforts of Garcia, Miller, and other pioneers, the American Academy of Teachers of Singing, informed by new and convincing evidence from disciplines such as anatomy, physiology, kinesthesiology, vocology, cognitive science, and psychology, states its full endorsement of Twenty-First Century, fact-based, and functional voice pedagogy and terminology.

The Academy believes that singing teachers and other voice professionals have a tremendous opportunity as well as a professional responsibility to expand their teaching skills through a clearer understanding of the actual mechanics of the singing system. The Academy acknowledges the value of the use of imagery and kinesthetic feedback in the teaching of singing. However, the efficacy of these devices is extremely variable. Knowledge of what is actually happening in the singing system, how it is functioning to produce the desired results, empowers teachers to direct their students to work consistently toward healthy, efficient, stylistically correct, and artistic performances.

Embracing change can be challenging, but given the knowledge we continue to acquire, our aim and responsibility always is to clarify the process of singing. For example, the AATS paper, "In Support of Contemporary Commercial Music (nonclassical) Voice Pedagogy" (2008), acknowledged that increasingly diverse genres and singing styles require equally diverse pedagogic approaches. In this present paper, our message is that voice science does not tell us what to do as teachers of singing: it tells us what is happening during the act of singing. Science informs art, it does not create it.

Allowing that no one paper can possibly cover all aspects of voice pedagogy, the Academy addresses herein some specific elements of the singing system in order to provide a clearer understanding of vocal function and encourage the standardization of terminology. These functions include **cognition** (the role the brain and mind play in all human activities, including singing), **breathing** (inhalation and exhalation), **phonation** (making vocalized sounds), **resonation** (how and where the vocal sounds are amplified), **registration** (the interaction of phonation and resonance), and **articulation** (how and where the vocal sounds are shaped into language).

COGNITION (the role the brain and mind play in all human physical and emotional activity, including singing)

Common terminology: cognition, intuition, proprioception (awareness of body position), mental focus, innate talent juxaposed learned skill, “fight or flight” response, conscious control of singing.

Primary issue: can singers consciously manage the many mechanisms of the singing process?

The act of singing requires an interactive system in which the component parts of a biomechanical instrument are activated in fractions of seconds when a singer initiates a vocalized sound. Current thinking in neural and cognitive science does not support conscious control of these actions. Rather, the singer needs to develop a solid technique that, through *meaningful* repetition, functions largely on a subconscious level, thus allowing the singer to concentrate on musical and communicative expression.

Neural and cognitive science also confirms the combination of explicit and implicit memory within the process of learning. Singers experience both. For example, learning a new song would involve explicit memory as they try to process unfamiliar words and music, while already learned activities such as riding a bike, typing, or singing would activate automatic or implicit memory.

Among many other tasks, both conscious and subconscious, our brain is responsible for processing information that we receive through our five physical senses. Inner and outer perception of sensory experiences should be developed as part of the training process, including, for example, the management of the “fight or flight” response. Since humans are programmed for survival, most singers in an audition or performance venue have experienced the adrenaline-fueled, disruptive response commonly known as performance anxiety or “nerves.” Subconscious perception of the situation as “life threatening” triggers the fight or flight response and disrupts the singing system. Staying in character and in the environment of the song’s story, however, may enable the singer to manage said response and allow for successful command of the performance.

Voice pedagogues would do well to remind their students that no activity occurs in human beings without the brain and the mind. We need to be “mindful” artists.

BREATHING (inhalation and exhalation)

Common terminology: breath management, breath support, breath control, appoggio, air flow, singing on the breath, air compression.

Primary issue: providing an appropriate supply of air to enable optimal phonation.

Breath is the power source of singing and is required to establish and maintain vocal fold vibration. Throughout the ages, numerous breath management techniques have been employed that vary dramatically in the amount of air pressure and airflow they can generate. Breathing for singing is complicated by the fact that air pressure is directly related to the volume of air held within the lungs. Immediately following a full inhalation, contraction of expiratory muscles can easily produce more air pressure than is optimal for the required singing task. During this phase of the breath, singers often must resist the outflow of air by engaging inspiratory muscles during expiration. But as air volume is depleted, singers must reverse this muscular action, gradually increasing expiratory effort to maintain adequate pressure and flow.

Traditionally, the balancing act of producing this consistent supply of air is called breath support, breath control, or breath management. Unfortunately, the instruction to “support the voice” can be one of the more confusing directions a singer hears and can often lead to over-tightening the abdominal and intercostal muscles which, in turn, over-pressurizes the breath. Singing rarely requires the breath holding and physical exertion used in lifting heavy objects. Our goal should be to achieve balance, providing only as much power in the breath as the vocal situation demands.

Despite scientifically vetted information readily available to all, misconceptions persist about the role of the diaphragm muscle. What singer has not been told to “support with the diaphragm” or to “sing from the diaphragm, not from the throat?”

Anatomically, the diaphragm is a muscle of inhalation. In most people, it is passive during exhalation, providing little or no expirational force, although elastic recoil in the muscle as it returns to its resting position might supply some minimal power. Since we normally sing during exhalation, other muscles, including the abdominals and intercostals, are required to provide the power necessary to sustain vocal fold vibration. In some singers, the diaphragm is active during phonation maintaining a gentle contraction that helps to regulate air pressure through muscular antagonism. For those particular individuals, it is factually correct to say that the diaphragm contributes to breath support, but for the majority of singers, the diaphragm is passive throughout exhalation. The instruction to “sing from the diaphragm” may be intended to induce muscular activity in the epigastric (above the navel) or hypogastric (below the navel) regions of the abdomen. If that is the case, then proper and accurate terminology should be used.

PHONATION (making vocalized sounds)

Common terminology: vocal folds, vocal cords (often misspelled vocal “chords”), glottis.

Primary issue: the physiologic function of the vocal folds in speech and singing.

The vocal folds are the sound source of the singing system. They are air driven oscillators. Located inside the larynx (“the voice box”) in a horizontal V shape while breathing, they close and open at extraordinarily high speeds to produce a large range of pitches. For example, to sing the pitch C_4 (middle C), the vocal folds must close and open 256 times per second; the octave above, C_5 (C

above middle C), doubles the number to 512 times per second. C_6 is an astounding 1024 cycles per second.

Vocal fold oscillation (the opening and closing cycles of the glottis during phonation) is initiated by air from the pulmonary system and sustained through aerodynamic and elastic forces. Phonation requires four codependent muscular actions: 1) the glottis must be adducted (closed) to begin phonation; 2) the vocal folds must be shortened and thickened to produce lower and louder sounds; 3) the vocal folds must be elongated and thinned to produce higher and quieter sounds; 4) the glottis must be abducted (opened) to stop phonation and to breathe. Vocal timbres, including aspects of registers and registration, are dependent on the interaction of the vocal folds with vocal tract resonance. These two elements of voice production are interdependent and rarely function with true independence.

RESONATION (how and where the sounds are amplified and reinforced)

Common terminology: the vocal tract - laryngopharynx, oropharynx, and nasopharynx resonance; tracheal, chest, head, skull, sinus, and masque (mask) "resonance."

Primary issue: mistaking perceived vibrations and a variety of physical sensations for actual resonance.

Musical resonance occurs in two forms: forced resonance and free resonance. In forced resonance, there is a direct mechanical coupling of the sound source (vibrator) to the resonator. Instruments such as the piano, violin, and guitar all work by this principle. Forced resonance also is present in the human voice and is responsible for the sensations of vibration some singers feel in the chest, head, or other locations. In singing, however, that resonance is *private*: it is sensed by the singer, but never heard by the audience. Vocal sound is the product of free resonance, which occurs when sound waves travel through a hollow space or void. Musical instruments that include the trumpet, clarinet, and human voice all work

on this principle. For a trumpet, the resonator is the hollow space within the tubing; for a singer, it is the vocal tract. Because human resonators are movable, they are called *flexible resonators*, while the trumpet and most other wind instruments have unchangeable or *fixed resonators.*

The complex sounds produced by vocal fold vibrations (the source) enter the vocal tract (the filter) and are selectively amplified and reinforced. Unresonated vocal fold vibration resembles a buzzing sound devoid of vowels and language but rich in overtones, some of which are amplified while others are strongly attenuated (damped) by passage through the vocal tract.

Intentional changes in the shapes made by the jaw, lips, mouth, soft palate, tongue, and the position of the larynx, help to determine the overall configuration of the vocal tract and which acoustic frequencies (overtones) from the vocal folds are enhanced. Thus, a rock singer will sound very different from a classical opera singer because of different vocal fold and resonator activity. Each singer will have a different functional and aesthetic goal as well.

A common misunderstanding is the belief that primary resonators exist in other physical locations such as the skull, the sinuses, the trachea, and the area of the face referred to as the "mask." As previously noted, vibrations felt in these and other places such as the chest and head are the result of forced resonance. These vibrations may help to provide kinesthetic feedback for singers (a "feel" for singing), but they do not contribute to the sound that is heard by the audience.

Instructions to direct or "place" a vocalized sound in a specific location (e.g., "bounce the tone off the hard palate," "send the sound out through the eyes," "place the vibrations at the end of the nose," "focus the air down the spine") are often based on sensation and kinesthetic feedback experienced by the instructor. Because we are individual human beings with unique personal morphology (body structure), there is no reason to assume that all singers will feel vibrations in the same anatomic locations. Pedagogic preoccupation with creating vibrations in specific places may undermine the singer's efforts to develop an efficient vocal

technique. In fact-based, functional voice technique, vibrations are recognized as only serving personal sensory feedback that is unique to each individual singer.

REGISTRATION (the interaction of phonation and resonance)

Common terminology: chest, middle, head, falsetto, belt, mix, belt-mix, head-mix, vocal fry, whistle.

Primary issue: understanding the interdependent roles of vocal fold vibration and vocal tract resonance.

Terminology associated with registration is both extensive and confusing. For example, low-pitched sounds are often said to be produced in *chest voice (voce di petto), belt, modal register, alto, heavy mechanism, thick folds, lower register, Mode 1,* or simply identified functionally as being thyroarytenoid (TA) dominant. High-pitched sounds are often said to be produced in *head voice (voce di testa), legit, falsetto, loft register, soprano, light mechanism, thin folds, upper register*, *Mode 2,* or simply identified functionally as being cricothyroid (CT) dominant.

Voice registers are not exclusively the result of changes in the way the vocal folds vibrate: resonance also plays an important role. For example, registration shifts such as the lower *passaggio* in classical women's voices involve alterations in both vibrational mode and resonance. Other shifts such as the transition into the upper extension of operatic tenors and baritones are exclusively changes in resonance. Regardless of what they are called, registration events for both women and men occur through the interaction of the larynx and the vocal tract and are not produced in the chest, head, or any other physical location. For this reason, the Academy recommends avoiding terminology that is sensation-based, and advocates for functional terminology that acknowledges the respective activities of phonation, resonation, and registration.

ARTICULATION (where and how the vocalized sounds are shaped into language)

Common terminology: jaw, lips, teeth, tongue, hard palate, soft palate (velum), throat.

Primary issue: the rigid control of the articulators.

Up to this point in the singing process, air has been taken in and then released under pressure to vibrate the vocal folds which, in turn, send acoustic signals to the resonating cavities which then amplify and reinforce those signals. The articulators shape that sound into some form of communication.

The tongue is the primary factor in articulation and plays a role in the production of all vowel sounds and many consonant sounds. It elevates in the front to produce the [i] sound (as in the word *me*), and elevates in the back to produce the [u] sound (as in the word *you*). Therefore, absolute directives to "keep the tongue flat during singing" or "press the tongue against the lower teeth" might lead to unintentional negative issues with regard to clarity of vowel and consonant articulation. Likewise, instruction to continually "lift the soft palate" may compromise its ability to move down when needed for more nasalized sounds. If the singer understands that the tongue and soft palate, as well as all the other articulators, need to be flexible and fluid in their movement, unintended limitations in vocal quality and intelligibility may be avoided.

Articulatory rigidity also directly impacts phonation. Anatomically, the muscles of the tongue and jaw are inextricably linked to the larynx through their mutual connection via the hyoid bone. This wishbone-shaped bone is the upper suspension point of the larynx, the lower attachment point of the tongue, and the point of origin for most of the muscles that drop the jaw and open the mouth. These interconnections allow inappropriate tension in one structure to be passed directly to another. A tight tongue will likely cause collateral damage in the form of a tight and perhaps wobbly jaw. Excess jaw tension deprives the tongue of needed flexibility and might even elevate the larynx out of the position desired for almost any genre or style of singing. Healthy singing demands appropriate

freedom from excessive tension as well as fluidity of movement in each of these important articulatory structures.

In conclusion, fact-based voice pedagogy and terminology help foster a common nomenclature and encourage technique that is consonant with the laws of nature. AATS has addressed this issue in previous publications, including a 1969 pamphlet about singing terminology; ongoing research will bring us even more revelations, information, and clarity about what Manuel Garcia called “the invisible instrument.” However, the mechanical act of producing a tone does not, in and of itself, produce art. Vocal art is created through imagination, function, musicality, phrasing, and of course, emotion. Therefore, it is the singer who is both talented and motivated, dedicated to developing a technique based on functional voice training, devoted to putting in the demanding hours of practice necessary for mastery, compelled to express something meaningful only he or she can voice, and committed to share that vision with others, who will be best able to navigate the journey of the singer-artist. Fact-based voice pedagogy provides the solid foundation that supports that journey.