Care of the Senior Voice
Lakeside Harmony Weekend
July 27, 2024, 12:40 p.m.
Syllabus and Outline

Instructor: Dr. Don R. Campbell
Prerequisite: None

Required Materials:
- Handouts on the Senior Voice

Objective:
"Care of the Senior Voice" is a lecture and activity class designed to help "seasoned citizens" and music directors who lead them understand how to maintain healthy vocal technique.

Outline
The Effects of Age on the Voice (Parts 1-3) Sataloff and Kost

I. Anatomy and Physiology

A. Using Larry and Hedley, show the major parts of the vocal structure.

B. The larynx develops most of its anatomic characteristics by the third month in utero.

C. The hyoid bone ossifies by 2 years of age.
   1. Ossify means to turn into bone of bony tissue.

D. The thyroid and cricoid cartilages ossify during early 20s.
   1. These cartilages do not turn into bone but become hardened and more rigid.

E. The arytenoid cartilages ossify in the late 30s.
   1. These also do not turn into bone but become harder and stiffer.

F. Vocal fold length
   1. Infant—6-8 mm. Around quarter inch
   2. Adult female—12-17 mm. From just under a half inch to a little under .75 inch. Female vocal folds grow about 34%.
   3. Adult male—17-23 mm. From just under a .75 inch to almost an inch. Male vocal folds grow as much as 60%.
   4. By 18 years of age, the female voice drops about 2.5 half steps, and the male voice drops about an octave or 12 half steps.

G. Lungs
   1. During young adulthood the "power source" of the voice (or lungs) reaches its full potential as the chest enlarges and thoracic and abdominal musculature strengthens. Overall muscular strength and stamina peaks.

2. From young adulthood to old age, the respiratory system decreases in force and rate of contraction of respiratory muscles, stiffening of the thorax, and loss of elasticity of lung tissues. The decline continues with increasing age.

H. Larynx
   1. Throughout adulthood, cartilages undergo ossification and calcification, intrinsic muscles atrophy, and joints erode.
   2. In elderly men, the mucosa stiffens and increases in viscosity in comparison with women and younger men, resulting in decreased ease of phonation.

I. There are changes in the vocal folds in the aging process.
   1. Thyroarytenoid muscle (vocal folds) or TAs.
      a. Changes can lead to presbyphonia.
      b. There is a loss of muscle mass, strength, and quality in the aging human TAs.
      c. These changes could play a role in the shortening of the vocal fold affecting fine tuning tension.
      d. Historically, complete glottal closure has been regarded as a characteristic of normal phonation in young adults.
      e. Aging men sometimes demonstrate an increased incidence of glottal gaps in different ways from women.
      f. Aging women can show anterior glottal gaps. Young women present posterior glottal gaps.
      g. These glottal gaps can result in an airy sound, vocal fold bowing, phase and amplitude asymmetry, and tremor.
   2. Facial bones continue to grow from young adulthood through old age.
      a. Changes in facial muscles include decreased elasticity, reduced blood supply, atrophy, and collagen fiber breakdown.
      b. The tongue gets thinner, which can decrease tongue strength.

II. Anatomic Changes from Young Adulthood to Old Age

A. Speaking
   1. The aging voice is associated with a change in vocal quality that may be perceived as reduced volume, increased breathiness, a change in pitch, decreased endurance, and reduced vocal range.
   2. Older voices are associated with a loss of range and described with undesirable adjectives such and “hoarse,” “raspy,” “breathy,” “unsteady,” “tremulous,” and “shaky.”
   3. Many of these characteristics are not solely the result of aging, but rather from poor physical conditioning that results in weak respiratory and abdominal muscles and ultimately inadequate vocal support.
   4. Jitter and shimmer are higher in the elderly when compared with younger people. (See definitions of jitter and shimmer in Vocal Definitions section.) These terms relate to perceptual qualities of harshness and roughness, which have been identified as characteristics of “old” voices. Singers, as well as other healthy, physically fit older individuals display less jitter and shimmer and sound “younger” compared with their counterparts in poor health.

B. Speech Intensity
   1. Although there is a variability in vocal intensity with age, most studies agree that in the elderly, vocal intensity of speech and the ability to modulate it are reduced.

2. Men over the age of 70 use higher conversational speech intensity levels than younger men, even after controlling for hearing acuity. Not enough study has been done to explain this.
3. In women, no age-related changes in speech intensity have been found, either in reading or conversational speech.

C. The Aging Voice
1. Older adults differ from children and young adults in terms of laryngeal and pulmonary (lung) structure and function, hormonal environment and other bodily conditions, aerobic conditioning, susceptibility to injury, intellectual function (including memory), and other factors.
2. Older adults have special needs, limitations, and challenges with their voices. Expert diagnosis, medical treatment, voice therapy/training, and occasionally surgery usually can maintain or restore vocal stability and "youth."
3. This is important because voice weakness and instability are interpreted often as reflecting intellectual instability. As a result, presbyphonia can impair the credibility of societies' wisest and most experienced elders.
4. Presbyphonic loss of volume also makes it difficult for patients to talk with the older friends, many of whom are hearing impaired. This could lead older voice patients to withdraw socially, substantially impairing quality of life.
5. Dysphonia in people aged 65 and older has increased. (Spasmodic dysphonia is what RFK Jr. has. See Vocal Definitions section.) Twenty to thirty-five percent of elderly patients use their voices for work suggesting that vocal health is a high priority with this subgroup of older patients.
6. Dysphonia and hearing loss frequently coexist in the elderly: those with hearing loss are more likely to have dysphonia than their counterparts without hearing loss. However, much more research needs to be done.
7. Although some age-related alterations cannot be avoided in specific individuals, not all are manifestations of irreversible deterioration.
8. As our understanding of the aging process improves, it is becoming more and more apparent that many of these changes can be forestalled or even corrected.
9. As physicians, voice teachers, and yes, music directors, we need to look closer before concluding, "I can't help your voice; you're just getting older.
10. To that I say, "Try barbershopping early and often."

III. The Aging Process

A. Effects of the Aging Process
1. As body structure changes, so does performance. Aging is associated with deteriorating bodily functions—like accuracy, speed, endurance, stability, strength, coordination, breathing capacity, nerve conduction velocity, heart output, and kidney function.
2. Muscle and neural tissues atrophy. Ligaments atrophy, and cartilages turn to bone, including the larynx. (*As cartilage cells die, a group of cells that have surrounded the cartilage model differentiate into osteoblasts. The osteoblasts begin forming bone matrix on the partially degraded cartilage. Eventually, all the cartilage is replaced by bone.*)
3. The folds themselves thin and deteriorate, losing their elastic and collagenous fibers.
4. Vocal fold edges also become less smooth, which makes them stiffer and thinner.
5. This is not a cheery picture.

6. However, it appears possible that many of the functions can be maintained at a better level than expected until very near the end of life, perhaps allowing for a high-quality singing career to extend into or beyond the seventh decade!
7. We cannot categorize people based on chronological age. Biological age is a more useful measure, considering the condition and functioning of each individual body.
8. There are things we can do to slow biological age even while time marches on.
9. John Glenn returned to space in his seventies—in fact, he was 77. William Shatner flew into space and became the oldest man to do so, at the age of 90 (b. 1931), with Jeff Bezos' Blue Origin joyride.

B. Physical and Medical Intervention
   1. Muscle disuse at any age can cause loss of muscle fibers indistinguishable from that seen with advanced age.
   2. Exercise prevents or reverses many of these changes in the young, and it appears to have the same effect when the changes are caused by aging.
   3. Proper nutrition and weight control are also important.
   4. Respiratory function normally decreases with age, but physical exercise that increases lung capacity and function helps to slow that process.
   5. It is helpful to think of each person as having a performance range from his or her poorest performance to his or her optimal performance. Audiences have established a certain level of performance that is acceptable for a professional singer. Let's say at age 35, at your peak as a "professional," that is 100%. You might be able to get by with a 90-95% performance. However, as a singer ages, physical abilities deteriorate. If the singer performs at 50% of his new ability level, that would be an unacceptable performance standard. If, through appropriate singing training, exercise, voice therapy or medication (if needed), and aerobic conditioning, people can get to 70, 80, or 90% of their potential performance level, they may maintain professionally acceptable performance standards for many decades. Hence, the opportunities for barbershop and civic choruses.
   6. In general, rehabilitation is sufficient to restore acceptable voice function and eliminate most acoustic information perceived as "old."
   7. We are accustomed to thinking of older people as having great latitude in most things by virtue of experience and deference to their age.
      a. When we hear a 60-year-old tenor develop a "wobble," we write it off as "getting old" and are reluctant or embarrassed to challenge him; because, after all, he can't help aging.
      b. We also often don't want to suggest exercises, such as swimming, walking, jogging, or other aerobic exercise for people with grey hair and a little extra weight. But this reticence is unfair, unproductive, and detrimental to people.
      c. A singer whose respiratory and abdominal conditioning is not good enough to allow him or her to walk up a few flights of stairs without becoming winded probably is unable to maintain good abdominal support throughout a show or concert.
      d. Regular vocal technical training can eliminate tremolo and improve agility, accuracy, and endurance in the older singer just as it can in the beginner.

C. Psychology and Intellect
    1. Mood disorders, including major depression, are not unusual in the elderly and may account for significant decline in cognitive, affective, and behavioral function.
    2. In addition, elderly people have a higher incidence of risk factors associated with mental illness, including poverty, bereavement, isolation, sensory deficits, and physical illness.
    3. Some medications have effects that could exacerbate vocal problems due to affecting hormone balances including testosterone, estrogen, and androgen. For instance, with women, androgens may cause irreversible masculinization of the voice, and their use should be avoided whenever possible, especially in professional singers or those who sing a lot.

D. Voice Therapy
    1. A voice therapy team can include a speech-language pathologist, singing voice specialist, and acting-voice specialist.
        a. The speech pathologist is responsible for identifying and eliminating voice abuse and misuse, teaching vocal hygiene, and developing and exercise program for the spoken voice that emphasizes appropriate breath and abdominal support, relaxation in the muscles of the head and neck, and appropriate use of resonance to optimize audibility.
        b. The singing voice specialist works symbiotically with the speech pathologist in caring for singers and non-singers. Singing skills are to speaking skills as running skills are to walking skills. If we try to rehabilitate a patient who has difficulty walking and can have that patient jog or run, walking becomes trivial. Singing expands a person's phonatory limits, increasing breath support and phrase length, increasing frequency (pitch) and intensity (volume) ranges, and strengthening the voice beyond the level necessary for even extended speech.
        c. Acting-voice teachers teach techniques to develop speaking-voice strength and projection, but also for control of face and body function, phonatory expression of emotion, preparation and interpretation of spoken materials, and other communication skills.

E. Surgery
    1. Tell my surgery stories.

F. Good News
    1. Because older singers and actors may have considerably less natural reserve and resilience than youthful performers, we need to be particularly demanding with them.
    2. They cannot compensate for or tolerate weakness like teenagers, nor can they recover quickly from injuries to their vocal apparatus.
    3. However, with optimal physical and vocal conditioning, proper medical supervision of cardiac and respiratory function, and appropriate medication, weight control, nutrition, and surgery (in selected cases), many singers, actors, and others may enjoy extra years or decades of improved performance!

IV. Understanding Voice Doctors: Who and When (Kari Ragan)

A. Singing teachers and singers must understand the different medical specialties.

B. Broader practice ENTs deal primarily with sinuses, allergies, or tonsils.

C. ENT physicians or otolaryngologists diagnose and manage disorders and diseases of the ears, nose, sinuses, larynx, mouth, throat, head, and neck. Much more training is required. They often have subspecialties…
   1. Allergies
   2. Facial Plastic/Reconstructive Surgery
   3. Head and Neck Oncology
   4. Laryngology (throat)
   5. Otology/Neurotology (hearing and balance)
   6. Pediatric Otolaryngology
   7. Rhinology (nose)
   8. Sleep Disorders

D. Singers need ENTs with a subspecialty in voice care (laryngology) and have access to videolaryngoscopy to properly visualize the vocal folds with either a flexible scope or a rigid scope.

E. Ways to find a voice doctor
   1. Most laryngologists are affiliated with major academic medical centers or practice in larger metropolitan areas.
   2. That may require singers to travel several hundred miles to find a qualified laryngologist or ENT voice specialist. I went from the Upstate of South Carolina. to Bowman-Gray Hospital in Winston-Salem in North Carolina—over 200 miles and 3.5 to find a world-class voice surgeon.
   3. Experienced voice teachers in your areas are obligated to know which physicians can provide accurate diagnoses and appropriate treatment plans. (That may be one of the first questions to ask a prospective voice teacher.)
   4. These links provide listings for medical voice specialists.
      a. voicefoundation.org
      b. alahns.org
      c. voicedoctor.net
      d. gbmc.org/nationalreferraldatabase
   5. If the ENT's subspecialty is plastics or allergies, they may not be the voice specialist a singer requires. See IV. C above.
   6. With student permission and depending on office protocol, voice teachers wanting to further educate themselves on voice care may be able arrange to attend the appointment and/or have a medical evaluation sent. Never expect the student to relay complete and accurate information to or from the doctor.
   7. Communication from the voice care team to the primary singing teacher is crucial so the teacher can further understand and advocate for the singer.

F. When to refer
   1. If a voice teacher has a concern about the vocal health of a student, it is never too early to suggest an evaluation. This also goes for choir/chorus directors.
   2. Singing teachers are liable for the voices in their studios and can be placed in a challenging position should students refuse or delay proper evaluation by a

laryngologist or ENT voice specialist. If the singer is jeopardizing his or her vocal health, or the teacher's reputation, then the teacher should consider discontinuing lessons.

3. If a singer is experiencing voice issues for longer than two weeks, especially after an upper respiratory infection, cold, prolonged cough, or other circumstance that left them vocally fatigued or hoarse without improvement, an examination by a laryngologist or ENT voice specialist is necessary. It is *not* for the teacher or musical director to guess whether there is a medical implication in what they hear during a singing lesson.

4. Below is a list of warning signs for voice teachers to be aware of:
   a. a prolonged (longer that two weeks) voice concern;
   b. sudden onset of hoarseness;
   c. prolonged hoarseness, roughness, breathiness, or lowered pitch on speaking;
   d. persistent cough;
   e. continuous feeling of globus (lump in the throat);
   f. continuous sinus drainage (not always a sinus issue, it can be reflux);
   g. voice fatigue;
   h. voice strain;
   i. unreliable voice;
   j. loss of high notes or endurance;
   k. effortful or painful speaking or pain during or after singing;
   l. issues in areas of *passaggio* (register changes) not previously experienced;
   m. the need to constantly clear the throat.

G. Stigmas
   1. It's commonly understood that physical athletes at some point in their career will sustain an injury that requires loss of participation. It's reasonable to expect that vocal athletes at some point in their activities may need assessment and guidance.
   2. Singers tend to blame themselves when they are diagnosed with a voice pathology or injury (I did.)
   3. Singers are inextricably linked to their voices; identity and self-esteem are profoundly tied to the singers' perceptions of their voices.
   4. This voice as "self" framework from which singers operate further complicates the psychological component of voice concerns and the willingness to seek medical help.
   5. Singers and teachers of singing must learn to advocate for themselves and their students in seeking optimal technical and medical guidance.
   6. Understanding voice hygiene, vocal health, and the possible necessity for medical evaluation is not just for the professional voice user. Singers in high school choral and theatre programs, church and community choir singers, and yes, barbershoppers can be harmed when experiencing voice issues.
   7. If there are lingering problems or concerns, seeking medical evaluation is always the wisest course of action!

V. A Singer's Guide to Vocal Care (Susan Vaughn)

A. How many of you own cars? How many of you ignore the warning lights on the dashboard? Those who raised your hands…you can leave now!

B. Robert Bastian, director of Loyola University Medical Center's Voice Institute at Chicago's Civic Opera House, conducted a study of 40 singers and found that the mean time that singers waited to schedule first exams after the onset of their vocal symptoms was a shocking 33 months—that's almost three years!

C. If you've had a voice problem that continues for 7-10 days schedule an appointment with a laryngologist or ENT voice specialist.

D. The most common voice damage arises in singers who have "The show must go on though I'm half-dead" personalities. They perform with laryngitis, and cause injury to their vocal folds.

E. During an hour of continuous singing, your vocal folds collide about 800,000 times. If these collisions are too forceful or the mucosa (tissues that cover the vocalis muscles or thyroarytenoid muscles) is infected or dry, the vocal folds may swell up. If you exacerbate this condition through vocal abuse or trauma, you could end up having to have surgery.

F. Many vocal problems can be caused by harmful vocal techniques, but more by speech-related issues.

G. Warning signs related to daily voice use:
   1. Do you allow yourself adequate warm-up and cool-down? If not, you may be risking vocal strain, fatigue, and decrease vocal range.
   2. Are you a chatterbox? Voice overuse can cause sustained injury.
   3. Do you have a hearty laugh? Loud laughter "snaps" the vocal fold open and closed—causing swelling.
   4. Do you attend loud parties or speak in noisy environments? You may be straining your voice to be heard.
   5. Do you speak lower or higher than your normal voice range? This can cause strain.
   6. Do you clear your throat of cough repeatedly? This can rupture blood vessels.
   7. Do you smoke or find yourself in smoky environments? First- and second-hand smoke cause redness and irritation of your vocal mucosa and dries your vocal tract.
   8. Do you vocalize with "harsh glottal attacks" or forcefully pronouncing each starting vowel? If it is too harsh, it can harm your vocal folds.

H. Misuse can cause nodules (callous-like growths) to form. Nodules often go undetected by singers because they may only affect the singing voice—not the speaking voice.
   1. Symptoms of nodules include inability to sing high notes softly, increased breathiness, reduced vocal endurance, prolonged warm-ups, and day-to-day variability of vocal capabilities.
   2. Nodules affect females more that males. Researchers aren't sure of the reason, but they theorize that this is because women's vocal folds are thinner and vibrate many more times than do men's vocal folds.

I. Vocal trauma and abuse can result in hemorrhage, which may result in the formation of a polyp (a projecting, swollen membrane) on the vocal fold.

1. Some polyps resolve after vocal therapy and rest, though most require surgical excision and scarring can cause permanent voice change.
2. Singers who use their voices heavily—particularly those who are high sopranos—must take extra care not to tax their voices to the point where vocal fold hemorrhaging might occur. Be safe and vigilant.

J. Do you suffer from chronic hoarseness? Hoarseness may be caused by vocal fold scarring, lesions, and other abnormalities on the edge of the vocal folds that impede vibration. See a doctor.

K. Singers as a group are susceptible to reflux.
   1. Those who perform at night often eat large meals shortly before retiring. If your bed is horizontal, stomach acid bubbles up onto the vocal folds.
   2. Drinking alcohol, especially before bed exacerbates this "bubbling."
   3. Effects of reflux in the morning include scratchy throat, bitter taste, coated tongue, heartburn, and hoarseness. Also, repeated throat-clearing, excess phlegm, and a feeling of a "lump-in-the-throat."
   4. To minimize reflux:
      a. avoid spicy food, citrus products, peppermint, tomatoes, caffeine (in coffee, tea, and soft drinks);
      b. avoid alcohol—especially in the evenings;
      c. eat smaller meals;
      d. reduce fat intake by limiting your intake of red meat and butter and avoid fried foods, chocolate, cheese, and eggs;
      e. don't eat within three hours of bedtime—in fact, do not lie down just after eating;
      f. don't wear clothing that is too tight around the waist;
      g. raise up the head of your bed six inches so that gravity will help food through your gastrointestinal tract.

L. Singers tend to be more affected by substances like dust, mold, artificial smoke, and fogs than other stage performers because singers inhale air more deeply and expel breath more slowly. The result is that toxic chemicals may remain in their lungs longer and in higher concentrations.

M. Health Advice
   1. Dietary Tips
      a. Because vocal folds vibrate against each other 100 to 1400 times a second, and require constant lubrication, it's important that you drink lots of water throughout your day and avoid caffeinated or aggravate reflux. Pee pale.
      b. Some singers are adversely affected by milk and milk products.
      c. Others are negatively affected by alcohol.
      d. Avoid "fad" diets.
   2. Medication Tips
      a. Antihistamines, oral decongestants, and diuretics can dry and thicken secretions, causing your vocal folds to be more vulnerable to injury.
      b. Antidepressants can prompt these negative side effects too.
      c. Aspirin, which thins the blood, can cause vocal hemorrhaging, particularly if you take it while coughing.

d. Some vitamin and herbal remedies also thin the blood such as: dong quai, willow bark, primrose, garlic, vitamin E, gingko biloba, and ginger.
e. Oral contraceptives and other medications can permanently masculinize a woman's voice. So, if you are taking birth control pills, be sure they don't contain androgens or a high progesterone content.

3. Traveling Tips
   a. Minimize your speaking while in flight, and drink extra water. Noise levels on planes can reach 92 dB; trying to be heard over that noise can greatly stress your voice.
   b. The stress of flying can affect your voice and bodily strength. Try to rest before and after flights.
4. Vocal Rest
   a. Some singers worry that prolonged rest may cause "vocal fold atrophy," but this isn't so if "absolute voice rest" is undertaken for no more than two weeks. Might the vocal folds be a little weak? Yes, but it will not approach the level of "atrophy."
   b. Absolute voice rest is rarely used except in very serious conditions like a mucosal tear, vocal hemorrhage, scarring, or polyps.
   c. Don't whisper or whistle. They can be as taxing to your vocal folds as singing.
   d. Instead of whispering, you can use intimate speech.

N. Anesthesia during surgery
   1. Try to avoid procedures that require general anesthesia.
   2. Standard intubation requires running a tube down the throat past the vocal folds and into the lungs.
   3. If you must have general anesthesia ask for the smallest endotracheal tube for your procedure that will keep you alive so damage to your vocal folds is decreased.
   4. Better yet, ask your anesthesiologist if a diaphragm will work for your surgery.

VI. Major Benefits of Semi-Occluded Vocal Tract (SOVT) Exercises (Ingo Titze)

A. Voice therapy with a semi-occluded vocal tract has a long history. The use of lip trills, tongue trills, bilabial fricatives, humming, and phonation into tubes or straws has been hailed by clinicians, singing teachers, and voice coaches as helpful for training and rehabilitation. SOVT is used by vocal pathologists to repair damaged larynges as well as strengthen and develop a freely-produced vocal sound. Its main proponent and authority today in Ingo Titze.

B. Read the email from my student that I got in the middle of writing this class.

C. How SOVT works
   1. The upper portion of the vocal fold is spread apart, proportional to the steady pressure that is built up in the supraglottal vocal tract, behind the semi-occlusion.
   2. The medial surfaces of the vocal folds can become parallel without pressing the vocal folds together if cricothyroid and thyroarytenoid muscle activities are balanced.

3. Phonation threshold pressure is lowered with parallel and slightly separated vocal fold surfaces.
4. Vocal fold vibrational amplitude and collision forces are reduced with slightly separated vocal folds, allowing lung pressure and fundamental frequency to be taken high in a pitch glide. The stretching of the vocal folds strengthens the vocal ligament for better control of, and access to, high pitches.

5. The first resonance frequency is lowered to around 200 Hz, which means that the lower-frequency harmonics can benefit from vocal tract acoustic inertance in a range from 200—1500 Hz. The approximately equal reinforcement of harmonics helps to avoid register instabilities and supports mixed registration. **"Inertance" is the ultimate result of the balance between breath pressure from below the vocal folds and acoustic back pressure above the vocal folds.**
6. The acoustic inertance of the vocal tract also lowers the phonation threshold pressure.

D. The beauty of the exercises is that most of these effects occur simultaneously without much voluntary adjustment. The system self-regulates. For example, higher lung pressure produces larger vibrational amplitude, but higher lung pressure also produces more vocal fold separation. The combined actions leave the contact stress regulated at a low value. More lung pressure (support) can then be added to increase the amplitude without creating more collision.

E. Whenever semi-occlusions are discussed in pedagogic and clinical circles, the questions arise regarding the diameter, the length, and the material of the tube or straw.
   1. The diameter of the straw is the most critical component. A small diameter produces the greatest flow resistance, and hence the greatest oral pressure.
   2. A longer tube produces slightly more acoustic inertance, but the effect is secondary because a semi-occluded vocal tract is already inertive.
   3. The material of the straw or tube (plastic versus glass or metal) matters little. Both have much greater wall stiffness than vocal tract soft tissue and therefore do not yield much or absorb much energy at the walls.
   4. A plastic straw can be pinched to further regulate the resistance.
   5. Some practitioners use multiple parallel thin straws (coffee stirrers), beginning with three and gradually working toward one if variable resistance is needed to adapt to the "bottled-up" feeling. If the straws are too thin, air will not be "funnel" to the mouth and out the straw. The air will go into the nasopharynx. Experiment with proper direction by holding your nose and removing straws until it feels balanced.
   6. The last question that generally arises pertains to the use of a glass of water to terminate the distal end of the tube or straw with a higher flow resistance (water versus air). Aside from the air bubbles that are created, the effect of which I have not studied in reference to laryngeal function, the higher resistance can be obtained equivalently by using a smaller diameter straw. The unsteadiness of the pressure associated with the air bubbles does spread to the larynx, producing a low frequency modulation that may, or may not, have therapeutic value.

F. **How to use the straw effectively. (Don Campbell)**
   1. Always use a good singers posture by standing tall and keeping your head balanced on your shoulders and not "turtling."
   2. Use a straw that has a smaller diameter than the ones in the fast-food chains—preferably .5mm or smaller. Vocal pathologists often use a coffee stirrer, but I've found that for me that creates too much back pressure and can create inappropriate tension, *which is not our friend.*
   3. Cut the straw in half. For me, not doing so creates a weird, unpleasant vibration in the straw. Plus, it doesn't use as many straws over the long haul.
   4. When putting the straw in your mouth, be sure to have your tongue under the straw with the tip of your tongue touching the back of your bottom front teeth. If your tongue is pulled back as if you are sipping a soda, the back of your tongue is pushing down on your epiglottis and partially covering your larynx. It will also create inappropriate tension, which, as we now know "*is not our friend.*"
   5. Using gentle phonation, hum into the straw at a comfortable pitch range with narrow pitch glides (glissandi) up and down. You can do these narrow glides in your low range and middle range.
   6. Gradually, increase the range distance from the "chest" voice through the mid-range and into the "head" voice. You can also start in your higher, light "head" mechanism and do downward glides. As you use the higher registration, allow the vocal folds to thin out. Avoid trying to ram the heavy "chest" mechanism into the upper registration. The sound you are aiming for is one voice—not three separate ones.
   7. Repeat. Avoid strain and over-singing.
   8. Other variations to use with the straw are to:
      a. sing stepwise vocalises that are within a fifth—increasing range slowly.
      b. sing simple songs that are in your comfortable range and then to sing them in different keys;
      c. sing the songs you are working on in the correct keys;
      d. use the vocal warm-ups your director has you sing in rehearsals.
   9. Some suggestions and cautions:
      a. go slowly;
      b. if there's pain, you're doing something wrong;
      c. experiment with different diameter straws;
      d. keep your tongue forward and your larynx comfortably low at all times…*because inappropriate tension is not our friend.*

G. Ingo Titze demonstration https://www.youtube.com/watch?v=0xYDvwvmBIM

H. See Don Campbell's article in the *Harmonizer*, March/April 2021, p.21.

VOCAL DEFINITIONS

HISTOLOGY

Histology, also known as microscopic anatomy or microanatomy, is the branch of biology that studies the microscopic anatomy of biological tissues. Histology is the microscopic counterpart to gross anatomy, which looks at larger structures visible without a microscope.

JITTER

Jitter is a measure of the irregularities in the frequency at which the vocal cords vibrate. Even when one tries hard to sing a particular note and keep it at a constant pitch, there will always be slight irregularities in the speed at which the vocal cords are vibrating and hence the pitch over time. Singers can sometimes notice this when they are tired for example. With training, singers work to minimize these irregularities, or Jitter, in their voice. There are several ways to calculate the magnitude of the Jitter and this is measured in OperaVOX as the percentage change in the frequency of consecutive vocal cord vibrations from their common average. The higher the Jitter and the more abnormal the voice sounds. High values of jitter (more than 1 or 2%) can indicate a problem with your voice such as throat inflammation for example. High Jitter can be caused by several conditions that affect the vocal cords, including nodules, polyps, and weakness of the laryngeal muscles. If you are a singer, you will want a very stable voice and therefore very low jitter measurements. (*OperaVox is a multi-dimensional voice-measuring program.)*

SHIMMER

Shimmer is calculated by measuring the change in loudness, or amplitude, over several sound waves generated by the vocal cords vibrating. OperaVOX measures the average (absolute) difference between the loudness of consecutive vocal cord vibrations divided by the common average. Shimmer is a measure of the irregularities in the loudness of a particular pitch over time. Even when one tries hard to sing a particular note and keep it constant, there will always be slight variations in its loudness over time. It is a measure for the short-term irregularities of vocal fold vibrations. In a similar way to Jitter, Shimmer is calculated by measuring the change in loudness, or amplitude, over several sound waves generated by the vibration of the vocal cords. OperaVOX measures the average (absolute) difference between the loudness of consecutive vocal cord vibrations divided by the common average. An increased Shimmer (above 3%, for instance) can be the result of several conditions that affect the vocal cords, including nodules, polyps, and weakness of the laryngeal muscles.

PRESBYLARYNGIS

As we age, muscle begins to atrophy. The vocal folds are composed of several important layers of tissue, but the fullness and shape of the vocal folds comes from the vocal cord muscle. Age-related vocal fold changes may include loss of volume and bowing (inward curvature) of the vocal cord inner edges, a condition termed presbylaryngis or presbyphonia. This may lead to a gap between the vocal folds during speaking, and other muscles may subsequently squeeze more tightly to compensate for reduced vocal fold closure. Other age-related changes to voice may be related to changes in hormones or mucous glands.

What are the symptoms of presbylaryngis? Voice changes due to vocal fold atrophy are common in people over the age of 60 years. The most common symptoms include:

- Reduced vocal volume;
- Higher pitched voice;
- Breathy, “thin” sound;
- Increased speaking effort;
- Vocal fatigue;

- Difficulty communicating with friends and family (especially with noise in the background or on the telephone)

Presbylaryngis Treatment
If you are diagnosed with vocal fold atrophy or presbylaryngis, voice therapy with a speech-language pathologist is the most common treatment. By focusing on improved vocal technique and better breath support, many people experience improvement in vocal volume, quality, and endurance.

In some cases, your treatment team will discuss with you whether or not vocal fold augmentation is appropriate. This involves the injection of filler into one or both vocal folds to achieve straighter vocal fold edges and allow better vocal fold closure. Our experts have special expertise in performing this procedure in the clinic under local anesthesia.

PRESBYPHONIA
Presbyphonia is a term used to describe the age-related changes that can affect an individuals' voice. As we age, the acoustic characteristics of our voice changes. Muscles can decline in strength and elasticity can be lost (age related muscle atrophy), this can cause the vocal folds to bow and therefore cause changes to the voice. This can be dependent on the chronological age of the individual and the demands made on the voice. Voice problems may be more apparent when attempting to sing, exerting the voice or especially in professional voice users. Symptom severity can vary from person to person.

People with presbyphonia may experience some of the following symptoms:
- ♪ less efficient speech: this may present as shaky, squeaky, weak, rough and hoarse. But it can vary from one person to another;
- ♪ speech may sound rushed and breathy;
- ♪ reduced control over the voice: pitch, range and volume may appear reduced and voice quality may appear generally deteriorated;
- ♪ occasional or frequent breaks in their pitch;
- ♪ laryngeal tension;
- ♪ speech may worsen towards the end of the day;
- ♪ unable to sustain adequate volume in a noisy environment;
- ♪ vocal folds can swell (oedema) and cause the pitch to drop

Treatment/Therapy—The overall aim of therapy is to improve the quality or the individuals' voice and for their voice to become optimum. With therapy, the hope is to: improve muscle strengthening, increase good vocal behaviors, and increase confidence in vocal ability.
This is done through:
- ♫ promoting good vocal health and hygiene;
- ♫ reducing vocal abuse (e.g. reducing coughing and throat clearing);
- ♫ vocal warm up exercises;
- ♫ decreasing tension in the larynx, around the neck, and in the shoulders;
- ♫ increasing speaking volume/projection;
- ♫ relaxation;
- ♫ breathing exercises to improve breath support.

If you notice any soreness or discomfort of the vocal tract after a practice session, you are attempting the tasks with too much force.

SPASMODIC DYSPHONIA (This is what RFK Jr. has.)
Spasmodic dysphonia, also known as laryngeal dystonia, is a neurologic disorder that can affect the voice and speech. It is a lifelong condition that causes the muscles that generate a person's voice to go into periods of spasm. It results in involuntary spasms of the muscles that open or close the vocal folds, causing a voice that presents with breaks and strained/strangled quality or breathy quality, depending on the type of spasmodic dysphonia (adductor or abductor). In some cases, the disorder is temporary or can be improved through treatment.

SEMI-OCCLUDED VOCAL TRACT (SOVT)
"**How Voicing through a Straw Can Save Your Vocal Folds" by Megan Miller**
https://operacarolina.org/news/how-voicing-through-a-straw-can-save-your-vocal-folds-2/

As a voice therapist, I am frequently asked to name the "best" exercises for the voice. Without hesitation, I always give this "best" distinction to a category of exercises called semi-occluded vocal tract exercises (SOVT). There are several variations to these exercises including: voicing through straws of varying lengths and diameters, humming /voicing on nasal consonants ("m," "n," etc), lip or tongue trills, voiced fricatives ("z," "v," etc), raspberries (labio-lingual trills), or rounded lip vowels such as "o" (as in "boat") and "u" (as in "boot"). The really good news is that if you have ever had a voice lesson, you've probably been doing this in some form or fashion for years!

SOVT exercises are just as beneficial to healthy vocal folds as they are to injured vocal folds and they are applicable to a myriad of voice disorders. They are extremely "user-friendly" and some variations are even gentle enough to be used with the resumption of voice use following vocal fold surgery.

How do they work? The full technical description of the acoustic and aerodynamic benefits of these exercises is beyond the length and scope of this article. For more information about these benefits, see any of the references listed below. Dr. Ingo Titze has headlined the majority of the research on SOVT exercises. You can watch him demonstrate some of these here: https://www.youtube.com/watch?v=0xYDvwvmBIM.

In a nutshell, SOVT exercises create a narrowing at some point along the vocal tract, introducing a resistance that generates "oral pressure that interacts with the lung pressure in such a way that optimal vocal fold vibration can be achieved" (Scearce, 2016). Specifically, the vocal folds come together with a neutral degree of pressure (not too pressed or too breathy), again making this a very gentle way to establish voicing.

While SOVTs come in many forms, the "crown jewel" of these exercises is by far voicing through a small-diameter straw, i.e. a coffee stirrer or cocktail straw. Leda Scearce, MM, MS, CCC-SLP, provides a nice summary of the research and mechanics behind this in her book *Manual of Singing Voice Rehabilitation: A Practical Approach to Vocal Health and Wellness (2016).* She outlines how this particular task helps to facilitate optimal breath support, quickly engages the respiratory muscles, helps the vocal folds to collide more gently during vibration, and reduces the amount of air pressure required to set the vocal folds into vibration (Scearce, 2016). Voicing through a small-diameter straw also elongates the vocal tract, optimizing it to reinforce the acoustics and aerodynamics of the vocal fold vibration and essentially training the vocal tract to do the same thing without the straw (Titze, 2010). For weak vocal folds, this can also help reduce compensatory strain and promote an ideal balance between engagement of the thyroarytenoid muscle (muscle that makes up the bulk of the vocal folds, most actively engaged in chest register) and cricothyroid muscle (muscle responsible for pitch changes, most actively involved in head register) so that maximal vocal fold closure is achieved

without excess effort (Scearce, 2016). So not only is this a gentle way to produce voicing, it is one of the best ways to improve the efficiency of voice production while minimizing strain.

What do you do with them? Truthfully, you can do almost anything with them—maximally-sustained single pitches, specific or non-specific pitch glides, messa di voce on single pitches, and any number of arpeggios or scale patterns. For skilled singers not currently experiencing an injury, this could be complicated scales or musical patterns from their current repertoire. For injured or untrained/minimally-trained singers, the vocalization patterns can be less complex, matching the degree of the singer's current abilities and increasing in complexity as technical abilities improve. You can begin with straw phonation, advancing to lip or tongue trills, and then moving into nasal consonant-vowel combinations or words. That's one of the beauties of these particular exercises – they are endlessly adaptable to meet the individual singer's needs. The possibilities are infinite. They are so flexible and user-friendly, in fact, that I consistently use these with all my voice patients—not just the singers.

So grab a straw and vocalize away! Your vocal folds will be stronger and more coordinated because of it!

Additional information:
http://www.isingmag.com/2016/10/24/vocal-nerds-semi-occluded-vocal-tract-exercises/
http://www.voicescienceworks.org/sovt-exercises.html

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Instructor Expectations:

- A willing and teachable spirit along with a confident attitude is necessary for every director—novice or expert. I'm here to provide opportunities for your development and success. Don't let new ideas put you on the defensive. We're here to experience together what the current science says about the voice.
- I may offer suggestions that differ from other instruction you have previously received. Try it to the best of your ability—then when you get home, keep what works for you and throw out what doesn't.
- Join in on the discussions. Your input, observations, and questions are essential to the success of the class.

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