The SVS and working with blind patients: Tools and Stradegies

I am a singing voice specialist, whose specialty is teaching people who are blind or have vision loss. I would like to present a workshop in this area. I have been a voice instructor at the Filomen D'Agostino Greenberg Music School at Lighthouse International since 1995. (In addition, I have taught other areas at the Lighthouse since 1985) The definition of vision loss is as follows: people who, with the aid of glasses and/or contact lenses, cannot see visual images such as print from a book, newspaper or a crosswalk clearly. These images still appear distorted, blurred or incomplete. If the vision loss is total, it is called blindness.

The demonstration will begin with how does one introduce a student with vision loss to a new environment such as your studio.

In addition, conceptual differences between totally blind and visually impaired students will be discussed. How do the vocal pedagogical techniques differ between teaching a student who has never had vision with a personal who has some vision, or recently lost his or her vision? The concepts of shapes are different. The hands on approach are more readily applied with regards to a more kinesthetic approach to teaching.

There are different types of vision loss and these different areas effects the individual approach to teaching singing. Some of these visual disabilities are cataracts, glaucoma, macular degeneration, retinopathy, retinitis pigmentosa, and CMV.

In order to adapt to the different vision losses, the printing of either Braille music, or print materials must be adapted in order to fit the needs of the student. Areas such as contrasting print, point size, spacing, fonts, margins, paper finish, etc. will be discussed, in addition to describing the various audio devices and video magnifiers that aid the students.

I can bring some of my students from the Lighthouse to Philadelphia, and/or students from the Foundation can be presented to me.

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Core Stabilization and Vocal Exercises: Combining Best Practice for Enhanced Performance in Vocal Athletes

Core (dynamic) stabilization exercises have been given a great deal of attention in recent scientific and popular literature. Most evidence supports the utilization of dynamic stabilization exercises to enhance muscle strength and endurance in the abdominal and lumbar regions. Dynamic stabilization exercise programs have also been correlated to enhanced performance and decreased injury rates in elite athlete populations. Professional singers, especially musical theatre performers, are considered to be vocal athletes. Possessing strong and less fatigue-able core stabilizers has been anecdotally connected to improved phonation, lower levels of fatigue, and greater choreographic range.

The purpose of this workshop is to translate current research regarding core stabilization exercises into meaningful training programs for vocal athletes. The first section of the workshop will include evaluative tests of core muscle strength, muscle length and muscle endurance. The second section of the workshop will include education, performance and progression of core stabilization exercises using clinical tools such as Physioballs™, Theraband™, BOSU™ balls, foam rollers, Body Blade™, and SRF™ System. The third section of the workshop will incorporate vocal exercises with the stabilization exercises, mimicking the functional needs of the voice-body system during performance of choreographed singing.

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The Accent Method:
Foundations and Applications to the Voice Studio

The Accent Method is a highly effective set of exercises based upon improving the coordination of the respiratory, phonatory, resonatory, and articulatory systems. If this method is chosen for use in the voice studio or in voice therapy, it is imperative that the correct underlying bases and activities be understood and validly reproduced as intended by the original creators of the method. A distortion of the protocol will result in decreased effectiveness.

The Accent Method's applicability is wide-spread, as it can be used with performers of all ages and experience levels and for both healthy and pathologic voices. It is a "user-friendly" choice for any performer or vocal pedagogue, in particular, because it draws upon our "user" knowledge gained through years of singing and focuses it specifically on more efficient vocal production, or "more bang for the buck". It also helps ensure safe and healthy vocal production, thus reducing the likelihood of future vocal pathologies.

As both a professional singer and a licensed speech-language pathologist, I have used the Accent Method with a variety of singing students and patients with voice, resonance, and/or articulatory impairment with great success over the past 10 years. It is quickly learned and includes advancing levels of complexity correlated to fine-tuning this coordination that is so crucial to healthy voice and speech production. I would like to propose this session as a workshop session held at the AVA, to include active participation by the audience.

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New Developments in Inverse Filtering

Inverse filtering to obtain an approximation to the glottal airflow waveform, as developed almost 50 years ago by Jan Gauffin and others, used the output of a microphone as a source. Though using an oral volume velocity (mask signal) waveform offers certain advantages over a microphone, recent developments have made the use of a microphone signal a practical and less expensive alternative for many applications. An inexpensive omnidirectional electret microphone placed close to the mouth, with a simultaneous electroglottograph signal to aid in the adjustment of inverse filter parameters, can yield a glottal flow waveform accurate to frequencies higher than those attainable with a mask, meaning a better fidelity and a usefulness at a higher ranges of pitches, such as those found in singing. Though the zero level is not obtainable with a microphone, a rough amplitude scale, in liters per second, is obtainable, if the proper technique is used. This workshop will take participants through the implementation of microphone-based inverse filtering and a methodology for adjusting inverse filter parameters.

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Posture For Singing, How And What Do We Teach?

It is commonly assumed that posture is essential for optimal singing. Many clinicians and singing teachers stress 'ideal posture' in their teaching, insisting that the singer 'stand up straight, chin up, chest up, stomach in'. This 'ideal' however is not only static but does not allow for the dynamic movement involved in gesture, let alone moving around on stage. It is derived from a military tradition of soldiers on parade and medicalized by German physicians Braune and Fisher in 1897. Good posture must be dynamic. It depends on the musculoskeletal coordination of the individual in movement. Imbalance leads to increased tension.

How then can one teach posture in the voice studio or in the voice therapy room? How can the teacher identify musculoskeletal imbalance? What are the elements of the singers stance or movement that the teacher, or clinician that signify imbalance? How does one bring about the small changes in physical organization that are needed for good vocal production?

This workshop will explore these questions. Using a 'hands-on' interactive approach, this workshop will explore how to recognize those aspects of musculoskeletal imbalance (a poorly organized system) that negatively impact the physiological and biomechanical efficiency in a singer. Several specific techniques will be explored. These techniques can be adapted by participants to facilitate students/clients in developing the self-awareness necessary to regain the coordinated movement and physiological and biomechanical efficiency needed for optimal freedom in singing.

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Accent Reduction and the SLP

Can accent reduction help you advance your career and/or benefit your clients? Accent reduction targets functional communication for foreign-born professionals. A holistic approach to accent reduction focuses on development of skills such as clear production of consonants and vowels, stress patterns, rhythm, intonation patterns and body language of American English. Two NYC speech language pathologists share their most effective and convenient ways for targeting accent reduction. Specific attention will be paid to why SLP's backgrounds and skills work well when training this population.

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Lisa Patti, M.S. CCC-SLP, Speech Language Pathologist, Sound Speech International, New York, NY, (917) 693-0577, lmpatti21@yahoo.com

Go Figure: Estill Voice Training™ for the Voice Studio & Clinic

Estill Voice Training™ (EVT) is a revolutionary method of teaching voice developed by Jo Estill that integrates pioneering scientific research with the artistic study of voice. The purpose of this Estill Voice Training workshop is to demonstrate select Compulsory Figures for Voice Control™ and apply them to common problems encountered in the singing studio and singing voice therapy. Workshop participants will have the opportunity to produce select figures, describe the underlying anatomy and physiology, and apply them to drama, music, or voice therapy programs. The Compulsory Figures for Voice are unique exercises that address power, source and filter properties of voice production, and include: retraction of the false vocal folds for healthy voice production; narrowing of the aryepiglottic sphincter for twang resonance in opera, belting, & the rehabilitation of hypofunctional voice disorders; and, changing vocal fold mass for register variation. Since an integral part of Estill Voice Training is the connection of the sound of the figures to the acoustic image in the spectrogram, participants also will learn how a customized acoustic program is used as a visual feedback tool. Participants are encouraged to volunteer their voices, teaching and/or therapy challenges during the session.

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An Integrated Approach to Unlocking Muscle Tension Dysphonia

Dysphonic patients often encounter frustrations in the medical management of their condition when no obvious structural cause of their dysphonia is apparent. The consequences of this condition involve an inability to perform in the workplace or participate socially. Laryngeal muscle tension and associated elevation of the larynx at rest is a common clinical presentation in such patients and requires specific attention to resolve voicing issues in both the short and long term.

The treatment strategy involves a three-pronged approach

- Local manual therapy addressing muscle tension in the supra hyoid perilaryngeal muscles to assist cricothyroid joint mobility and lower the resting position of the larynx. In the short term this provides an environment in which normal voicing can be achieved.
- Speech therapy to maintain improved biomechanics at a laryngeal level and eradicate any poor voicing patterns that may have developed at a local level.
- Analysis of the periabdominal muscles whilst voicing to ensure appropriate subglottic pressure levels. This is achieved through the use of real time ultrasound analysis whereby abdominal muscle patterns are observed and corrected if variations from normal sequences are apparent. Poor recruitment patterns inevitably have consequences at a laryngeal level.

The approach utilised to achieve each component will be demonstrated with anatomical, physiological and recent literature review provided to illustrate the rationale and practical management behind this management approach.

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Integrated Voice, Speech, and Movement Explorations Supported by Laban Movement Analysis

Rudolf Laban, the originator of Laban Movement Analysis, was an Austro-Hungarian dancer, choreographer, teacher, philosopher, theorist, and writer whose life spanned from 1879-1958. He is still considered the most important movement theorist from the 1900's to present time. Laban Movement Analysis (LMA) is a theoretical framework for observing qualitative and quantitative changes in movement ranging from conversational hand gestures to complex actions. Laban shunned the idea that the study of expressive movement was only the purview of the dancer or gymnast. Instead, he was dedicated to bringing opportunities to explore movement to individuals from all walks of life. Laban developed his theories and practices through observing how the human being moves as its physical condition, environment, cultural influences, and communication with other people affects it physically and emotionally.

  Using LMA as a backdrop to investigate my own ideas, my contribution to the field has been the development of a fully integrated system of training in voice, speech, and movement. During individual and group explorations, the participants will experience the interplay among LMA concepts of Effort, Space, and Shape integrated with breath support, voice, and articulation. The purpose of the integration is to simultaneously develop functional and expressive communication skills that are whole-bodied. The value of unifying body, voice, and speech through LMA is pertinent to individuals from many professions and can benefit anyone interested in explorations in expressive, clear communication.

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Standard Pedagogy and Technique For the Female Belt Voice

In this workshop I will explain, in detail, a new pedagogical approach to the female belt voice that is easily understandable for all voice care professionals. The purpose is to clarify the teaching of the belt voice so that more teachers will confidently know what they are doing and more singers will avoid vocal injury. Topics covered will include:
Standard vocal technique for women
The breaking of the rules for belt voice
Human anatomy and physiology and the relation to voice type
The importance of voice type when identifying belt ability
The difference between belt voice for contraltos, mezzos, sopranos and coloraturas
Understanding the concepts of super belt (high belt), belt passaggio and the yell track
The relationship between legit voice and the belt voice
Introducing, "The Octave Rule: A Guide For How High You Should Belt"
Application to repertoire
Implications of the chosen song key
This workshop can involve 2 singers as examples or can be done solely as a powerpoint presentation with recorded examples. If singers are used, a piano and pianist would be required.

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BUZZY CHILD- Resonant Voice Therapy That's Fun

Goal: Following the principals of motor/cognitive learning, participants will observe the presenter model key components of "BUZZY CHILD," experience hands-on exploration of these key components and also experience differences and sameness of instruction depending upon the "developmental age" of the child.

Rationale: More than five million school-aged children in the USA are diagnosed with voice disorders C. Sapienza et al.). Data suggest vocally exuberant children often grow into vocally exuberant adults. "BUZZY CHILD" facilitates an early awareness of voice use and care without the "NOs" of traditional voice therapy. Children learn how to use their voices strongly, while limiting injury and helping to heal the existing injury. "BUZZY CHILD" facilitates children internalizing this learning to be able to access and employ it throughout their lives.

History: Leslie S. Kessler and Katherine Verdolini-Abbott et al. developed "BUZZY-CHILD" incorporating the framework of "Resonant Voice Therapy", (Verdolini-Marston et al. 1995) with age-appropriate alterations honoring research focusing child vs. adult learning. Among the differences are the children's lack of specific sensory, cognitive and language-based knowledge and experiences which require significant experiential learning.

"BUZZY CHILD" has been in development, tested and used at *The Voice Experience*, in the Washington, D.C. area; for the past 10 years, with children three years up and is divided into two levels based on "developmental age.

Pediatric Voice Therapy should be based on current theories of motor/cognitive learning, systematic flexible and FUN. "BUZZY CHILD" is designed to meet those objectives.

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Katherine Verdolini-Abbott, Ph.D CCC-SLP, Assoc. Professor Communication Sciences & Disorders, School of Health & Rehabilitation Services UPMC, UPMC 1400 Locust St. Pittsburgh PA15219, (412) 232-3687, KAV25@pitt.edu

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Rita Hersan, M.S.,CCC-SLP, Speech-Language Pathologist, UPMC Voice Center Dept. Otolaryngology, UPMC 1400 Locust St. Pittsburgh PA15219, rihersan@yahoo.com

Data done right: Avoiding common mistakes in aerodynamics

Do you use aerodynamic assessment in your voice laboratory? Do you want to but need a primer? This workshop will demonstrate the proper use and set up of equipment to collect air pressure and air flow signals. You will learn how to give effective instructions, troubleshoot problems during data collection, and how to decide which trials to select for analysis. We will explain the assumptions behind the methods, common pitfalls, and simple solutions to error-free data collection. You will learn how (and why) to determine laryngeal airway resistance and phonation threshold pressure. Come to this workshop to learn how theory translates to practice and how to interpret aerodynamic data to make the most of your clinical or research voice assessment.

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Nancy Pearl Solomon, Ph.D., Research Speech-Language Pathologist, Walter Reed Army Medical Center, 6900 Georgia Avenue NW, Washington DC, (202) 782-8597, Nancy.P.Solomon@us.army.mil

Management of Tongue Tension in singers: Strategies and techniques for addressing muscle tension issues related to the tongue

The vocal tract contains numerous muscles, the contraction of which have the ability to negatively or positively affect articulation, resonance, and efficiency of phonation. The tongue comprises a significant portion of these muscles; thus, the optimal balance of muscle activation and relaxation in this organ is essential for developing and maintaining a healthy, efficient vocal technique.

The location of the tongue and the interrelatedness of its musculature enable it to potentially impact the function of the jaw, velum, pharynx, and larynx. As a result, a pedagogical approach that focuses directly on the tongue can have a wide-ranging impact on technical outcome. This lecture/demonstration will encompass: (1) presentation of information regarding the identification of technical issues related to the tongue, (2) instruction for specific methods that are both directly and indirectly effective in remediating these issues, and (3) application of the suggested strategies and techniques within the context of a brief master class.

*Note: I have authored a paper on this topic that is "in cue" for publication in the Journal of Singing. I can provide this document for the Symposium review committee if samples of content presentation would be helpful.

Dr. Carla LeFevre, School of Music, University of North Carolina at Greensboro, 336-854-4189, 336-202-5057, carlalefevre@aol.com

CHARACTER VOICE: the voice *arrives* from the whole body

Building on the basic principal that the whole body speaks, the notion of how to build a character voice will be addressed, both in professional coaching anecdotes, and in experiential exercises coached by Bull for the attendees of the workshop. Those attending will explore character voices from sample texts provided.
Actors attending can also bring texts with them to be used for coaching.

The workshop will be divided into two parts:

I. The exploration of the instrument and the use of gravity as a guide for release and support.

II. The application of the whole body, gravity based approach to character voice development.

Katie Bull draws from various sources when coaching character voice work.
First, she credits the wisdom of her primary mentor Chuck Jones, who used to emphasize that, when wanting a character voice, it's important to find the body of the character first, and let the voice come from the body.

In addition, she draws from her explorations as a jazz singer, and composer; as a post-modern dance improvisor; and as a writer and director with an interest in the visceral impact of poetic language & Jungian and gestalt based notions of the parts of "self," and archetype .

Issues of the impact of extreme character voice demands upon vocal health will be addressed, and the notion of a gravity based exploration as primary, will be introduced .

Katie Bull, BFA Theater Arts, Head of Vocal Production, Atlantic Theater Company
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The Acoustics of Male *Passaggio* Training

Awareness of the acoustic registration events caused by changing interactions between the lower harmonics of the voice source and the first formant of the vocal tract can assist both teacher and student in developing a smooth, comfortable transition through the passaggio into the upper range of the male voice. This workshop will demonstrate how knowledge and anticipation of these events can form the basis for effective pedagogic strategies. Stable vocal tract length is necessary for timbral consistency throughout the F0 range, since this determines the general location of all formants, including the singer's formant cluster. However, upon ascending the scale, untrained males tend to shorten the vocal tract, apparently to preserve the strong first formant/second harmonic (F1/H2) relation, resulting in "yell" timbre. If the vocal tract is kept stable during pitch ascent, the "yell" is avoided by allowing the second harmonic to pass through and above the first formant, creating the timbral shift referred to as covering or "turning over," and avoiding the laryngeal muscular adjustments associated with pressed phonation. The variety of first formant locations across vowels creates opportunities for developing effective strategies for training the male passaggio.

In this workshop, participants will:

1.	Become familiar with the harmonic-formant interactions that occur through the male passaggio;
2.	Have experience in discerning the vocal "turn" as volunteer singers learn to keep their vocal tract shape constant through the H2/F1 crossing; and
3.	Learn pedagogic techniques used in implementing this approach to passaggio training.

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Why and How to integrate Rock and Roll in your Voice Studio

Opera America currently lists 137 opera companies in the United States. On the flip side, The Indie Venue Bible, a leading contemporary music journal, lists over 26,000 live music venues from New York to Los Angeles. The number of opportunities for the Contemporary Commercial Music (CCM) singer has greatly expanded over the past few decades. Despite this development, the teaching profession has been slow to embrace the notion of vocal training geared to the specific needs of the CCM singer. There is no doubt that classical vocal training can serve well as a fundamental basis for many styles. However, a strictly classical approach, by its very nature, inhibits exploration of alternative registration and resonance strategies necessary for today's rock timbre and style. Furthermore, CCM singers who study voice with classically oriented teachers may find that traditional vocal exercises largely fail to expand the skill set required to achieve their goals.

Participants of this workshop will be exposed to the basic physiological and pedagogical differences between Rock and Classical voice production; and will explore beginning exercises for incorporating this style in the studio without compromising vocal health.

This presentation will require a piano and demonstration student, preferably with some background in contemporary commercial music repertoire. A PA system or amplifier and microphone would also be helpful.

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Kathryn Green, DMA in Voice Performance, Professor of Music, Shenandoah University, 1460 Universtiy Drive/Winchester/VA/22602, (540) 666-54556, kgreen@su.edu

The Dante Pavone Breathing Exercises

Developed by the internationally renowned singing instructor Dante Pavone, the Pavone Breathing Exercises are based on the Italian appoggio technique and are designed to establish abdominal and lower back breathing, an advanced level of expiratory breath control and an optimal raised rib posture for singing. The protocol consists of three breathing exercises which are practiced in a particular sequence over a specific period of time. The exercise protocol, when performed as directed, provides for easy generalization of posture and breath control techniques to stage and studio and is appropriate for all styles of singing. Dante was especially known and appreciated for his instruction in commercial singing techniques.

The workshop will include 1) a brief discussion of the anatomical and physiological rationales for the Pavone Breathing Exercises, 2) demonstration of and instruction in the exercises with workshop attendees, 3) applications and modifications for the singing studio and voice clinic, and 4) most important , group participation !!!!

Handouts will be provided.

Karen Kochis-Jennings, Ph.D., M.A., Professional Diploma Vocal Performance, Assistant Professor ; Voice Therapist ; Singing Teacher, California State University, Northridge ; Cedars Sinai Voice Clinic; Karen Jennings Vocal Studio, California State University, Monterey Hall, 18111 Nordhoff Street, Northridge, CA 91330 , (323) 644-1758, karen.kochis-jennings.32@csun.edu

Rehabilitation of the Injured Singing Voice - Collateral Damage

Singing Voice specialists work with many types of disorders. The most common are those that directly affect the vocal folds such as: (1)nodules, (2)polyp, (3)cyst, but to name a few. However, because the entire body is the voice, any surgery or life issue that takes us out of homeostasis has the potential to alter the systems balance of voice. For the purpose of this workshop we will refer to these things as indirect causes that affect the vocal folds. One of the questions that I most often hear from patients is "If I'm medically cleared, why is my voice still having trouble? This workshop will give practical exercises and approaches for working with these indirect cases. The specific cases that will be presented here include: (1) post goiter removal, (2)pregnancy, (3)jaw surgery (pre and post) and (4)post cancer surgery/treatment.

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Training the Rest of the Voice—for Singers who also *Speak* and *Move* Onstage

This participatory, movement-based workshop makes direct connections between the singer's vocal technique(s) and the physical/vocal skills required for other voice use onstage. Music curricula are often so crowded that performers emerge highly trained, but with vocal skills in only one area. Yet, they must introduce themselves and their material in auditions and will likely need to speak, laugh, cry and/or produce other vocal sounds in the context of opera, operetta, or other dramatic works. Therefore, the rest of the voice also needs training! Everyday speech will not suffice, nor is it appropriate—or healthy—for professional work onstage.

The presenter draws on recent research into breath management strategies of elite vocal performers, and relates observations from that study to the practical work of speaking and singing onstage. Workshop participants will move easily between speech and song and will focus on significant elements of phrasing across a range of vocal genres.

Joan Melton, PhD, ADVS, MM, BM, Director (also Professor Emeritus, CA State University, Fullerton), Voice Theatre Solutions, 333 W Mifflin St, # 2090, Madison, WI 53703, (917) 991-5199, joan.melton@onevoicebook.com

Taming Musical Performance Anxiety

In the current age of heightened awareness of psychological impairments, the problem of performance anxiety among musicians is highly visible and recognized as a debilitating force by musicians, music educators, and physicians alike. The detriments of musical performance anxiety (MPA) can range from technical mistakes in solo lessons, to debilitating anxious thoughts during performances, to the possible termination of what could have been a promising career on the stage. While different studies produce varied statistics on the number of performers affected by MPA, as many as 90.6 percent of all people may encounter anxiety when they find themselves in the spotlight, a figure that should not be ignored and must be addressed by music educators. This workshop is for music educators with students at all levels, and is intended to provide specific tools that teachers can take back to their high-school, college, graduate, amateur and professional-level students to systematically work toward less musical performance anxiety.

This unique workshop will be jointly presented by a college music faculty member and a psychiatrist/faculty member at a medical school. The session will begin with a short lecture and discussion segment covering the prevalence of musical performance anxiety, contributing factors, and symptoms.

Next, the large segment of the session will be highly interactive. The presenters will ask for volunteers from the group to demontrate techniques for proactively treating MPA at the educational level. For example, "flooding" is a technique used by therapists to help those who exhibit extreme cognitive symptoms. The educational equivalent can be performed in a studio class or similar situation. Several other techniques will also be addressed.

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Untying the Knot: Rehabilitation of Muscle Tension Dysphonia in Singers

Maladaptive muscle tension in singing is a problem that plagues singers, voice teachers and singing-voice rehabilitation specialists alike. Appropriately addressing maladaptive muscle tension is especially critical when recovering from a vocal pathology. When working with injured voices, it is important to be aware that muscle tension may develop as compensation for an underlying structural or neurological abnormality, may be a causal factor in developing a voice injury, or both. Assessing the role of muscle tension in the voice problem is essential for designing a rehabilitation therapy plan which includes effective intervention strategies that are targeted at unloading the singer's particular muscle tension behaviors, leading to voice recovery, optimal vocal efficiency and long-term vocal health. In this workshop, the instructor will explore topics including the following:

- Effects of posture and body alignment on muscle tension
- Relaxation and stretching exercises to reduce muscle tension
- Appropriate muscle activation vs. maladaptive muscle tension
- Accurately identifying the locus of muscle tension (i.e. infra-hyoid muscles, intrinsic laryngeal muscles, abdomen, shoulders, neck, tongue, mandible, etc.)
- Strategies and techniques for unloading/releasing maladaptive muscle tension targeted at specific muscle structures and groups
- Training kinesthetic awareness and reference sensations for locus of effort and free vocalization
- Feedback mechanisms (auditory/visual/tactile, etc.)
- Determining appropriate amount/duration of singing

These principles and techniques will be explored primarily via hands-on demonstration with singers, but also through case examples and audience interaction.

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Hanna Somatic Education: Free the Body, the Breath, the Voice

Stress, repetitive use and accidents can lead to chronic muscle contraction patterns and restricted movement. Chronic muscle contraction patterns are often unconsciously maintained. Thomas Hanna named this tendency *sensory-motor amnesia* (SMA). He developed Hanna Somatics (which has its origins in the Feldenkrais Method) which enables us to use our brains to overcome SMA and negative effects of stress, trauma and aging. Hanna Somatics can also enhance performance and well being. We can receive feedback from our bodies more accurately and continue to develop somatically throughout our lives. This workshop introduces somatic theory and exercises for assessing and somatically transforming ourselves, freeing muscles for better body use and voicing.

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Speaking Shakespeare

Shakespeare's words are best interpreted from the breath and sounds, rather than from the words. Actors and interpreters of Shakespeare's work often make the mistake of approaching the text from an intellectual standpoint rather than getting the words into their body and supporting them with the breath. During a 55 minute workshop, Sonnet 18 will be used for all exercises. Part I of the session introduces the connection of breath to sounds through practical exercises and floor work followed by application to breath with connection to text. The sharing of individual discoveries will be encouraged at the end of each exercise. Part II of the workshop will break down vowels and consonants in order to explore how the sound may inform the speaker/actor through the isolation of the individual sounds in each word. The participants will experience heightened emotional relevance, intensity and an emphasis of each word within the line. The workshop will close with shared personal discoveries and revelations. Participants will take away a new method with which to approach text and explore Shakespeare's words. Skills offered in this workshop are helpful to the Speaker, Actor and Presenter. It is suggested that participants wear comfortable clothing.

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Human hearing modelling based analysis of speech and singing

Traditional wide- and narrow-band spectrography and spectra have dominated the speech science laboratory for many decades, but during this time much more has been gleaned about the function of the peripheral hearing system in terms of its analysis of incoming sound. Human hearing modelling spectrography enables the reason for the use of a wide- and a narrow-band analysis to be demonstrated in that the hearing system is essentially a narrow-band system for low frequencies and wide-band for high frequencies. The output from the inner ear in terms of hair-cell firing waveforms can also be modelled; this is the input to the neural firing process to the VIIIth nerve.

The workshop will explore the differences between the spectrographic representations for a series of test signals as well as spoken and sung tokens with a view to highlighting the potential advantages of the use of a hearing modelling approach to acoustic analysis. Hair-cell firing waveforms will also be explored in terms of current theories concerning pitch and timbre perception. The approach will be non-mathematical and should appeal to all interested in finding out more about how our ears work and how this can impact acoustic analysis techniques.

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Youth Is Not Wasted on the Young: Teaching Singing to Children

Even in this, the twenty-first century, the controversy over what age to start singing lessons still rages. As an internationally-recognized authority on child voice pedagogy, I continue to address this issue in lectures, writings, and instruction of children in the studio, workshop, and master class settings. I will bring several children of various ages to help demonstrate age-appropriate voice technique and repertoire in a "public lesson" format. Time will be set aside for questions and answers.

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Different Strokes For Different Throats

Most singers are trained to sing classical music including opera and art songs, orchestral and chamber music, operetta, and oratorio. There is little in the behavior of the vocal mechanism that bridges from these styles to jazz, gospel, rock, pop, country and rap, some kinds of music theater (which is, in itself, unique in many ways). Filling that gulf is something each individual singer must do for him or herself, which is neither efficient nor always safe.

From a mechanical or vocal production point of view, some things are definitely the same in healthy singing in all styles of music, but there are some significant differences, from the larynx up. Understanding these differences is important as they impact vocal performance and health. Knowing what things interface and what things do not should not be guesswork.

ENTs and speech language pathologists as well as singing teachers must understand the elements of singing voice training that are necessary in the 21st Century. For those who have only been exposed to traditional approaches, this workshop will open the door to new ideas that have emerged in the past 25 years.

The session will feature demonstrations with one or two individuals going from one style to another, while being guided to make appropriate adjustments to vocal response through specific exercises. Volunteers will be taken from the audience if there are any individuals present who are classically trained singers who would like to learn how to "switch gears".

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Voice Alexander Technique and Text

It is commonly assumed that posture is essential for optimal singing. Many clinicians and singing teachers stress 'ideal posture' in their teaching, insisting that the singer 'stand up straight, chin up, chest up, stomach in'. This 'ideal' however is not only static but does not allow for the dynamic movement involved in gesture, let alone moving around on stage. It is derived from a military tradition of soldiers on parade and medicalized by German physicians Braune and Fisher in 1897. Good posture must be dynamic. It depends on the musculoskeletal coordination of the individual in movement. Imbalance leads to increased tension.

How then can one teach posture in the voice studio or in the voice therapy room? How can the teacher identify musculoskeletal imbalance? What are the elements of the singers stance or movement that the teacher, or clinician that signify imbalance? How does one bring about the small changes in physical organization that are needed for good vocal production?

This workshop will explore these questions. Using a 'hands-on' interactive approach, this workshop will explore how to recognize those aspects of musculoskeletal imbalance (a poorly organized system) that negatively impact the physiological and biomechanical efficiency in a singer. Several specific techniques will be explored. These techniques can be adapted by participants to facilitate students/clients in developing the self-awareness necessary to regain the coordinated movement and physiological and biomechanical efficiency needed for optimal freedom in singing.

Janet Madelle Feindel, MFA, DLT, ATI, Fitzmaurice Voice, Associate Professor, Voice/Alexander Technique, School of Drama, Purnell Center, Carnegie Mellon University, Pittsburgh, PA 15213

**A workshop in Musical Theater Voice: Maintaining health and flexibility while adapting
your voice to cover the wide variety of Broadway musical styles**

D. Michael will collaborate with two musical theater singers. Trained as a classical singer, D. Michael adapted his talents to achieve a 'crossover' performance career in opera, oratorio, jazz, pop, musical theater, and studio recording. He brings his life's lessons learned, his interest in the science of voice, and his 'common sense' approach to breath, pitch, and resonance to work in his NYC voice studio where he is successfully working with several of Broadway's finest singer/performers.
Translation: They are employed.

D. Michael Heath, BM, Opera, Oratorio and Art Song, Vocal Instructor/Coach, Voice Foundation, NATS, AEA, SAG, AFTRA, AGMA, 107 West 69th Street Suite 2C, New York, NY 10023, (212) 580-7863, dmhnyc@hotmail.com

How To Get That "Raspy" Sound Without Vocal Consequence

The growing popularity of raspy and distorted vocal production has created a demand for knowledge about doing it safely. Melissa Cross has identified a method by which this can be taught and executed safely. Participants will know the mechanics of distorted phonation; in particular, within the context of identifiable pitch. This is not exclusive to heavy metal, as this raspy phonation can appear *de rigueur* in all styles from Broadway to children's music. Exercises will be demonstrated so that teachers can share their newly found insight to an ever-widening clientele. The workshop will also touch on other vocal techniques that are specific to modern popular music. Often, what sounds like a blasphemous disregard of the rules of proper vocal technique is not necessarily so. Melissa Cross will show that compromising vocal health to "get that cool sound" is far from mandatory!

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Respiratory and Laryngeal Control Therapy for Treatment of Paradoxical Vocal Fold Motion (PVFM)

PVFM is a nonorganic disorder of the larynx that involves unintentional paradoxical adduction of the vocal folds, causing airway obstruction. The severity of the disorder is determined by the duration and the degree of adduction of the vocal folds. Symptoms may include dyspnea, chest tightness, cough, throat tightness, stridor, dizziness, and hoarseness. In many cases PVFM episodes are accompanied by fear, anxiety and panic, and when the presentation is severe, it may result in frequent OR visits. These symptoms are not unlike those of asthma, and often patients with PVFM are misdiagnosed with asthma. In adults, the reactive upper airway obstruction is most commonly triggered by exposure to irritants such as gastroesophageal reflux, strong odors and fumes. In adolescents and children, it is primarily triggered by exercise and is typically confused with exercise-induced asthma. The disorder often coexists with asthma, and should be suspected in any patient in whom traditional asthma treatment is not effective. Currently, the gold standard for a differential diagnosis involves direct visualization of abnormal vocal fold motion, during an episode when the patient is symptomatic. Adolescent athletes often require free running exercise challenge to reproduce their symptoms and confirm abnormal vocal fold motion laryngoscopically.

Management of patients with PVFM requires a comprehensive yet sensitive examination of underlying etiology, precipitating, maintaining and recovery factors. Multiple factors influence therapeutic success, including correct diagnosis, medical treatment if needed, proper behavioral intervention, and patient cooperation. Team approach is paramount. A team that includes ENT, Pulmonary, Allergy, and Speech Language Pathology is ideal. Once the underlying medical condition is controlled, behavioral treatment is managed by a speech pathologist with expertise in this area. The primary treatment modality involves a combination of biofeedback, patient education and therapy that aims to improve respiratory control and maintain an open respiratory tract, avoiding the functional upper airway obstruction. In most cases, behavioral treatment is highly effective and patients are able to resume their activities without significant limitation.

Session Proposal

Instructional workshops on therapeutic approaches for treatment of the most common voice disorders are a landmark of Fridays at the Voice Foundation meetings. However, there has been a lack of offerings that focus on the specific therapeutic modalities used for treatment of PVFM patients. This probably stems from the fact that this is a relatively new area of treatment for speech and language pathologists. In the last decade this disorder has gained momentum due to increased research, and more widely spread information both in the medical/health community, as well as in the general public. Currently there is a better understanding of etiologies, diagnosis and development of successful treatment options available for patients with PVFM.

My expertise in working with PVFM patients was developed over the last decade and evaluation and treatment of this patient population constitutes now an important part of my practice. I have lectured nationally and internationally on this disorder. I have put together the first "Clinical Grand Rounds on PVFM" session at the 2008 American Speech, Language and Hearing convention. This session proved to be a very successful forum, reflecting the current interest and need in our profession for continuing education on this complex respiratory-laryngeal disorder, and was asked to implement it again in following years. At the Cleveland Clinic, I give yearly in-

service lectures to the departments of ENT, Pulmonary, Allergy, and Internal Medicine on diagnosis and treatment of PVFM. I have developed a very active internal and external referral base. I am currently a member of the newly formed "Asthma Center" at the Cleveland Clinic, coordinating interdepartmental collaboration in the treatment of patients with reactive upper airway obstruction.

The proposed workshop will focus on discussion of etiological factors (precipitating and maintaining), as well as the process of differential diagnosis, and goals and techniques for restoring normal breathing behavior. But primarily, I want to focus on specific breathing and laryngeal exercises that I have developed over the years, which in my experience, are very effective for management of symptoms of PVFM. This therapeutic technique is called "Respiratory and Laryngeal Control Therapy".

The presentation will include exercises indicated for the two major subdivisions of PVFM: 1) Adults with irritant induced PVFM, and 2) Juveniles with sports induced PVFM.

Topics to cover include:

- Identification of inefficient breathing patterns
- Identification of paradoxical abdominal movement during deep breathing
- Instructions on correcting paradoxical abdominal movement and developing good abdominal breath control
- Development of more advanced breathing control with the use of respiratory ratios, and progressive slow breath practice to decrease "air hunger" threshold.
- Use of "rescue breathing" exercise
- Modifications to use by patients with exercise induced PVFM

Attendees to the workshop are expected to have basic knowledge of PVFM, as time constraints will prevent in depth cover of the nature of the disorder. There will be hands-on practice, with the use of a volunteer to demonstrate use of techniques, as well as practice of the exercises by all attendees. The final part of the workshop will involve sharing with participants the actual course of management undertaken with patients and comparing it with ideas generated from dialogue with the audience.

Given the growing number of patients with this disorder referred to SLP practices over the last decade, the proposed workshop will likely be of high interest for students, recent graduates and experienced clinicians who work with this patient population.

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The Sound of Your Voice

This oral presentation will be aimed at liberal arts and theatre education students and teachers.

It will describe a new approach to transdisciplinary instruction developed by Dr. Behrens; and facilitated by colleagues from areas such as medical, sign language, music and speech pathology (Dr. Carozza).

Voice awareness education is important for the general public as well as for all active professionals in the public arena such as teachers, instructors, and business professionals.

Speech pathologists see many voice cases upon referral from ENT's in their private offices both for vocal abuse as well as other medical therapies.   Dr. Carozza will describe recent case histories with comment by Dr Behrens from the speech science and linguistic point of view.

Other voice educators would benefit from this session as it will broaden their viewpoint on how voice awareness can be brought to their students, colleagues and the general public in an interesting and dynamic fashion.

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Profile of a School Music Teacher and Relationship to Vocal Health: One Size Does Not Fit All!

In order to study the voice care and voice use of music teachers in the public schools, we must have a working knowledge of the context in which these teachers teach. In this heterogeneous grouping of teachers, the profiles of different music teachers often vary greatly. Classroom location (in or outside the school building), age level of students being taught, subject matter (ensemble or general music class), class size, primary instrument, number of class periods in a row are all characteristics present in the profile of music teachers; each profile characteristic has the potential to influence vocal health differently. Thus, voice use and impactful environmental factors for music teachers are not universal and need to be considered in context. Initial analysis of data collected at two music education conferences as well as through the use of a targeted questionnaire via SurveyMonkey supports the wide variances in the profile of a music teacher. This paper/presentation will outline the contexts of K-12 music teaching and demonstrate the need for those involved with vocal pedagogy/vocal health training at the college level to have an understanding of the K-12 music teaching context. In addition, this information will help define subsets of music teachers for future research.

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Acoustical and Perceptual Analyses of the Voices of Classroom Music

This study examined time-of-day effects on acoustic measures of voice in classroom music teachers under two vocal production conditions (natural-speaking and lecture-presentation) at four points in time. Subjects taught in one of three music disciplines (elementary/choral/instrumental) and in either an urban or rural location. Digital recordings were made before and after four teaching days during one semester. Voice sampling tasks included reading four sentences with sustained vowels for perturbation analysis and reading a standardized paragraph to obtain continuous speech sound pressure levels. On each visit, subjects completed a vocal self-assessment survey to gain insight into perceived vocal function and stress level. Results of repeated measures ANOVA procedures revealed significant differences in fundamental frequency (F_0), % jitter, % shimmer, signal-to-noise ratio (SNR), and sound pressure level (SPL) for both time-of-day and production condition. The F_0 of the instrumental music teachers was significantly different than the elementary general and choral teachers. All correlations between perceived stress level, perceived vocal function, and the acoustic measures were non-significant, as was the visit main effect. The inclusion of more vocal health and hygiene education is suggested for music teachers and teacher training programs.

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Correlation Between Perceptual Assessment and Acoustic Parameters of the Vibrato in Famous Tenors

Introduction: Vibrato is one of the main elements which provides the singer with high vocal quality. There are several attributes of the vibrato, such as the rate, extent, regularity and the onset. These parameters can influence the perception of vibrato quality. The objective of this work was to analyze the influence of acoustic parameters in the vibrato quality perception.

Material and Methods: Vibrato of 15 famous opera tenors was assessed during the last moment of the aria "La donna e Mobile" where they emited a Si4 (494 Hz) with a sustained vowel /e/. This high note was selected for its closeness to the tenors' voice limit and its great demand in vibrato control. Vibrato rate, extent, jitter and onset values were obtained by VoceVista software. For the three first parameters, 15 vibrato cycles were measured without considering the first and the last ones. A panel of 10 Speech and Language Pathologist specialized in singing voice, singing teachers and professional opera singers performed perceptual assessment. This panel classified vibrato quality into a 5 point scale. Correlations among the vibrato acoustic parameters were performed as well as correlation between these parameters and the perceptual assessment.

Results: Correlation among vibrato acoustic parameters was not found. High negative correlation was found between vibrato jitter and the vibrato quality.

Conclusion: Vibrato acoustic parameters acted independently among themselves. Vibrato jitter was the most influential parameter in the perceptual assessment. Vibrato regularity is the principal element that influences the perception of vibrato quality.

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Listeners' Perceptions of Passaggio Transition Gestures by Trained Females Singers

Previous data indicate that trained female singers exhibit one of two distinct patterns of electrogottography (EGG) and spectral output when singing through their first passaggio (Miller & Schutte, 2005; Morris et al., 2010). The purpose of this study was to determine if groups of listeners would perceive superior evenness of tone through the passaggio when the singer exhibited a gradually shifting EGG pattern.

The eight trained female singers who participated in the Morris et al. (2010) study provided the singing samples. Each participant sang ascending and descending A3-A4 glissandos of the vowel [a:] at a comfortable mezzoforte level and a tempo of two notes per second. Ten iterations of both the upward and downward glissandos from each voice were randomly ordered and included on an experimental CD.

The first group of listeners will be 10 experienced voice pedagogues who are vocal performance faculty, and the second group will be 10 voice scientists familiar with singing voices. The listeners will play back the CD via loudspeakers in a quiet room. They will mark each voice rating on response sheets with 100 mm Likert-type lines. Each listener will be directed to put a vertical mark through the line to indicate her/his impression of the quality of the passaggio transition that was sung.

The perceptual data will be compared to the EGG data. Correlation between the two data sets will be determined using a Pearson correlation coefficient. Separate correlations will be run for the two listener groups.

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**Investigating the Effects of Broad-Spectrum Sound Exposure on Vocal Resonance
in the University Singer**

The purpose of this study is to ascertain whether the resonance of the singing voice can be affected and improved by exposure to the resonance of a broad-spectrum instrument such as a gong. To quantify this, the spectra will be analyzed using Fourier Analysis techniques in Dr. William Schottstaedt's CLM (Common Lisp Music) software and other programs. Renowned vocal pedagogues continuing the work of Dr. Alfred Tomatis have submitted extensive studies that investigate the relationship between what the ear hears and what the voice produces. The Missouri Western Voice Alliance has chosen the resonance of the gong and its impact upon the resonance of a young singer as the focus of this study.

The study will utilize college singers between the ages of 18 and 25 who are currently enrolled in the music program. Vocal spectra of the singers will be measured while vocalizing on the vowels a, e, I, o, and u for all 12 chromatic pitches from C4 through A4 for women and C3 to C4 for men. The vocalists will be recorded again after receiving a 30 minute relaxation session and 20 minute gong resonance immersion using a 30" Wuhan Gong.

Based on differences and similarities within these tests, discussion will focus on the acoustic effects of sustained resonance vocalizations as affected by an outside acoustic influence, and how differing pedagogical training techniques specific to Classical pedagogical approaches may utilize these findings to develop a pedagogical tool to enhance resonation in the singing voice.

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Objective Characteristics of "Superbelt"

In the category of singing that some have labelled" contemporary commercial music" (CCM), a recent trend has been to extend the upper limit of the range beyond ca. D5 (587 Hz), the approximate end of the range of the female "belt" voice. We refer to this as "superbelt," a name that comes from some of its practitioners. The purpose of our investigation is to measure key objective parameters of this production through signals registered non-invasively by microphone and electroglottograph (EGG). The key parameters are formant frequencies and the glottal closed quotient, estimated by means of spectrum analysis and EGG, respectively. Our subjects are singers from the New York area who can readily produce the requisite sounds.

Preliminary measurements indicate that the production is characterized by unusually high first and second formants, as well as closed quotients at least 20% larger than those typically found in the female classical "head" register.

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Glottal closed quotient measurements by electroglottograph validated through videokymography

There is evidence that high closed quotients (CQs) are a characteristic feature of certain types of robust male operatic voice production, a fact that makes an accurate estimate of CQ an important item in singing voice assessment. The non-invasive electroglottograph (EGG) signal offers a convenient measure of CQ in both studio and laboratory, provided that such measurements can be validated. This experiment compares CQ measurements made with EGG to those made with simultaneous videokymographic (VKG) recordings. Preliminary results show closed quotients of approximately 75% in both EGG and VKG signals in well-produced tones in the upper middle range. The implications of such CQs for vocal sound and vocal pedagogy are discussed.

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The relationship of size and degree of singer motion to acoustical data as measured by a motion capture system

The purpose of this investigation was (a) to examine the effects of two singer gestures (high, circular and low, circular gesture) on intonation and amplitude of phonation as measured by standard acoustical measures, and (b) to explore possible correlations between these acoustic data and 3D motion (size and direction) data from reflective sensors placed on each participant's eyebrows, nose, mouth, and hands. Singers ($N = 30$), ranging in age from 18-72 years, sang a phrase from a familiar song while performing with: (a) no motion, (b) a large, circular arm movement, and (c) a small, circular arm movement. Singers were video and audio recorded using the Opti Track 3-D infrared motion capture system, which synchronized acoustical and 3D motion data.

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Alto or Soprano? Trying to assess the voice and the career of Maria Callas

Since her first appearance on opera stages, Maria Callas was defined as the modern reincarnation of the great divas of the nineteenth century as Isabella Colbran, Maria Malibran, Giuditta Pasta, Marietta Alboni, the inspirers of the great pre-romantic and romantic composers such as Rossini, Bellini and Donizetti, who composed for the voices of these singers from alto to dramatic agility soprano and coloratura soprano roles: those artists sung all these roles with ease and reliability. It means that the lyrical voice was beyond modern classification, derived from post-romanticism and verismo. Maria Callas brings back the model of the early nineteenth-century opera singer, what some critics described as "absolute singer" to highlight the great singer's ability to fully adapt her voice to a wide variety of repertoire and roles.

Which was the real nature of Maria Callas' voice? Soprano with considerable capability in lower notes or alto with facility in singing highest notes? Which were the causes of her early vocal decline?

In this study we analyze several audios and videos fragments of recordings regarding different periods of Maria Callas' career, evaluating the physiological and artistic characteristics of her voice, identifying the different vocal registers and the ability to modify vocal tract conformation, exploring the posture and respiratory dynamics and also making comparisons with other singers. We finally try to classify Callas' voice and to evaluate the causes of her early vocal decline also analyzing testimonies of the singer herself, of doctors who examined and treated her, of close friends and colleagues.

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Vocal Warm Up Exercises (VWUE) and the quantification of vocal flexibility in the singing voice – a pilot study.

Vocal Warm Up Exercises (VWUE) are considered essential for healthy singing technique. Measurements of the singing voice that are clinically useful are elusive. Short term changes in the singing voice may be perceptually significant, but show no statistically significant acoustic or aerodynamic change.
An online survey of over 700 singing pedagogues (Meyer 2009) indicated that vocal flexibility is a primary goal of VWUE. If vocal flexibility can be non-invasively quantified, then the efficacy of these exercises may be evaluated.
Vocal flexibility may be defined as the ability to modulate pitch, vowel, and intensity of vocal performance in a rapid and smooth manner.
This pilot study (supported in part by the 2010 Van L. Lawrence Fellowship) explores the acoustic criteria for evaluating vocal flexibility pre- and post-VWUE.
10 healthy subjects (age 18-22) will perform six singing tasks pre-and post-VWUE. 48 samples per subject will be gathered over four sessions: six samples per session pre VWUE, and six post VWUE. Subjects will be instructed to restrain from singing or demanding speech for four hours prior to sample collection to insure their voices are not "warmed up."
The 480 samples will be examined acoustically to answer the following two questions:
1: Can vocal flexibility (rapid modulation of pitch, vowel, and intensity) be acoustically quantified?
2: Do Vocal Warm Up Exercises increase vocal flexibility?

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The effects of singer spacing and riser step heights on choristers' perceived vocal production, auditor choral sound preferences, and obtained long term average spectra with an SATB choir

This investigation assessed acoustic and perceptual differences among performances of an SATB choir positioned alternately on two riser units (standard riser and custom riser with taller steps) while singing an a cappella choral excerpt in three chorister spacing conditions (close, lateral, and circumambient spacing between singers). Previous studies have indicated choral singers seek to hear their own voices in preferred self-to-other ratio over nearby singers and the rest of the choir, that singers report more efficient, less strained vocal production with spread spacing between and among singers, and that audiences prefer the overall choral sound of a choir singing with more spread spacing. The present study addressed such variables while adding the dimension of more vertical space between rows of choir singers.

Singer participants (N=27) offered perceptions of vocal production and ability to hear self and other in each of the six sung conditions. Auditor participants (N=60) indicated preference for overall choral sound between randomly ordered pairs of digitally recorded excerpts. Long-term average spectrum (LTAS) data were used to analyze recordings of each sung condition from two microphone locations (mixed field and diffuse field).

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The Teaching Performer: A Survey of Assets vs. Choices in Voice Use

Despite fine instructional texts in Voice Hygiene such as those of Sataloff (2005) and McCoy (2004), as well as compelling Vocal Dose studies of Titze (2000-2005), challenges continue to increase for voice teachers who are also active performers, or Teaching Performers. Those who are successful and those who struggle with the demands placed upon their voices could very well be divided by quality choices in the ways they use their voices during teaching, when singing, and in the midst of a hectic lifestyle.

The purpose of this study was to investigate the practices of Teaching Performers in and out of performance periods, as well as to assess the readiness of these teachers to consider hygienic changes in their vocal routines. Volunteers from the National Association of Teachers of Singing (NATS) were recruited to participate in an anonymous on-line survey. Ten published experts were chosen for validity assessment, and test/retest instrument reliability was determined with twenty subjects. The remaining Teaching Performers responded to questions and supplied relevant factors associated with their choices for the care and use of their voices, using calibrated ranking, open form, and likert scales.

Discussion focuses on descriptive survey results and analyses, including agreement and disagreement between Teaching Performers regarding the real or perceived benefits of calculated voice use in their teaching and performing careers. Results of this survey may provide a basis for future studies and further recommendations in the field of Voice Pedagogy.

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Voice Use and Self-Reported Voice Health of Pre-Service Music and Elementary Educators, Undergraduate Voice Performance Majors and Other Undergraduate University Students: A Voice Dosimetry Investigation

Research has suggested that pre-service educators experience more voice disorders than other university students (Simberg, Sala, & Rönnemaa, 2004). Some studies have begun to quantify the vocal load of university students using voice dosimetry. Some of these studies have investigated undergraduate or graduate vocal performance majors (e.g., Austin & Hunter, 2009; Gaskill & Cowgill, 2009; Gaskill & Cowgill, 2010; Schloneger, 2010a; Schloneger, 2010b). Other studies have also examined the voice use of pre-service music educators (e.g., Gaskill & Cowgill, 2010; Manternach, 2010). To date, few studies have quantified the differences in voice use and self-reported voice health of pre-service educators, undergraduate vocal performance majors, and university students in various majors.

The purpose of this investigation was to examine voice dosimeter data including phonation duration and percentage, amplitude, frequencies, and distance dose acquired over contiguous 7-day periods (including a 5-day typical school week and two weekend baseline days) by university students of various majors ($N = 8$) in concert with daily voice use surveys and self-reported voice health indicator statements. Participants were female, junior year undergraduate students majoring in choral music education ($n = 2$), elementary education ($n = 2$), vocal performance (n = 2), as well as a comparison sample of liberal arts non-teacher education students ($n = 2$).

Results were discussed in terms of voice use by university students in various majors, voice use education, limitations of the study, and suggestions for further research.

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The use of Voce Vista in the Teaching Studio

At the recent conference, Physiology and Acoustics of Singing 5 (Stockholm), Jan Hammar spoke about the use of computer software in singing teaching and the need to break the habitual pedagogical style. He specifically stated that the field needs research about the results of biofeedback in the studio and called on colleagues to do this work. To that end, the present study aims to produce and document results found when a teacher uses VoceVista, a voice analysis system, in the voice studio. Two groups of private voice students (4 subjects taught using VoceVista and 4 control subjects taught without the use of this technology) received 10 45-minute lessons each.   Each student underwent an entrance and exit voice evaluation at the Temple University Speech-Language-Hearing Center including: multi-dimensional voice analysis, a voice range profile (with subjective notes regarding voice quality), maximum phonation time on /a/ and a lip trill, inverse filtered wave assessment, spectrogram analysis(sustained /a/ and /i-e-a-o-u/ sequence), a Voice Handicap Index for singers, and vocal exercises. When implementing the use of VoceVista, students were taught to monitor volume by using the envelope, to assess noise in the voice through the use of the spectrogram, and to look at the strength and placement of formants through the use of the spectrum and spectrogram tools. Effectiveness of the lessons was determined by the teacher's and students' subjective ratings and by the initial and final voice evaluation.   All lessons were video-taped for review.

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Acoustic and Perceptual Voice Assessments of Entering Music Education and Music Therapy Undergraduate Students

The purpose of this study was to examine an array of voice data (e.g., singing range, SFF, S/Z ratio, selected perturbation measures, onset, singing voice quality, intonation, vocal health self-perceptions) acquired over a 3-year period with undergraduate students (N=60) entering the music education and music therapy programs at a Midwestern University. Data were disaggregated by sex, age, major, previous singing experience, and whether or not students were required to undergo individualized voice pedagogy protocols prior to a subsequent voice assessment. Results were discussed in terms of the feasibility, viability, and outcomes of using a voice assessment protocol with all students entering a pre-service music teaching or music therapy program.

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Audio-Psycho-Phonology and Singing: A Condensed Tomatis-Based Listening Program for Collegiate Vocal Students

This dissertation presents the qualitative research findings of a condensed, observational case study of collegiate vocal performance students who participated in an adapted version of an auditory stimulation program based on the work of French otolaryngologist, Dr. Alfred Tomatis. The program provides a method of improving auditory function through a regimen of acoustically modified classical music called the *listening program* and a series of vocal exercises called the *Corso Audio Vocale (CAV)*. These auditory stimulation programs are a product of an emerging, multi-disciplinary science called Audio-psycho-phonology (APP). Tomatis was a pioneer in this field, which studies the human auditory system as an important regulator of human physical, psychological, and neurological functions, including phonation. The researcher explores the relationship of APP and singing and its applicability as an educational modality for improved vocal technique.

Tomatis spent over fifty-five years teaching and conducting clinical research among singers to explore the complex connections between the ear and voice. Analysis among four participants revealed varied and compelling evidence that the auditory system plays an important part of a singer's well being and vocal performance. Third-party observational data from each participant's voice teacher confirm improvement among the case studies represented. Findings suggest that the science of APP provides a new dimension in vocal pedagogy by acknowledging the importance of the auditory system in optimal singing.

Keywords: Tomatis, Corso Audio Vocale, Audio-Psycho-Phonology, auditory system, listening program, vocal pedagogy, vocal performance

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How are we communicating? Results of a major research survey on the use of science and imagery in the voice studio in the United States and Canada

An examination of the literature relating to Vocal Pedagogy reveals a sharp and longstanding philosophical division between teachers who believe that voice should be taught with imagery (empirical teachers) and those who believe that voice should be taught based upon science (mechanistic teachers). But is this still an accurate assessment of our profession? This presentation will share the results of a survey conducted in the summer of 2010 that examined this question. 520 voice teachers responded to the survey, and surprising results were obtained. The vast majority of voice teachers report that they combine science and imagery in their teaching, and in fact achieve the greatest amount of success by combining these two methods.

However, in spite of this apparent overwhelming consensus on the combined use of science and imagery in the studio, well over half of the respondents continue to believe that the profession remains philosophically divided. Detailed statistical results from the survey will be presented. The author's conclusion that the sharp philosophical divide of years past is closing will also be considered and discussed.

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Absolute Range in Singers

Historically, vocal range has been defined as usable or performable range. Absolute range is being defined here as the highest and lowest note a singer can produce on a regular basis. Surprisingly, very few singers or even voice teachers are aware of their absolute range, often under-estimating it by as much as two octaves.

This project will use a concise protocol to ascertain the highest and lowest note of a minimum of 100 subjects, comprised of male and female singers of different levels of experience. Singers will be between the ages of 25 and 45 (post pubertal and pre-menopausal) and in good vocal and physical health. Singers may be classically or commercially trained, and singers of unusual heights (below 5' or over 6' 4") will be excluded. Multiple voice teachers instructed on the range-finding protocol using a detailed questionnaire and instructional videos will collect the data. The goal will be to amass data to determine average absolute vocal ranges, unrelated to timbre or fach; to find if a hypothetical 3 1/3 octaves is indeed a quantifiable average range; to determine if males, on average, have wider ranges than females; if trained voices exhibit wider ranges than those with minimal training; and if one's low note can be used to predict one's highest note.

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Cochlear Implanted Singing Study

Voice and speech characteristics in deaf children vary considerably from children with normal hearing. Cochlear implant devices help improve some but not all voice quality parameters 6 to 12 months post-implantation. There remains poor long-term frequency but normal amplitude (Campisi et al., 2005). We asked whether vocal training in the form of singing lessons could improve speech production many years post-CI activation. Each participant, aged 13-18 years, took part in 10 weekly, thirty-minute voice (singing) lessons at the Hospital for Sick Children. Lessons were conducted by graduates of the Voice Pedagogy program at the University of Toronto, under the guidance of Professor Lorna MacDonald, Lois Marshall Chair in Voice, and Head of Voice Pedagogy programs. Vocal lessons consisted of vocalises including breathing and alignment techniques, vocal tract shaping, articulation of vowels and consonants, song learning, and pitch matching exercises. Singing and listening homework was directed by a music CD produced for the study, and a practice log completed by the student and/or parents. The control group were hearing aid users. This session will detail the study, the design of the voice lessons, the results on the speech effectiveness of the students, and indications for further collaborations between voice training (singing) and hearing impaired and cochlear-implanted students.

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Acoustic analysis and the identification of performance stress in singing

Performance anxiety and everyday stress are issues which impact on every singer and vocal pedagogue. It is commonly accepted that stress changes the vocal output, usually to the detriment of a performance, and many techniques are employed and taught to minimise the proliferation of anxiety in singing. Listeners, especially expert listeners such as teachers, can often identify stress in a performance without previously knowing the performer and may even suggest specific physical tensions which are causing a change in the sound. However, the aspect of the sound associated with stress is not always easy to identify, especially if it is a factor of timbre rather than a tangible audio change such as vibrato rate or extent.

An experiment was conducted in which subjects were recorded speaking and singing in a relaxed 'normal' state and induced state of moderate 'stress'. The level of stress was self-assessed by the subject throughout the experiment and the subjects were videoed so that any obvious physical changes could be observed. The recordings were analysed using 'PRAAT' to assess whether differences in the output between the 'stress' and 'normal' recordings could be identified through acoustic analysis. The methodology and findings will be discussed alongside the relevance of acoustic analysis in assessing stress in singing.

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Staying in-tune in four part a cappella singing with key shift: a look at the repertoire

Previous work on pitch drift with musical key change (Howard, J. Voice, 2007, **21**, (3), 300-315) demonstrated that an *a cappella* (unaccompanied) vocal quartet does shift with music key change in certain circumstances. This paper explores *a cappella* choral repertoire that has a tendency to drift in overall pitch to investigate the extent to which just tuning can account for it. A questionnaire sent to choral directors and singers asked about repertoire that tends to change pitch and for any suggested reasons for this. Of the 13 responses listing 19 pieces of music, none mentioned temperament.

 Choral scores have been analysed for pitch shift based on just temperament and the results will be illustrated and their implications for performance discussed. Reference will be made to commercial recordings where pitch shift is evident, but of course, there is no knowing whether or not a given recording has been subjected to studio post-processing to "correct" for pitch shift. Analyses have been carried out on the Wenger Corporation anechoic choir recording, where no post processing for tuning has been carried out, where some pitch shift is evident. Results suggest that the shifts are in keeping with the predictions although not to such a great degree. Pitching strategies for choral directors will be suggested.

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An Examination of the demographics of a SVS practice

       This presentation grew out of a desire for the SVS of the Sound Singing Institute to know and understand the breadth of the demographics of this specific practice's population. All of the information reported was gathered at the initial evaluation. An excel spreadsheet was created into which the data was entered and then tabulated. This presentation will examine the following categories: (1) age, (2) gender, (3) singer type, (4) genre, (5) group, (6) diagnoses, (7) post surgery, (8) post cancer treatment, (9)medical condition, (10) referral source, and (11) occupation.

       The categories for this database grew over time and some of the categories were difficult to synthesize. For instance, the diagnoses category contains both medical diagnoses and patient reported symptoms of the vocal apparatus. Also, in regard to genres, while the researcher realizes that only commercial and classical could have been written, the most popular genres were also specifically outlined.

       The diagnoses category, the post surgery and the medical conditions categories were extensive. As this practice grew, the list of conditions did as well. While this researcher understands the correlation of psychological issues with singing, this presentation does not categorize the different psychological issues.

       Primary referrals were from ENT's in Houston as well as others in and out the state of Texas. It is the current practice of the SSI that a referral must have a medical examination. It is preferred that the patient have a video examination to present at the initial evaluation with the SVS as pictures only show if pathology is present and do not show muscular function.

       As outlined in "Preparing the Singing Voice Specialist Revisited," as the need for qualified and well trained singing voice specialists grows then a means for appropriate preparation is required. Perhaps the examination of a SVS practice will help to illuminate the breadth of preparation needed.

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Voice Therapy for Functional Dysphonia via Translation

Introduction: Voice therapy is essential to caring for millions of Americans with vocal problems. However, for immigrants who are non-English speakers (NES), native-language treatment may not be available. While voice therapy is often provided via translator, little data supports this modality.
Method: We prospectively surveyed individuals receiving voice therapy at our institution for functional dysphonia, where numerous NES individuals receive voice therapy through translation. Surveys were mailed prior to initiating therapy and two months after treatment began. The survey instrument was the validated 30-item Voice Handicap Index (VHI). NES patients were provided with a professionally translated version in their native language.
Results: 9/29 (31%) of the NES and 4/15 (27%) of the English speakers (ES) returned incomplete baseline surveys. ES and NES omitted an average of 2.5 and 1.4 questions respectively. Change scores were calculated for the 20 subjects (12 NES and 8 ES) who completed both pre- and post-treatment surveys, and were normalized to a maximal score of 120 to account for incomplete questionnaires. ES improved from a baseline mean of 49.1 to 30.5 (p=0.015), and NES from 56.9 to 47.3 (p=0.065). The mean for the entire group improved from 54.0 to 41.1 (p=0.002). No significant between-group difference was found.
Conclusion: Overall, this mixed population showed improvement in the VHI with voice therapy. A trend toward reduced improvement in the NES was seen, but our sample was insufficient to fully evaluate this hypothesis. Further studies of voice therapy via translation are warranted.

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Training Novice Listeners: Does it Improve Reliability and Accuracy of Perceptual Voice Ratings?

Training of novice listeners has been suggested as a way to improve the reliability of auditory-perceptual voice ratings. To test the hypothesis that training improves inter-rater reliability and accuracy of judgments, we examined training profiles across 8 weeks of 28 speech-language pathology students enrolled in a voice disorders course. Students were trained to use the Consensus Auditory Perceptual Evaluation of Voice (CAPE-V). For each of the eight training weeks, students completed auditory-perceptual judgments from five voice patients and wrote reports using the using an automated tool. Immediate feedback was provided by an expert report. Absolute differences between each student rating from the expert rater were calculated and Levene's test was used to analyze whether average CAPE-V rating differences became: (1) less variable across weeks, as an indication of greater reliability, or (3) closer to the expert rater, as an expression of accuracy. Results showed that the change in variance was not significantly different across the eight weeks for global dysphonia, roughness, breathiness, strain, and loudness ($p > .05$). Thus, students' ratings did not become closer to one another on these parameters. While a repeated measures ANOVA of the average differences from the expert across weeks was significantly different ($p < .0001$), there was no noticeable pattern of improvement where student rating scores became closer to the expert rating scores as training progressed. Based on our results and previous literature, we conclude that vocal features are likely based on internal representations that cannot be adequately defined and thus, altered, through our particular training method.

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Singing Voice handicap mapped by different self-assessment instruments

Purpose: To map voice handicap of popular singers with a general voice and two singing voice self-assessment questionnaires (VHI - Jacobson et al 1997; S-VHI - Cohen et al 2007; MSVH - Fussi et al 2005).

Methods: 50 singers, 25 male and 25 female, 23 with vocal complaint and 27 without vocal complaint answered randomly the questionnaires. The VHI is a generic voice-related self-rating tool, whereas the S-VHI and MSVH are specific singing voice self-rating instruments. For the comparison of data the following statistical tests were performed: Mann-Whitney, Friedman, Wilcoxon, Spearman.

RESULTS: Data showed that the VHI yielded a smaller handicap when compared to the other 2 questionnaires (VHIxS-VHI p=0.001; VHIxMSVH p=0.004). The S-VHI and MSVH produced similar results (p=0.723). Singers with vocal complaint had a VHI total score of 17.5. The other two instruments showed more deviated scores (S-VHI 24.9; MSVH 25.2). There was no relationship between sex and singing style with the handicap perceived. A weak negative correlation between the perceived handicap and the time of singing experience was found (-37.7% to -13.10%), that is, the smaller the time of singing experience, the greater the handicap is.

CONCLUSIONS: The questionnaires developed for the assessment of singing voice, S-VHI and MSVH, showed to be more specific and correspondent to each other for the evaluation of vocal handicap in singers. Findings showed that the more the time of singing experience of the singer, the smaller the handicap is. Sex and singing styles did not influence the perception of the handicap.

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Objective vocal quality in children using cochlear implants: a multiparameter approach

Objective: The purpose of this cross-sectional study is to determine the objective vocal quality in 36 prelingually deaf children using CI (cochlear implant) with a mean age of 9 years. An additional purpose is to compare the objective vocal quality of these 36 CI users with 25 age matched children with prelingual severe hearing loss using conventional hearing aids and 25 normal hearing children.

Methods: The objective vocal quality was measured by means of the Dysphonia Severity Index (DSI). Moreover perceptual voice assessment using the GRBASI-scale was performed.

Results: CI children have a vocal quality by means of the DSI of +1.8, corresponding with a DSI% of 68%, indicating a borderline vocal quality situated 2% above the limit of normality. The voice was perceptually characterized by the presence of a very slight grade of hoarseness, roughness, strainedness and higher pitch and intensity levels. No significant objective vocal quality differences were measured between the voices of the CI, hearing aid users and normal hearing children.

Conclusion: According to the results one aspect of the vocal approach in children with CI and hearing aids must be focused on the improvement of the strained vocal characteristic and the use of a lower pitch and intensity level.

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Perception of Voice-Related Quality of Life in the Diverse Types of Dysphonia

Purpose: to identified the differences in responses to the V-RQOL among individuals with different types of dysphonia.

Methods: 114 V-RQOL questionnaires of 73 patients with behavioral dysphonia, 28 with behavioral dysphonia and vocal fold lesions and 13 with organic dysphonia. All patients also performed a voice self-assessment. Data was analyzed according to self-rating of voice-related quality of life and vocal quality as well as the rank order of the statements.

Results: there was not statistically difference among the types of dysphonia; however each group separately had statistically different responses among the items. For both groups with behavioral dysphonia (with or without mass lesion), the most deviated item was: "I am sometimes anxious or frustrated" ($p<0.001$); on the other hand for the organic dysphonia patients was: "I have trouble speaking loudly or being heard in noisy situations" ($p=0.015$). There was one item in common for the three groups with the lowest rating: "I avoid going out socially". The similarity in responses is confirmed when looking at the rank order of the items, the first statements for the 3 groups are the same (items 1,2,3,4). There was no strong relationship between the items and the self-assessment of vocal quality, expect from one good correlation for the item "I have trouble using the telephone" in the group with organic dysphonia.

Conclusions: types of dysphonia do not produce different quality of life limitations, since profile of answers were similar to all respondents regardless the involvement of vocal behavior as an etiological factor.

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The Impact of Head Position and Stance on Aerodynamic Output During Sustained Phonation

Posture has long been recognized as an important factor in voice production. Attention to posture has been and continues to be an integral part of voice training for singers, actors and speakers. Recent studies by Fishman and Shipp (1970), Jones, (1972), Sundberg, Leanderson and von Euler (1989), Hoit (1995), Schneider, Dennehy and Saxon (1997), Takahashi et al (2002), Kooijman, et al (2005), Giovanni, Aki, and Ouaknine (2008), Lagier et al (2010) found that posture or body position impacted on respiration, voice handicap, intrinsic and extrinsic laryngeal musculature and glottal closed quotient as well as perceived phonatory effort.

This study examines whether aerodynamic measures are impacted by head position and/or stance. Mean peak airflow, peak airflow, and peak expiratory volume were measured using the KayPentax Phonatory Aerodynamic System. The impact of postural shift on mean airflow in 6 positions: head neutral, head forward and head back while sitting and standing in neutral, standing with knees locked and standing with knees soft was examined. In addition perceived phonatory effort was measured using a 100 mm visual analog scale. Results indicate that perceived phonatory effort increased with exaggerations in head position. Mean Peak Airflow decreased to statistical significance (0.007) in the head back position compared with standing with head neutral, and there also seemed to be a trend to decreased mean airflow in the knees soft position when compared with standing in neutral. These findings support that notion that posture plays an important role in the phonatory process.

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The relation between Body Mass Index and Speaking Fundamental Frequency in Pre- and Postmenopausal Women

The female voice is very sensitive to sex hormonal fluctuations. In postmenopausal women adipose tissue becomes the main source of estrogen production. As the fat cell mass increases, the level of endogenous estrogens also increases. The purpose of this study was to investigate the correlation between Body Mass Index (BMI) and Speaking Fundamental Frequency (SFF) in premenopausal women and postmenopausal women with and without hormone therapy (HT).

In this study 142 middle-aged women participated and were divided into three groups: premenopausal women (n=41), postmenopausal women without HT (n=41) and postmenopausal women with HT (n=60). The mean SFF (Hz) of connected speech was measured using Real-Time Pitch program from Computerized Speech Lab (Kay). In the three groups a correlation was calculated between BMI and SFF.

A positive correlation was apparent between the BMI and the SFF in the group of postmenopausal women without HT (p=0.043). In the group of premenopausal women and the group of postmenopausal women with HT no correlation was found between BMI and SFF.

In postmenopausal women without HT increasing BMI is associated with increasing SFF. This correlation is most probably related to the higher amount of estrogen production in adipose tissue in women with a higher BMI.

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Talkativeness and vocal loudness during daily activities and professional voice use

Purpose: to compare the self-assessment of talkativeness and vocal loudness during daily activities and professional voice use.

Methods: 1831 individuals, 18 to 70 years answered a questionnaire for self-rating of vocal quality, talkativeness and loudness. These 2 last items uses a seven-point scale: to score talkativeness, 1 represents a quiet person, 4 an averagely talkative person and 7 an extremely talkative person and to score loudness, 1 represents soft spokenness, 4 averagely loud spoken and 7 very loud spoken. Participants rated these items twice considering their professional and extra-professional voice use (adapted from Bastian, Thomas 2000). Subjects were grouped according to age and profession.

Results: Female reported higher degree of talkativeness and loudness in daily communication (mean 5.1 and 4.5 respectively) and professional use (mean 5.4 and 4.7 respectively). Naturally talkative people work in professions that require great vocal demand (p=0.096 professional and extra-professional use), conversely quiet people take professions that do not require much oral communication (p=0.428). Some professional categories impose additional vocal load even for individuals that are talkative (p<0.001). The vocal loudness needed during work is greater than during daily activities for most professional categories. The age range between 18 to 27 years was the only range that presented the same loudness both for professional and daily activities use (p=0.078).

Conclusion: Women identify greater demand for talking and speaking louder. Vocal demand is inherent to the individual's nature. Naturally talkative and loud people take professions that have great speaking demand, while the opposite happens with quiet people.

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The Principles of Motor Learning Prepractice Behaviours in Voice Therapy :
A Pilot Study

Purpose: This study investigated prepractice behaviors in voice therapy. The general motor learning literature describes five general prepractice variables: *motivation, modeling, verbal information, physical attempts* and *feedback*. Within the general variables are numerous specific variables. For example, *instructions*, *explanations* and *perceptual training* are specific variables within the broad category of *verbal information*. All variables were summarized within the Principles of Motor Learning (PML) Prepractice Schema. The study aimed to determine whether any or all of these prepractice variables could be reliably identified in clinical-type interactions.

Method: Nine final year speech-language pathology students participated in a pilot study. Participants categorized clinicians" behaviors in voice therapy training videos according to general and specific prepractice variables within the PML Prepractice Schema.

Results: Evidence of good intra-rater reliability was found. Inter-rater reliability was not consistent across the prepractice variables and therapy approaches. In general, inter-rater agreement was higher for *modeling* and *verbal information* than *motivation* and *feedback*. Inter-rater reliability for specific variables was relatively low.

Conclusion: The study found preliminary evidence that some prepractice behaviors described within the PML literature occur in the initial stages of voice therapy, and can be identified with varying reliability. Analysis of disagreement indicated that ratings were not random but were influenced by implicit and explicit meanings of behavior. The PML Prepractice Schema provides a unique methodology for further investigating (and potentially optimizing) the manner in which clinicians assist clients to acquire verbal motor skills.

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Risk Assessment Framework for Hyperfunctional Voice Disorders

Voice disorder is one of the most common communication disorders. According to Hazlett, Duffy and Moorhead, voice disorder is a global health problem. An estimate 3-9% of individuals in the US (Verdolini & Ramig, 2001) and 4% in Australia (Baker, 2008) has voice problems at any given time. Studies have shown that voice disorders not only resulted in lost of workdays and vocal pathologies, severe negative consequences economically, communicative, socially and psycho-emotionally. It has been universally agreed that the development of voice disorders involves a multifactorial pathogenesis and that the most cost-effective management strategy is prevention. The present project adopted the risk assessment model based on the probabilistic approach for voice disorders. Such approach takes into account different conditions that would affect the voice status of an individual.

The present project aimed to investigates the risk indicators and factors that are involved with hyperfunctional voice disorders using the Voice Risk Calculator - a self-reported questionnaire that assesses the different risk indicators for the development of voice problems. Findings from two studies will be reported. Study 1 was a cross-sectional study involving 30 dysphonic and 30 non-dysphonic subjects. Study 2 was a longitudinal study involving 5 non-dysphonic teachers and they were followed during the first year of their teaching. Results showed that specific conditions concerning vocal loading, physiological and psycho-emotional risk indicators positively correlated with the prevalence of dysphonia. It is contended that with the identified risk indicators of voice disorders, specific methods and strategies for preventive, diagnostic and intervention programs can be developed to eliminate or reduce these conditions (Beck, 1990; Page & Beck, 1997).

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Investigation of Laryngeal Resistance in Healthy Voice Users and in Patients with Voice Disorders.

Voice disorders are the most common communication disorder, impacting approximately 7.5 million people in the United States at any given moment. Considering the significant societal and economic impact of voice disorders, the long-range goals of the P.I. are to design prevention paradigms, to investigate a newly developed voice therapy model, and to identify reliable and valid clinical voice outcome measures. With the long-range goal of pursuing clinical investigation of a newly developed voice therapy model, the focus of the present work is the identification of a clinically relevant voice outcome measure. The measure of interest is laryngeal resistance (LR; subglottic pressure divided by average airflow) captured through a new instrument, the *Global Voice Analyzer* (GVA).

Two experiments were conducted. For experiment one, healthy voice users produced repeated /pi/s and the phrase "Pooh, pay Pia pea pie" into the GVA to determine the reliability and validity of the GVA and the phrase. For experiment two, patients with voice disorders produced the phrase into the GVA at pre- and post-treatment to determine LR's ability to capture voice changes following treatment. The following will be discussed in the oral presentation: rationale for conducting the studies with experimental questions, methodology, results, and explanation of findings.

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The Effect of Vocal Function Exercises on Vocal Efficiency in the Ageing Population

The human voice undergoes changes associated with normal physiological ageing after the age of 65. These age-related voice changes may indicate an overall reduction in vocal efficiency, which can have diverse vocal and psychosocial impacts for the ageing individual. At present, there is limited research attention as to whether vocal training programs can have positive effects on changes arising from physiological vocal ageing, in particular for ageing individuals who sing. This study aimed to investigate the effectiveness of a 7-week Vocal Function Exercises (VFE) training program on measures of vocal efficiency in a sample of ageing community choral singers.

A group of 22 ageing community choral singers (8 men and 14 women) participated in this study over a 7-week period and were pseudo-randomly assigned to either the VFE program or control group. Pre-training and post-training comparisons were made of auditory-perceptual, aerodynamic, and acoustic analyses, and self-evaluation measures.

Following VFE training, significant improvements in perceived roughness, maximum phonation time, and shimmer were found for participants in the VFE program group. The VFE training program was also generally perceived by the participants to have a positive effect on their voices. However, evaluations of perceived breathiness and strain, phonational frequency range, jitter, and noise-to-harmonics ratio did not reveal significant changes.

The results of this preliminary study suggest that VFE may have the potential to bring about positive effects on changes arising from physiological vocal ageing, and deserves further attention as a mode of vocal training program for ageing individuals, particularly for individuals who sing.

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Influence of Emotional Expression on Acoutsic Parameters of Vibrato in Opera Singers

Vibrato is considered one of the most essential characteristics of the classical singing voice. Vibrato can be acoustically described by the rate, extent and periodicity of frequency and amplitude modulations. The acoustic parameters of vibrato vary depending on the singer's technique and vocal expression. Some studies have reported that singers adjust their vibrato in relation to musical expression and vibrato parameters are modified depending on the level of expression. Despite research on the subject, there are no specific studies exploring how the acoustic characteristics of vibrato change with emotion.

Twenty-four opera singers were included in this study. Each had more than 5 years of classical voice and no voice complaints for over 1 year. Each subject was asked to sing the phrase "I Love You", while expressing different emotions (tenderness, anger, happiness and sadness). They were also asked to sing the phrase without emotion. The tonality of the musical phrase was adapted to each singer's vocal classification. Samples were also taken at 3 levels of intensity for each emotion: low, medium and high. A computerized acoustic analysis of vibrato was carried out. This analysis was performed during the vowel / o / of the word "Love" to determine rate, extent, jitter and vibrato onset. Using repeated measures analysis of variance (rmANOVA) parameters were compared to assess the effect of emotion and intensity.

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An investigation of factors affecting the quality of resonant voice production.

In order to maintain the quality of resonant voice, it is crucial to properly control the factors that may affect the reliability and validity of the measurement. The present study investigated the effects of pitch and vowels on the extent of facial bone vibration using vibro-detectors. Thirty females and 30 males aged from 20 to 30 years with healthy voice were given a session of resonant voice training. Vibration measurements using vibro-detectors on nasal bridge, upper lip were taken. Laryngeal muscle activities were detected using sEMG electrodes placed over the thyrohyoid and orofacial sites during resonant voice production. Results showed that the extent of facial bone vibration can be affected by different pitch levels but not by different vowels. While after resonant voice training, there was a significant increase in bone vibration within the pitch range around G4, but the EMG values remained relatively stable. These results suggested that the resonance increase is not due to higher laryngeal muscle activities. Those quantitative data of "optimal pitch range" for better resonance acquisition can be used as visual feedback and will form a valuable database which useful for the resonant voice training.

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Therapeutic Effect of Semi-Occluded Vocal Tract Exercises in Patients with Type I Muscle Tension Dysphonia

Phonation with semi-occluded postures of the vocal tract and phonation into resonance tubes are widely used for the purpose of voice therapy and voice training. These techniques increase the source/filter interaction and produce several physiologic and acoustic effects such as an increase of the inertive reactance of the vocal tract in the 200-1000 Hz range and thereby reinforce vocal fold vibration. Eleven male and female acting students diagnosed with type I Muscle tension dysphonia were treated with a sequence of semi-occluded vocal tract exercises during six sessions. This sequence included a prolonged bilabial consonant /B/and artificial lengthening of the vocal tract using resonance tubes. Phonatory tasks performed were a sustained phonation in a comfortable pitch, and ascending/descending pitch glides. Voice samples were recorded before and six sessions after voice therapy. Flexible laryngoscopy and spectral analysis using a spectrogram with a narrow filter at real time were used for analysis. Spectrograms were evaluated by five blind judges on a 100 mm visual analogue scale. Two time points were compared and statistical analysis performed. Significant positive changes were observed by spectral analysis evaluation but with no clear laryngeal muscle pattern changes. The result indicates that the use of resonance tubes and semi-occluded postures of the vocal tract can have a therapeutic effect in patients with type I Muscle tension dysphonia.

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The potential of acoustic measures for measuring the supranormal speaking voice

Introduction: Acoustic analysis is commonly used to objectively measure the voice as it is non-invasive and in-expensive. Many acoustic measures have been shown to reliably measure quasi-periodic voice signals. Normal and supranormal (better-than-normal) voices may therefore be reliably analyzed with a range of acoustic measures however it is not known which of these measures may distinguish supranormal from normal voices.

Method: Sixty-nine female participants (mean age = 20.44 years, range = 17-25) were recorded while producing a sustained vowel /a/. All samples were classified as Type 1/quasi-periodic (Titze, 1995). The samples were then analyzed for six acoustic noise measures: Noise-to-Harmonic Ratio (NHRP) and Harmonic-to-Noise Ratio (HNR) in Praat; Glottal-to-Noise Ratio (GNE) in LingWaves; Noise-to-Harmonic Ratio (NHRM) in the Multi-Dimensional Voice Program; and Cepstral Peak Prominence (CPP) and smoothed Cepstral Peak Prominence (CPPS) in SpeechTool. Results were converted to z-scores and frequency histograms were calculated for each acoustic measure. Distribution for each measure was calculated using skewness and kurtosis.

Results: The distribution of the histograms for GNE (skewness = -0.955, S.E. = 0.289, p = 0.001) and NHRP (skewness = -1.041, S.E. = 0.289, p = 0.0004) were significantly positively skewed. Distribution for GNE was also kurtotic (kurtosis =1.36, S.E. = 0.57, p = 0.017). The histograms for all other variables were normally distributed.

Discussion: Measures of CCP, CPPS, NHRM and HNRP have potential to measure and distinguish supranormal voices. This is because participants' results spread normally across the measures' full ranges, allowing sufficient discrimination to distinguish supranormal voices. Due to the positive skewness seen for GNE and NHRP, they may not be useful for distinguishing supranormal from normal voices. GNE produced a ceiling effect when measuring better-than-normal voices, as many voices were analyzed close to the maximum of +1.

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The effects of coaching and repeated trials on maximum performance frequency range in children

Maximum phonational frequency range (MPFR) refers to the frequency range from the lowest pitch in the modal register to the highest pitch in the falsetto register that an individual can produce (Hollien, Dew & Philips, 1971). MPFR is a test of maximum performance and it can be affected by various elicitation variables. The present study investigated the effects of coaching and repeated trials on MPFR in a group of Cantonese children. Thirty girls aged between 6 and 11 years were randomly assigned into two groups: coaching group and non-coaching group. All children produced their lowest and highest frequencies for 10 times each. Children in the coaching group were provided by the clinician with verbal encouragements and visual cue (hand-sweeping) to prompt them produce their maximum performance. Children in the non-coaching group were simply asked to repeat the task for 10 times. The results revealed no significant coaching effects on the MPFRs. The MPFRs were similar between the coaching and the non-coaching groups. However, the MPFRs could be achieved in fewer trials in the coaching group than the non-coaching group. The results also showed that the MPFRs elicited using 10 trials was significantly greater those that were elicited in fewer trials. These findings provide clinicians with procedural guidelines on the elicitation of MPFR in children.

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The Effect of Vocal Function Exercises on Vocal Efficiency in the Ageing Population

The human voice undergoes changes associated with normal physiological ageing after the age of 65. These age-related voice changes may indicate an overall reduction in vocal efficiency, which can have diverse vocal and psychosocial impacts for the ageing individual. At present, there is limited research attention as to whether vocal training programs can have positive effects on changes arising from physiological vocal ageing, in particular for ageing individuals who sing. This study aimed to investigate the effectiveness of a 7-week Vocal Function Exercises (VFE) training program on measures of vocal efficiency in a sample of ageing community choral singers.

A group of 22 ageing community choral singers (8 men and 14 women) participated in this study over a 7-week period and were pseudo-randomly assigned to either the VFE program or control group. Pre-training and post-training comparisons were made of auditory-perceptual, aerodynamic, and acoustic analyses, and self-evaluation measures.

Following VFE training, significant improvements in perceived roughness, maximum phonation time, and shimmer were found for participants in the VFE program group. The VFE training program was also generally perceived by the participants to have a positive effect on their voices. However, evaluations of perceived breathiness and strain, phonational frequency range, jitter, and noise-to-harmonics ratio did not reveal significant changes.

The results of this preliminary study suggest that VFE may have the potential to bring about positive effects on changes arising from physiological vocal ageing, and deserves further attention as a mode of vocal training program for ageing individuals, particularly for individuals who sing.

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Speech and Voice Range Profiles for Adults with Normal Voices

The phonetogram is an instrumental measure of voice that plots fundamental frequency against sound pressure level in a graphic display. Phonetograms have been shown to be sensitive to gender differences, age differences, and differences between pathological and healthy voice. However limited normative data are currently available for the two main types of phonetograms, Voice Range Profiles and Speech Range Profiles, particularly given the advent of automatic phonetograms and more sophisticated technology for computerised profiles. The present study collected control data from the Speech and Voice Range Profiles of 63 adults aged 21 to 65 years. Gender differences and correlations between Voice Range Profile measures were analysed. Test-retest reliability was also evaluated. Although the data obtained for Speech Range Profiles were consistent with previous research, Voice Range Profile data were substantially different, with wider SPL ranges for both males and females than those reported in previous literature. These differences suggest that further consideration of protocols for eliciting computerised Voice Range Profiles is warranted. Test-retest reliability for both Speech and Voice Range Profiles was good, thus providing further support for the use of phonetgrams in research and clinical practice.

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Development in Progress: Validating the Content of a Perceptual Evaluation of Voice Scale

Background
A validated and reliable scale for perceptual evaluation of voice tool is crucial to everyday clinical practice. The current study provides the results of the content validation stage of the development of a perceptual evaluation of voice tool for Cantonese speakers.

Methodology
Content validation consisted of three phases: (1) Literature search of a comprehensive list of vocal parameters; (2) Standardization of the definition of the vocal parameters; (3) Determine the relevance and representativeness of each vocal parameter.

Results
A total of 47 vocal parameters were identified through literature search. Definition of all the vocal parameters were reviewed and revised according to experts' opinion. Of the initial 47 vocal parameters, 22 were deemed relevant and represent voice quality as a whole.

Conclusion
Content validation is the first stage of a test validation process. Vocal parameters identified through the content validation process will be subjected to an array construct validity process including known-group method, convergent and divergent validity, factor analysis and Rasch analysis. The proposed perceptual evaluation of voice scale will be the first validated scale that utilized a range of test validation process. With a validated perceptual evaluation of voice scale, patients with voice disorders are able to receive a standard assessment administered among various clinicians and clinics. This not only allows better communication between professionals, but also ensures valid and standard outcome data collection.

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Final Validation of the *Vocal Fatigue Index*

Vocal fatigue (VF) is a phenomenon that many clinicians recognize as widespread, debilitating, and often baffling. Existing literature on mechanisms and treatments for VF is variable and inconclusive. One factor that may contribute to the variability in existing literature is the lack of a clear and consistent definition of vocal fatigue, and thus the ability to identify individuals who have it. A "Vocal Fatigue Index (VFI)" was developed and validated to help identify individuals with VF for clinical and research purposes.

An initial set of 21 questions (*VFI-1*) pertaining to VF symptoms was developed at the University of Pittsburgh Voice Center (UPVC) by a group of speech language pathologists and laryngologists specialized in voice disorders. Two hundred individuals with voice disorders completed the *VFI-1* at two clinical sites, UPVC and Vanderbilt Voice Center. Cronbach's alpha indicated a high item-to-total correlation overall ($r = .934$), except two items that were dropped from the index. Principal axis factoring for the *VFI-1* identified three factors. Those factors were related to tiredness of voice, physical discomfort during phonation, and symptom improvement with rest.

A *VFI-2* with the remaining 19 questions was subjected to validation. Test-retest reliability was obtained for 100 subjects with dysphonia from both sites. Test-retest reliability was high ($r = .951$). Construct validity was assessed by administering the *VFI-2* to vocally healthy subjects. The conclusion is the *validated VFI* can serve as a tool to identify individuals with VF for clinical and future research protocols.

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Prosodic adaptation during voice imitation

Voice imitation of a famous character results in detection and reproduction of some features, including not only the timber, but also prosody, speech flow or articulatory patterns. The famous French impersonator, Laurent Gerra, has accepted to participate in a vast series of work. The target speaker is our former president Jacques Chirac, and the speech material is a political speech of Jacques Chirac.

Our preliminary work showed that the impersonator does not modify his F0, but tends to increase his pitch register, which gets closer to the target speaker. Concerning rhythmic flexibility, the impersonator tends to exaggerate the global duration by slowing down the articulatory speed and the pauses duration more than by modifying the number of pauses.

The aim of this second step is to compare the performances of our professional impersonator with the attempts of 40 randomly selected male subjects. Initially, a perceptual evaluation will allow us to classify the samples according to the success of the imitation. Then a systematic study of prosodic and rhythmic characteristics of each sample will allow us to identify the features that distinguish a good imitation of bad one.

Our hypothesis is that certain features, such as the number and location of pauses, are invariants dependent syntactic rules and will be produced by all speakers, while the rhythmic aspects such as the length of pauses, is a better indicator of a good imitation performance.

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Perceptual evaluation of breathiness by inexperienced judges: contribution of a paired judgment task.

Perceptive analysis of voice quality suffers from inter- and intrarater variability. A comparative judgment task has proven successful in improving inter and intrarater consistency for judgments of overall grade of voice (G), both for experienced and inexperienced judges (Kacha et al, 2005).

This study investigates the contribution of a comparative judgment task to the perceptive analysis of *breathy* voice quality in *natural voices* by inexperienced judges.

A sustained /a/ and two sentences from 20 female speakers are presented in random pairs to 7 inexperienced and 5 experienced judges who are asked to label the most degraded sample regarding to *breathiness*. (Total: 190 pairs of sustained /a/ and 190 pairs of sentences). Each stimulus is also graded for B according to the GRBAS.

Statistical analysis: Spearman's rank correlation coefficient, Mann-Whitney U test.

The comparative judgment task yields higher inter and intrarater reliability than the GRBAS method both in the inexperienced and the experienced group. The comparative judgment task rules out group differences between experienced and inexperienced judges: no significant difference is found between the groups.

We conclude that inexperienced judges are as proficient as experienced ones in classifying breathiness with the comparative judgment task, the method also improves the performance of experienced judges. This method is interesting when precise classification of natural voices is required, eg assessing treatment proficiency, or developing anchor-voices for perceptive analysis training.

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Blood Lactate Levels Associated with Neuromuscular Electrical Stimulation to the Laryngeal Area

Prior research has documented changes in pitch and loudness measures following 30 to 60 minutes of NMES applied to the anterior neck and larynx. Data has also shown that some normally speaking participants experience symptoms of vocal fatigue, e.g., voice tiredness or weakness, and feelings of muscular soreness following NMES. Blood lactate levels may be used as an indicator of muscle fatigue, as high levels of blood lactate have been associated with impairments in performance. Preliminary data have demonstrated an increase in lactate following application of NMES to the laryngeal area, indicating that lactate levels do change in response to localized stimulation. Given that blood lactate may be used as an indicator of muscle fatigue, it is hypothesized that changes in blood lactate levels will correlate with both the voice measures of vocal fatigue and the subjective ratings of fatigue and/or muscular soreness. To complete the study, 10 men and 10 women will receive NMES for 1 hour, administered via VitalStim®. The electrodes will be applied to the thyroid lamina and to the cricothyroid space. Measures of blood lactate, voice recordings, and subjective ratings will be obtained before, during, and after the NMES session. These data will be used to determine the extent to which muscular fatigue contributes to the voice symptoms and/or the subjective ratings of fatigue and soreness. Data collection and analysis is currently underway.

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Voice Range Profile of trained Television Newscasters

The control of the vocal parameters of intensity and frequency are essential for television newscasters' communication.

The aim of this study was to verify the impact of vocal training on vocal control of intensity and frequency of television newscasters. The Voice Range Profile, that analyses the intensity in association of a frequency range, and the measurement of maximum phonation time were used in the participants' evaluation.

A total of 53 journalists were evaluated, aging from 23 to 55 y-old, divided in 2 different groups: 30 participants in the Newscasters Group (trained professionals) and 23 participants in the Control Group (non-trained journalists). The Newscasters Group was subdivided in 2 groups, with 15 participants in each group, classified according to their professional experience.

The analyses were done using Voice Range Profile (VRP), *Vocalgrama* (*CTS Informatica*), and all data have undergone statistic analysis.

The results showed no differences related to semitons extentions, in soft and loud intensities. There was a statistically significant difference between the Control Group and the Newscasters Group in the soft and loud intensity controls. Also, in the more experienced group (with more than 5 years of professional experience) there was no significant F_0 variation due to the intensity changing. Regarding to Maximum Phonation Time the newscasters group with more than 5 years of experience, presented longer MPT, in both sexes.

We conclude that the trained newscasters, with more than 5 years of experience, have a better vocal control and ability to use frequency and intensity variation.

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Preliminary Research for Paradoxical Vocal Fold Motion Using the Airflow Perturbation Device

When healthy patients are referred to the SLP for dyspnea, Paradoxical Vocal Fold Motion (PVFM), a condition where the vocal folds inappropriately adduct is suspected. Research is lacking that documents glottal change or change in airflow during PVFM episodes because of limitations in instrumentation, methodology, and unpredictability of symptoms. While laryngoscopy is the gold standard for diagnosing PVFM, it is invasive and lacks the portability and convenience for real-time diagnosis. Assessing resistance to airflow through well-constructed protocols may provide valuable clinical and research information. The Airflow Perturbation Device developed at University of MD, provides accurate, real-time measures of inspiratory and expiratory resistance. When applied to PVFM it is expected that \inspiratory resistance during attacks is increased as compared to resistance when asymptomatic. Also, if behavioral treatment is effective, resistance should be comparable to asymptomatic measures.

We will present findings for female athletes diagnosed through laryngoscopy with PVFM and control athletes contrasting rest and exercise respiratory resistance using an exercise challenge where Borg dyspnea ratings and exercise duration were also recorded. Analysis revealed significant between-group differences for rest inspiratory resistance, exercise inspiratory and expiratory resistance, Borg ratings, and exercise duration ($p <.05$). Trial Breathing Therapy (BT) for PVFM athletes revealed decreased inspiratory resistance suggesting that BT is effective for this group, and that the APD provides noninvasive assessment of airway resistance change. A case study will be presented chronicling an elite athlete throughout the diagnostic and treatment period.

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Correlation between Weight, Height, Fat analysis and Acoustic Parameters

Purpose: The purpose of this study is to analyze the correlation between body height, weight, fat distribution and Fundamental frequency.

Material: A total of 40 male subjects were included in this study. Each subject underwent acoustic analysis using the Kay Elemetric VISI Pitch (*Model 3300*) and complete weight analysis. Pearson`s correlation was calculated to estimate the strength of relationship between acoustic parameters and each of the weight analysis variables. Statistical significance was set at p-value <0.05.

Results: The mean age of the male subjects was 24 years with a range between 18 years and 40 years. The average weight and height were almost 80 Kg and 180 cm. with respective SD of 7.42 and 10.46. The Fat weight ranged between 3 kg and 25 Kg, with the main concentration being in the extremities, 61.84% +17.4 and less in the trunk, 16.20% + 7.6. The mean Fundamental Frequency was 120.13 Hz with a SD of 19.16 Hz. The mean Habitual Pitch was 114.16 Hz with a SD of 16.55 Hz. There was no significant correlation between the acoustic parameters and any of the weight analysis variables, in particular Fat weight and distribution, except for the Shimmer which correlated significantly with the trunk fat (p= 0.039) and muscle mass (p=0.038). There was a non significant negative correlation between Fundamental frequency, height, weight, fat weight, and fat distribution. On the other hand there was a non significant positive correlation between Habitual pitch, weight, fat weight and fat in the extremities.

Conclusion: The height, weight, muscle mass, fat mass and distribution, do not significantly correlate with the Fundamental frequency and the Habitual pitch.

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Visualizing Collagen Orientation Within Vocal Folds Using Polarized Light Microscopy

Viscoelastic properties of the vocal folds determine their oscillatory behavior during voice production. Viscoelastic properties depend on the composition and organization of the connective tissue which constitutes the medial and superficial layer of the vocal fold. Changes within these layers are associated with age or the occurrence of diseases or injury to the vocal fold tissue. Little understanding exists for the relationship between the composition and organization of the connective tissue on one hand and the nonlinear response of the vocal fold tissue to the applied forces on the other hand. The goal of this project is to measure collagen fiber orientation within vocal fold tissues. This new information will allow researcher to better understand viscoelastic properties in the entire vocal fold, leading to improved predictions about tissue response. Due to the birefringence property of collagen, the orientation of collagen fibers can be determined using polarized light without additional staining procedures. Using polarized light microscopy, we were able to map out the collagen content and the orientation of collagen fibers within the vocal fold tissues of different species (at different ages and in both sexes). Better understanding of the vocal folds in its entirety will advance the research field both experimentally and computationally, which will help improve the design of new treatments for the vocal fold related injuries.

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Quantitative comparisons between aerodynamic and morphometric parameters of larynx and vocal folds following laryngeal cancer treatments

Methods for the early treatment of laryngeal cancers include external beam radiotherapy (XRT), open partial laryngectomy surgery, and transoral endolaryngeal laser (TOL) surgical excision. There are debates over the optimal method in the literature and there is not enough evidence to clarify which method is best for people with early stage squamous carcinoma.

Voice quality is one of the major metrics to compare the outcome of different treatment methods. Aerodynamic parameters, e.g. airflow and pressure, characterize voice quality and provide a quantitative scale of laryngeal function, helping the identification of abnormal physiological mechanisms. Based on the direct dependency of these factors on the larynx geometry and glottic configuration, CTScan and MRI images were used to build precise 3D solid models of the larynx and the vocal folds. Quantitative comparisons between posttreatment morphometries of the larynx and the vocal folds after various treatment methods were made.

To evaluate objective aerodynamic parameters related to voice quality for different treatment methods, 3D numerical simulation of airflow through the glottis were conducted using COMOSL multiphysics software and 3D flow models. These simulations were also used to measure parameters which are not easily measured in patients, e.g. the wall shear stress, the orifice discharge coefficient and the pressure on the vocal folds.

Quantitative comparisons of aerodynamic and morphometric parameters of post-treatment larynges provide a better understanding of the advantages and disadvantages of different treatments

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Vocal fold vibration measurements with the use of laser Doppler vibrometry

The objective of this study was to obtain in vivo, online information on the dynamic properties of the human vocal folds using laser Doppler vibrometry (LDV). There is limited information on the dynamic response of the vocal folds. Few attempts have been made to measure the relationship between resonance frequencies and vocal fold tension and position. Laser vibrometry offers the potential to clinically measure dynamic mechanical properties, and diagnose voice disorders, vocal fold stiffness, and vocal tract properties. In addition, there is a need to study the vocal fold behaviour independently of airflow to more accurately define their mechanical properties, as the frequency of oscillations is significantly influenced by phonatory air flow. In this study, preliminary measurements were performed on volunteer human subjects. The excitation method consisted of a shaker exciting the thyroid cartilage with a force of 3-5 Newton (Svec, 2003). The subject performed the Kaneko manoeuvre (Kaneko, 1983), i.e. a short phonation which is interrupted while keeping the vocal folds in phonatory position. This process was repeated for different vocal fold tensions and phonating frequencies. The data was then analysed using modal analysis methods to determine the modal frequencies, and their relationship with the structural parameters of the vocal folds.

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Mechanical characterization of Hyaluronic acid-gelatin hierarchical composite biomaterial for voice restoration

The lamina propria plays a critical role in human voice production. Scarring of the vocal fold lamina propria may cause fibrosis. Scarring also affects the organization of fibers and mechanical integrity of the tissue, and leads to a stiffening of the vocal fold cover.

Viscoelastic injectable biomaterials are investigated for the treatment of vocal folds disorders including vocal folds scarring and unilateral vocal folds paralysis. Recent tissue engineering therapies are getting much attention for the treatment of vocal fold scarring through the use of scaffolds, cells and growth factors. Design, characterization and modeling of advanced scaffolding materials is needed to define mechanical requirements for tissue engineering.

Hyaluronic acid-based biomaterials are commonly used in the design of scaffolding materials for voice restoration due to their unique characteristics such as biocompatibility, viscoelasticity, and anti-inflammatory properties. Hierarchical structures are developed through the incorporation of micron-sized elements to enhance the mechanical properties and improve the degradation rate of such structures. Investigations of the mechanical properties of these micron-sized elements are needed for future modeling and optimization of these multi-element hierarchical structures.

In this study, hybrid micro-gels of hyaluronic acid and gelatin were fabricated to improve the cell adhesion and signalling of hyaluronic acid based hydrogel microparticles. The fabricated micro-gels were incorporated in a hyaluronic acid network. This study investigates the multi-scale mechanical characterization of this network through bulk and local mechanical characterization. Results indicate that these hybrid microparticles can potentially provide a favourable substrate for ligand mediated signalling and adhesion.

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Consistency of the LEMG Signal in Normal Subjects in a Multi-Trial Prospective Study

BACKGROUND: Laryngeal electromyography (LEMG) is considered the gold standard for the assessment of neuromuscular disorders of the larynx. LEMG is the only direct measure of laryngeal muscle function, and while it provides general information about the health of the musculature, its clinical utility beyond a general appreciation of function is debatable. Questions may be posed concerning LEMG's sensitivity, specificity, and reliability as a diagnostic tool for vocal fold paresis.
OBJECTIVE: Determine the consistency of the LEMG signal in a cohort of healthy adult participants at three different time points during the production of intensity controlled vocalization tasks.
METHODS: Prospective study using a two-factor repeated measure (RM-ANOVA) design with a group of 7 participants who underwent LEMG of the right thyroarytenoid muscle. LEMG signals were collected over three testing sessions (each separated by at least 1 month) using vocalization tasks performed under visually-guided intensity feedback (65 dB SPL and 75 dB SPL).
RESULTS: Results of the two-factor RM-ANOVA were non-significant for the interaction of the factors and for the main effect of testing time. However, the main effect for intensity was found to be significant (F= 5.71, p=0.054). Intra-class correlation coefficients (ICC) using a two-factor mixed random effect model indicated poor reliability in signal consistency between trials (ICC=0.56). Our results indicated that there was generally poor consistency in the LEMG signal over time and that vocal intensity was an important variable that impacted LEMG signal consistency.

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Rescue micro laryngoscopy: a protocol for utilization of four techniques in overcoming challenging exposures in micro laryngeal surgery

Objective: Discuss four techniques used to overcome the problem of difficult exposure during operative micro-laryngoscopy (MDL).The protocol uses four techniques in escalating fashion. These techniques are: 1. high frequency jet ventilation (HFPPV), 2. using a narrow bore diagnostic laryngoscope (Hollinger) with suspension, 3. using the 30 and 70 degree telescopes with angled instruments, and 4. using a flexible laryngoscope through a laryngeal mask anesthesia (LMA) device.

Method: From 1996-2010, endoscopy photographs from 1840 cases of MDL were reviewed. There were 12 cases used with HFPPV. Ten cases were done with the small bore Hollinger laryngoscope. Two cases were done using telescopes and one necessitated the use of a therapeutic flexible laryngoscope through the LMA. Only one case was aborted due to poor ventilation. These 26 cases are reviewed.

Results: The majority (98.5%) of micro laryngoscopy procedures were able to be performed with standard operating laryngoscopes using the microscope. Risk factors that contributed to difficulty in exposure included two cases of prior radiation therapy, one case of morbid obesity, and one case of Pierre Robin anomaly. The rest were unexpected. Switching from endotracheal intubation to HFPPV allowed adequate exposure in 12 patients while preserving magnification and bi-manual instrumentation. Ten cases were able to be done with MDL using a diagnostic narrow bore diagnostic (Hollinger) laryngoscope. When the above approaches fail, an angled telescope with an angled cup forceps was able to reach the lesion in two cases. Finally, one patient who could not be intubated was managed with a flexible laryngoscope through the LMA device.

Conclusion: Difficult exposure during MDL is unusual but not rare. It is often unanticipated. A proposal for graded use of these four techniques preserves some advantages of MDL. With each escalation, there is a degradation of the advantages afforded by traditional MDL. These include: minor increase in movement with HFPPV, loss of binocular visualization with diagnostic laryngoscopes, loss of bimanual instruments manipulation with the telescopes, and loss of stability with flexible laryngoscopy. Having an understanding of each technique and the need for escalation will allow the surgeon to perform rescue laryngoscopy and complete the surgery.

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Voice During Pregnancy-A Cross Sectional Study

BACKGROUND: Voice problems are prevalent in pregnant women but none of the studies have characterized these voice problems acoustically in every month of pregnancy. Also none have addressed in particular the period of the pregnancy where these voice problems begin. Hence the present study was an attempt in this direction.

METHOD: Pregnant women in the age range of 18 to 35 years were divided into seven groups from the third month of pregnancy to ninth month of pregnancy. Age matched non-pregnant women were also included for the comparative purpose. All the voice samples were recorded into the praat software and analysed for fundamental frequency, frequency perturbation measures (jitter absolute, jitter relative, pitch perturbation quotient with a smoothening factor five) and amplitude perturbation measures (shimmer, perturbation quotient with a smoothening factor five, amplitude perturbation quotient with a smoothening factor eleven).

RESULTS: Results of one way ANOVA revealed that there was a significant main effect of the group at $p < 0.05$. Bonferronis post hoc test revealed significant difference between the controls and the pregnant women in all the months of pregnancy for the fundamental frequency measure at $p < 0.05$ whereas frequency and amplitude perturbation measures showed significantly higher value from the seventh month till ninth of pregnancy at $p < 0.05$. Results were discussed with respect to the underlying pathophysiology.

CONCLUSION: The results of the present study are of value for pregnant women who are sensitive to the vocal deviations and also for a professional voice users.

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Laryngeal Electromyography in Voice Disorders

Laryngeal electromyography (LEMG) is a valuable tool in the diagnosis of voice disorders. It is useful in the diagnosis, prognosis and treatment of many patients who come to a voice clinic.
Objective:
To describe the usefulness of the laryngeal electromyography in a voice clinic.
Study Design and Methods:
Prospective case review.
Methods and Materials:
All the patients with laryngeal movement disorders seen in the voice clinic were referred for LEMG. All the patients underwent voice assessment and videolaryngostroboscopy. LEMG procedure was performed by a laryngologist and a EMG-neurologist.
Cricothyroid and thyroarytenoid muscles were explored in all the patients. Posterior interarythenoid muscle was explored when necessary.
Results:
54 patients were referred for the procedure. 6 patients refused to do the LEMG. The initial diagnosis was vocal fold immobility in most part of cases (35 patients: 65%), followed by spasmodic dysphonia in (7 patients: 13%), paradoxical vocal fold movement, bilateral vocal fold atrophy, vocal granuloma, and psycogenic dysphonia. Sensitivity of LEMG was around 80% in vocal fold immobility.
Conclusion:
LEMG is a valuable tool in diagnosis assessment and prognosis of laryngeal movement disorders

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Switching Sides:
Vocal Fold Paralysis Post Pneumonectomy Contralateral to Site of Surgery

Recurrent laryngeal nerve (RLN) injury is a serious complication of thoracic surgery that increases morbidity and mortality. This ipsilateral complication is often recognized and treated appropriately in the immediate postoperative period.   However, it is important to consider the long-term effects of mediastinal shift and the possibility of postpneumonectomy syndrome on RLN function. Excessive stretching of the RLN can cause symptoms including stridor, hoarseness, and shortness of breath secondary to vocal fold dysfunction. The unique case described documents a unilateral vocal cold paralysis contralateral to the side of pneumonectomy which presents for evaluation six years after surgery. A thorough investigation into the etiology of the contralateral vocal fold dysfunction included elimination of mass lesions on the contralateral side of the neck or of the brain with chest CT scan and brain MRI respectively, as well as further characterization with videostroboscopy. Serial postoperative chest radiographs were reviewed documenting severe mediastinal shift. Subsequently, an extensive literature review reveals that this is the first reported case of contralateral vocal cord paralysis post-pneumonectomy. In addition to describing the effect of this dynamic airway repositioning on the RLN and subsequent vocal fold function, there will be an inclusive review of postpneumonectomy syndrome and its effects on the tracheobronchial tree and mediastinum.
Key words: True vocal fold paralysis, postpneumonectomy syndrome

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Task-Specific Singing Dystonia: Vocal Instability that Technique Can't Fix

Singer's dystonia is a rare variation of spasmodic dysphonia or focal laryngeal dystonia which presents only during specific tasks in the singing voice. Singer's dystonia is believed to be underdiagnosed since it is commonly attributed to singing technique problems such as register transition or wobble. Singer's dystonia differs from technique related issues in that it is task and/or pitch-specific, reproducible and occurs independently from the above mentioned technical issues. Objectives: The objective of this case series is to compare and contrast profiles of four patients with singer's dystonia to increase our knowledge of the diagnosis of this disorder. Methods: The methods used in the evaluation of the four cases included: a detailed case history, results of singing evaluations from individual voice teachers, ENT evaluation with endoscopy, and laryngeal electromyography. Results: Results demonstrate the similarities and unique differences of individuals with singer's dystonia. Information regarding current case status, response to treatment and singing status is detailed. Results vary from nearly complete relief of symptoms with Botox injections to minor relief of symptoms and discontinuation of singing. Conclusions: Three conclusions from this case series are: 1) singers dystonia exists as a separate entity from wobble or technique issues due to register transition, 2) singer's dystonia may be indicative of a larger neurological disorder, and 3) correctly diagnosing singers dystonia allows singers to acknowledge that their voice problems are not their fault and gives them an opportunity to modify their singing repertoire to continue singing.

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A voice acoustic analysis of thyroid adenoma patients after a unilateral thyroid lobectomy

Objective: The objective of this study was to investigate the features of voice changes in thyroid adenoma patients secondary to a unilateral thyroid lobectomy that did not result in laryngeal nerve injury.

Study Design: Prospective study.

Methods: Preoperative and postoperative fibrolaryngoscopic and voice acoustic analyses were performed on 32 adult patients (8 males and 24 females) with unilateral thyroid adenoma. Forty adults (20 women and 20 men) with normal voice function were grouped as controls.

Results: The vocal cords before and after surgery in all patients appeared to be normal under the fibrolaryngoscope. The preoperative voice was slightly abnormal in female patients and normal in male patients. One week after surgery, the F0 and Fhi levels of both male and female patients decreased significantly from the values recorded before surgery (P<0.05). One month after the surgery, the F0 standard deviation (STD), fundamental frequency perturbation (Jitt), amplitude perturbation (Shim), harmonic noise ratio (NHR), voice turbulence index (VTI) and degree of subharmonics (DSH) in female patients decreased significantly from the values observed before surgery (P<0.05). Three months after surgery, the values of these indicators returned to normal. But the Fhi value was still lower than the levels observed in the control group (P<0.05).

Conclusions: After a unilateral thyroid lobectomy, which did not result in injury of the laryngeal nerve, the voice of male patients consequently became slightly abnormal and returned to normal within one month. The voice quality of female patients improved from that demonstrated prior to surgery.

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"The pigeon call": an innovative esophageal-voice teaching method.

The recovery of speech after total laryngectomy is one of the most important goals in rehabilitation of patients subjected to this mutilation. There are many lost/modified functions: sphincter function, smell, taste, nasal/oral breathing and voice. There are various recovery methods and perhaps the most physiological and complete is the esophageal one.

Teachers of esophageal-voice, supported by speech-terapists/phoniatricians, have an essential role in rehabilitation and should follow specific rehabilitation protocols designed to facilitate learning/improvement of good technique. What makes a good esophageal voice is no noise during air injection, no breath of air from the tracheostoma, no long time intervals between air injection and voice production, appropriate loudness and phonatory time, fluent/uninterrupted speech, good pronunciation, rhythm, expression, modulation, lack of effort.

There are several techniques used to produce esophageal voice. At our department an innovative teaching method is used: it aims to get all the above listed requirements, nicely named "the pigeon call", invented by our teacher. One of the key points of the method is the development of a cyclical injection-ejection pump to automate the cyclical process of air injection and voice production, to maintain muscles and mucosa flexibility, preventing/reducing frequent states of hypertrophy/hypertonia, and to gain greater control of esophageal airflow during voice emission. Another important element of this method is the different conception of correlations between breathing and voice production, which leads to an increase in the phonatory time. It is also important to find a good control of the vocal tract for quality of sound, pronunciation and management of the injected air.

In this study we describe, through videos/audios, the teaching method and set out its usefulness and innovation compared with standard methods.

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A comparison of the voice handicap index-10 between medical and musical theatre students

Objective: Professional voice users experience a high vocal load and if voice quality deteriorates their livelihoods are affected. Our aim was to assess how a professional voice-user group, musical theatre students (*n* = 49), perceive their voices in comparison to medical students (*n* = 43). *Methods*: Participants completed a confidential questionnaire including demographics and the Voice Handicap Index-10 (VHI-10) in September 2010. *Results*: Response rate was 100% (92/92). The mean age of the medical students was 25 years, and musical theatre students was 20 years. The mean overall VHI-10 score was higher in musical theatre students than medical students (5.56, SD 4.13 versus 3.79 SD 3.02, *p* = 0.02), and particularly in three VHI-10 items: "voice strain", "lack of clarity" and "being upset from voice problem" (mean 0.82 SD 0.86 versus mean 0.44, SD 0.67, *p* = 0.02; mean 0.92 SD 0.89 versus mean 0.53, SD 0.70, *p* = 0.02; and mean 0.49 SD 0.79 versus mean 0.07, SD 0.26, *p* = 0.001, respectively). Furthermore, musical theatre students report higher possible voice problems in the past (6/43, [14%], 21/49 [43%], *p* = 0.002). *Conclusion*: In this small group, musical theatre students report more handicap than medical students. It is possible that this difference may be due to musical theatre students experiencing greater voice use over time or better recognition of potential voice problems. This may mean we need to do more to protect student's voices by optimising vocal care during their training, without neglecting the vocal needs of other students.

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Kissing nodules in boys and girl singers before puberty: Management.

We had followed 50 young singers with kissing nodules during 10 years 34 boys and 16 girls.
The diagnosis was done by Video Laryngeal Stroboscopy. All of them had speech therapy 6 to 12 months.
 The results were amazing:
On 34 boys, the Kissing nodules disappear for 30 boys. I performed PhonoSurgery on the 4 boys with a Kissing nodule: 2 were nodules and 2 were bilateral cyst.
On 16 girls: 9 disappeared and 7 were still there after puberty. The voice was clearer and only 2 of them wanted to have phonosurgery. The pseudo-husky voice was liked by 5 girls.
Conclusion: if there is a kissing nodule, phonosurgery must be done after puberty.

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Dimitris Case

Dimitri, a male adult of 27 years old had 5 procedures of laryngeal surgery for Papilloma. When he came to me, he had a laryngeal web, almost complete.
He could not talk and hardly breathe.
A tracheotomy was indicated. But my anaesthesiologist and I decided to try a pre-oxygenation technique to avoid this procedure.
The pre-oxygenation was achieved with a tight-sealed face mask during 15 minutes.
This complete pre-oxygenation allowed an apnoea of, at least, 5 minutes and less than 7 minutes after the induction of anaesthesia.
The anaesthesia was induced and maintained with continuous infusion of Propofol and Remifentonyl, in accordance with standard regimens protocols. This technique allows a fast achievement of deep level anaesthesia.
The phonosurgical procedure was performed with a CO2 Laser and last 20 minutes:
The first 5 minutes was to open the glottic space and to put in a tube of 5 in diameter.
Than the web was treated and finalized with Mitomycine C.
The voice came back and the breathing was very satisfactory 2 weeks and 3 months later.

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Diagnosis and Treatment of Chronic Infective Laryngitis

The incidence of chronic primary infection of the larynx has catapulted from obscurity to everyday clinical practice in the last decade. Causal factors, both known and suspected, include increased use of broad-spectrum antibiotics, systemic and inhaled steroids, and immune suppression in transplant patients. Presenting symptoms commonly include dysphonia, dysphagia, globus, and occasional dyspnea.

We performed a retrospective review of patients from September 2007 to September 2010 diagnosed with chronic infective laryngitis. Patients fell into three groups dependent upon the causative organism(s): fungal only, bacterial only, and combined. Clinical videostroboscopic findings included:

      1. Generalized, abundant thick whitish mucus of the laryngopharynx, and
      2. Laryngeal mucosal crusting with scant whitish mucus.

Laryngeal cultures in Group 1 patients generally showed only fungal or both fungal and bacterial disease, while Group 2 patients exhibited bacterial disease alone. A localized treatment protocol using nebulized Gentamycin or Vancomycin was developed for Group 2 patients, greatly increasing successful treatment of this condition.

Clinical suspicion, definitive culturing, and directed management are offered for the increasing problem of chronic infective laryngitis. Localized treatment appears more effective than systemic therapy for this superficial mucosal disease. Gentamycin nebulization is offered as a treatment choice for chronic bacterial laryngitis, almost universally secondary to Staph aureus.

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The characteristics of Vocal fold immobility following endotracheal intubation

Objectives We investigated the clinical and laryngeal EMG characteristics in patients with vocal fold immobility (VFI) following endotracheal intubation.

Methods Thirty-six cases of unilateral vocal fold immobility following endotracheal intubation and anesthesia were analyzed. The clinical and LEMG characteristics and voice function were evaluated.

Results All patients complained of persistent, severe hoarseness with breathiness and vocal fatigue immediately following surgery. Thirty-two patients complained of aspiration. Patients had undergone previous abdominal surgical procedures in 20, for emergent setting in 9, for pharyngolaryngeal surgical procedures in 3, and for the other surgical procedures in 4. Twenty-seven patients were found to have left VFI, 9 patients had right VFI. The LEMG of 6 of 21 patients showed normal patterns. The LEMG of 15 of 21 patients showed mild to moderate recurrent laryngeal nerve (RLN) injury with adductor branch in 8, with abductor branch in 3 and both abductor and adductor branch in 4. For RLN injury, fibrillation potentials or positive sharp waves, reduced recruitment patterns, decreased evoked LEMG signals with delayed latency (TA muscle, 2.2±0.4 ms; PCA muscle, 1.8±0.7 ms) and lower amplitude (TA muscle, 2.2±0.8 mv; PCA muscle, 1.1±0.4 mv) were also seen. Closed reduction was performed under local anesthesia on 24 patients. The vocal assessment is significantly improved after reduction.

Conclusions VFI following endotracheal intubation (most had history of abdominal surgery) mostly caused by mechanical fixation of the cricoarytenoid joint. Left-sided dislocations occurred more frequently than right-sided ones. Some of them also accompanied with RLN injury (mainly involved in adductor branch).

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Narrow band imaging in vocal cord hyperkeratosis

Objective: To determine whether narrow band imaging (NBI) endoscopy facilitates identification of vocal fold leukoplakia with dysplasia.

Patient and Methods: A prospective pilot clinical trial comparing NBI to white-light (WL) endoscopy in subjects at risk for head and neck cancers is underway at our institution. The study was approved by the Institutional Review Board. So far, seven subjects have displayed hyperkeratotic lesions of the vocal folds. Both WL and NBI images were recorded and reviewed by both a laryngologist and an academic otolaryngologist with experience in NBI.

Results: Hyperkeratotic lesions were visible both under WL and NBI endoscopy. The lesions varied in size and extent. NBI improved contrast visualization of lesions in all subjects compared to WL. In addition, four of seven subjects, had hyperkeratotic lesions that were surrounded with "blue halos" on NBI which were not evident with WL. This finding was interpreted as increased vascularity of the lesions. Available biopsies in three of the subjects in this group demonstrated dysplasia.

Conclusions: NBI provides added value in determining size, extent, and vascularity of hyperkeratotic vocal fold lesions compared to WL endoscopy. In this small sample, hyperkeratotic lesions associated with vascular patterns detectable on NBI demonstrated dysplastic change on biopsy. Increased vascularity may reflect angiogensis associated with malignant transformation. This is a promising preliminary finding that may support a role for NBI in early detection of laryngeal carcinomas, however, increasing the power of the study through examination of additional subjects is needed.

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Botox Dose in Patients with Spasmodic Dysphonia: Tremor versus Dystonic Types

OBJECTIVES: Spasmodic dysphonia (SD) is commonly treated with chemodenervation by injecting botulinum toxin (BTX) into thyroarytenoid muscles. Initial doses vary and limited data are available regarding appropriate BTX dose for individuals with tremor versus non-tremor SD. The purpose of this study was to identify possible differences between BTX doses in patients with SD of voice tremor (SD-Trem) compared to those with dystonic SD (SD-Dyst).

STUDY DESIGN: Retrospective chart review.

METHODS: 109 individuals with SD-Trem (n=51) and SD-Dyst (n=58) were identified. All had a minimum of four BTX injections of equal amounts to thyroarytenoid muscles. Average starting dose and average dose over multiple injections were compared.

RESULTS: Initial BTX dose recommendations tended to be less for the SD-Trem group ($m = 2.79$ $std = 0.73$) compared to initial BTX dose recommendations for the SD-Dyst group ($m = 3.07$ $std = 0.95$); $p = 0.08$. When comparing all injections the SD-Trem group ($m = 2.60$ $std = 0.68$) received fewer units of BTX compared to the SD-Dyst ($m = 3.17$ $std = 3.17$) with a significant group effect $p < 0.01$.

CONCLUSIONS: Results suggest a bias toward recommending a lower starting dose of BTX for patients with SD-Trem compared to patients with SD-Dyst with comparison of subsequent BTX doses seeming to support this clinical bias. Patients with SD-Trem appear to require lower doses of BTX to treat symptoms of SD compared to patients with SD-Dyst.

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Influence of silent reflux in singing voice

The influence of esophageal and pharyngeal reflux, hiatus hernia or inferior esophageal sphincter opening on the voice has been well documented in the last years. When silent reflux is affecting the voice the patient does not have any complain about esophagus or stomach. When the pharynx or the larynx is inflammated, it is easier to have bacterial or viral infection. The food can be good or noxious, every food has different components that can give vitamins, minerals, proteins and so on but they can also act as allergens mainly the chemicals used in the processing of the food. All these possible reactions can depend on each individual system and the way the persons are handling their food. The singing voice needs a good breathing in order to support an air column.. Sometimes due to reflux the diaphragm function is not a good one. The laryngeal mucosa has to be lubricated by the secretions from the glands near the vocal folds. The airways system and the vocal folds need also humidity; silent reflux dries and can irritate them. The mucosal wave has to be a regular one in amplitude, vertical movement, periodicity an regularity .The pharynx and tonsils can be dried and provoke irritation in the moment of eating, drinking or swallowing. It is not difficult to find due to reflux that the nose is dry or the posterior part of the turbinates can be irritates and provokes alterations in the secretions .When the secretions are thick, they irritate the laryngeal mucosa and the feeling of obstruction can produce the necessity of clearing the throat causing inflammation in the vocal folds and cough .Clearing throat or vocal folds because of the presence of thick secretions is common, problems by maintaining volume or pitch and a right bright color by speaking. In the singers as a high risk group there are more problems like the necessity of pushing vocal folds in order to produce the sound they are accustomed to and due to the inflammation of the posterior third from one or both vocal folds the glottal closure is not complete. The general and respiratory health are important for the population needs a good alimentation and good and enough sleep. The prevention is important to avoid damage in the voice mechanism due to inadecuate eating habits or an irritant food. It is frequent to find patients with voice problems and without digestive symptoms. The smoking helps the inflammation of esophagus and stomach. The education about the damages of the respiratory system and the voice can help the singers to avoid problems during performances or rehearsals.

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Laryngeal lipotransfer: review of a 13 year experience

Objective: To determine the indications and efficacy of lipotransfer for treatment of various vocal fold pathologies.

Study type: Blinded retrospective review.

Methods: The indications, techniques, and voice outcomes were reviewed for 100 patients who underwent laryngeal lipotransfer between 1998 and 2009. Mucosal wave and glottic closure patterns were accessed via strobovideolaryngoscopy. Findings of paresis were quantified using laryngeal electromyography. Each patient completed a voice handicapped index (VHI) at presentation and at a minimum of one year following the final laryngeal procedure. VHI scores and post operative improvement in glottic closure were reviewed.

Results: Lipotransfer was used to treat glottic insufficiency secondary to vocal fold motion abnormality or vibratory margin pathology. Motion abnormalities included vocal fold paresis, paralysis, and cricoarytenoid joint immobility. Vibratory margin pathologies included sulcus, scar, and atrophy. Lipotransfer was performed alone or as an adjunct procedure. Augmentation was accomplished either by lateral injection or by medial implanation through an access tunnel. The majority of patients showed improvement in glottic closure after lipoinjection at one year. This measure correlated with improvement in VHI scores.

Conclusion: Laryngeal lipotransfer is a safe and effective technique. It remains a valuable treatment of glottic insufficiency and short segment vocal fold scarring.

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Comparison in Diagnosis of Glottic Pathology Between Stroboscopy and Direct Microlaryngoscopy

Introduction: Diagnostic differences have been noted between direct microlaryngoscopy (DML) and rigid telescopic strobovideolaryngoscopy (RTS). However, studied differences have not included epithelial pathology and have not been prospectively evaluated. To evaluate the nature of these differences, we prospectively compared the glottic maps of patients undergoing DML to the glottic maps at the time of RTS. The differences in diagnosis were noted, and intraoperative management changes recorded.

Materials and Methods: IRB approved, prospective, observational study. Consenting patients from 2007-2010 were included. Glottic maps were recorded at the time of RTS and DML. Patients undergoing flexible fiberoptic or distal chip stroboscopy were excluded. Microlaryngoscopy included evaluation of the glottis by rigid angled telescopes through the laryngoscope, by microscope and by palpation with blunt right angle probes.

Results: Fifty-one patients (25 males, aged 19-82) were included. Time between RTS and DML averaged 28 days (range 5-79). The diagnosis that drove surgery was altered for 11 patients. Fourteen patients had additional ipsilateral lesions at the time of DML, six had fewer. Nine had additional contralateral lesions, two had fewer. Two showed additional contralateral pathology of the same type. Ten had identical glottic maps. Ten patients underwent a management change.

Conclusions: Stroboscopy does not always provide an accurate diagnosis. The most common limitation was the diagnosis of additional lesions. Almost one fifth of patients underwent intraoperative management change. Because DML often reveals an altered diagnosis, the possibility of a change in intraoperative management should be included in the surgical consent process, and surgeons should be prepared for alternate surgical strategies.

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Complications of injection laryngoplasty using calcium hydroxylapatite paste

Objective: To report the adverse effects of using calcium hydroxylapatite paste as a focal fold filler.

Methods: Major and minor complications were reviewed in 19 vocal folds after injection laryngoplasty using calcium hydroxylapatite paste. Mucosal wave was assessed using strobovideolaryngoscopy. Implant location was examined using CT of the larynx. Vocal fold function was compared before and after injection, as well as after implant removal in selected cases.

Results: Nine major complications were encountered following surgery performed at three institutions. These included 4 vocal folds with an adynamic mucosal wave, 3 with a severely decreased wave, and 2 with vibratory margin granulomas. CT scanning confirmed 6 cases of implant malposition (possibly migration). Seven implants were removed through lateral cordotomy between 2 and 24 months after injection. Mucosal wave function recovered in 5 vocal folds after explant. Minor complications were encountered in 12 additional vocal folds. These included tissue inflammation and mucosal wave restriction.

Conclusion: Injection laryngoplasty using calcium hydroxylapatite paste has been regarded as an effective treatment for glottic insufficiency. In some patients, calcium hydroxylapatite can cause an intense inflammatory reaction and compromise vocal fold function.

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Broadway Vs the Bushveld: A South African Experience in the Multidisciplinary Management of Injuries Sustained by the cast of the South African production of the "Lion King".

In a production of the Disney Musical: The Lion King in Johannesburg, South Africa, several highly talented performers were cast in lead roles. These performing artists ranged from those who had had formal vocal training to others who had no training at all. Many of these individuals presented with a variety of significant vocal chord pathologies during the run of the show. This paper presentation reports on the challenges we experienced and the journey we undertook with them in our multidisciplinary voice clinic. We describe the varied range of pathologies (making use of videostroboscopic "before and after" images), the causative processes, medical treatment, voice therapy and voice training in each case. The emphasis was on voice conservation, education, ensuring safe vocal performances in an attempt to limit the disruptions to the artists' careers as well as assist the production to continue its successful run. We also describe our interactions and interventions with the cast and producers of the show, who had not anticipated the difficulties that many of the performers experienced. Our experience also forced us to reconsider the indications for absolute and relative voice rest, as well as the appropriate timing and indications for surgical intervention. We consider the differences of our local situation compared to the international experiences and trends, and interrrogate the implications of our experience with this production for the entertainment industry in South Africa in the future.

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Glutathione and the voice; preliminary investigations and a call for research

Oxidative stress has been has been implicated as an etiology for laryngeal cancer and as a mechanism for laryngeal aging. Glutathione (GSH) a tripeptide synthesized intracellularly, has multiple functions including protecting cells from reactive oxygen species (ROS). GSH depletion has been found in numerous disease states. GSH is found in laryngeal tissue in both its reduced and oxidized form. Currently, there is no research investigating the role of GSH supplementation and the prevention of laryngeal injury. GSH is poorly absorbed orally, although, N'Acetyl Cysteine, undenatured whey protein and alpha lipoic acid appear to elevate glutathione levels in the body.   GSH is available as a compounded intravenous nutritional supplement that has been safely used in patients with Parkinson's disease to their tremendous benefit. This paper will discuss the successful use of intravenous glutathione in patients with acute and chronic vocal fold inflammation. Case reports will be discussed. Benefits have been found in patients with refractory larygopharyngeal reflux, refractory laryngeal mucus, and laryngeal allergies.

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Voice Disorders in the Elderly

OBJECTIVES: Despite the prevalence of voice disorders, as well as the physiologic and functional changes of the aging larynx, there is a lack of data analyzing dysphonia in the geriatric population. The goal of this study is to investigate dysphonia in this cohort.
STUDY DESIGN: Retrospective chart review.
METHODS: This study analyzes the histories, demographics, voice handicap index (VHI) questionnaires and objective voice measures (OVM) for 175 patients with voice complaints, ranging from 65 to 89 years of age. Diagnoses of any vocal fold pathology were made via strobovideolaryngoscopy and laryngeal electromyography (LEMG) at the time of presentation.
RESULTS: Strobovideolaryngoscopy revealed that laryngeal laryngopharyngeal reflux in 91% (N=159) was the most common diagnosis associated with the voice complaints, followed by muscle tension dysphonia in 73% (N=127) and paresis in 72% (N=126, 72%). Of the 175 patients in this study, 27% (N=48) of patients had a history of antecedent event which might have contributed to their current dysphonia, most commonly upper respiratory tract infection in 27% (N=13) and endotracheal intubation in 21% (N=10). Ninty-three percent (N=153) of patients who underwent LEMG had weakness in the distribution of at least one nerve. VHI scores varied greatly, ranging from 4 to 104, with an average score of 43.9. When VHI scores were correlated with objective voice measures, correlations were found with mean jitter (%), jitter (abs.), maximum phonation time and shimmer (%) was found. When OVM scores were compared to Kay Pentax normative thresholds, 69.7% of subjects were found to be above the threshold for soft phonation index (SPI).
CONCLUSION: Our studies identified at least one pathologic factor contributing to dysphonia in all elderly patients presenting with voice complaints. The high average VHI score indicated that these geriatric patients experienced significant dissatisfaction due to their dysphonia. The problem was of sufficient magnitude to result in a high percentage of patients proceeding with treatment. Additional research is needed to determine normative values for objective voice measures and other assessments

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Laryngeal electromyography guided hyaluronic acid vocal fold injection for unilateral vocal fold paralysis

Background:
        For predicting prognosis of unilateral vocal fold paralysis (UVFP), LEMG has been widely used in USA. It also has been used for guidance of Botox vocal fold injection (VFI) for spasmodic dysphonic. Hyaluronic acid (HA) is a safe injectable material that can be used for VFI to improve the glottal closure of UVFP. The purpose of this study is to report our experience in using injectable needle electrode to guide HA VFI during LEMG for UVFP.

Methods:
        From Mar. to Jun. 2010, 20 UVFP patients received LEMG examination at our clinic. Before completion of LEMG, 1.0 cc HA (Restylane Perlane®) was injected via 26 Gauge mono-polar injectable needle electrode into paralyzed thyroarytenoid muscle. The data before, 1 week after and 3 months after injection including normalized glottal gap area (NGGA) from stroboscopy, maximal phonation time (MPT), phonation quotient (PQ), mean airflow rate (MAFR), perceptual evaluation of voice (GRBAS scale), voice handicap index (VHI) and self-grading of choking (grade 1 to 7) were analyzed with Wilcoxon signed rank test.

Results:
        After injection, NGGA was significantly reduced from 8.28 ± 4.45 units to 0.52 ± 0.70 units (1 week) and 1.79 ± 3.11 units (3 months). The MPT was prolonged from 5.66 ± 3.88 seconds to 11.73 ± 4.78 seconds and 11.25 ± 4.66 seconds respectively. Other analyzed data also showed statistically significant improvement.

Conclusion: LEMG guided HA VFI for UVFP is feasible and short-term result is satisfactory.

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Therapeutic Benefits of Strict Low-Acid Diet on Patients with Recalcitrant Laryngopharygeal and Voice Symptoms

In 1973, following an outbreak of food poisoning, Congress passed "Title 21," authorizing the Food and Dug Administration (FDA) to regulate the manufacturing of all foods and beverages that cross state lines. Without consideration for possible long-range, adverse, health consequences, the FDA mandated acidification of America's food – by law, all prepared foods and beverages must be below pH 4.6, and most are pH <4.

Reflux is epidemic and the reason appears to be related to dietary acid. At present, acid reflux affects 40% of Americans and 37% of people in the 20-30 year age group; and esophageal cancer is the fastest growing cancer in the United States.

The purpose of this presentation is to review the author's data on the impact of dietary acid-restriction on patients with laryngeal and voice disorders; and to offer a provocative preemptive conclusion: Excessive dietary acid appears to be the single most important cause of acid reflux and throat symptoms in patients with laryngeal and voice disorders; and dietary acid restriction is an inexpensive and low-risk but essential therapeutic intervention for many such patients.

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Vagal Nerve Decompression Surgery for Unilateral True Vocal Fold Paralysis—A Case Report

Unilateral true vocal fold paralysis (TVFP) is typically described as a laryngeal neuropathy associated with neoplastic, traumatic, or idiopathic processes. The true etiology of idiopathic TVFP, however, remains unclear and has historically been attributed to a poorly characterized post-viral syndrome. The clinical course and outcome of idiopathic TVFP varies widely though and treatment options focus on watchful waiting, palliative laryngoplasty, and/or voice therapy.

We present an unusual case of unilateral TVFP in an otherwise healthy 31 year-old woman with recent onset of dysphonia, dysphagia, dyspnea, and cough. After an extensive evaluation of the most common causes of TVFP, the patient had a T2-weighted MRI & 3D TOF MRA demonstrating arterial compression of the vagus nerve rootlets at the brainstem. Subsequently, the patient underwent microvascular vagal nerve decompression. Significant improvement of all symptoms was noted in the immediate post-operative period. Modified barium swallow study was normal. Repeat videostroboscopy demonstrated significant return of right vocal fold function.

Neurovascular compression syndromes of cranial nerves V-IX (eg., trigeminal neuralgia, hemifacial spasm, glossopharyngeal neuralgia) are well-documented with excellent results after microvascular decompression (MVD). The positive result of MVD in this case supports the conclusion that pulsatile arterial compression of the vagus nerve should be considered in the differential diagnosis of unilateral TVFP when other more common etiologies have been excluded.

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Adductor paralysis after botox injection for adductor spasmodic dysphonia as a Case presentation and Pathophysiological model

HYPOTHESIS: Botox injections into the thyroarythenoid muscles are the current standard for the treatment of adductor spasmodic dysphonia (ADSD) .The reported side effects includes a period of breathiness and difficulty of swallowing liquids. Here we report a single case of a women with bilateral adductor paralysis following botox injections for ADSD with bilateral hyperabducted vocal folds like a type IV synkinesis according to RL Crumleys definition (1) A complete aphonic voice and serious swallowing problems where the result

METHODS: The patient was examined every week over a period of 8 weeks after botox injection. Examinations were documented by means of stroboskopic imaging, voice range profiles, acoustic measurement and laryngeal electromyography of the musculus cricothyreoideus. It was necessary to build up and to train the false vocal fold adduction force and the super -supraglottic swallowing manover according to logemann to deal with that problem until the vocal fold adducting force recovered. The swallowing problems resolved within 14 days. The adducting force recovered and the acoustic quality of the speaking voice improved step by step in the period of 6 weeks. But the voice range profiles where still restricted in the middle and upper register, although the electromyography of the cricothyroid muscle was normal.

DISCUSSION: The likely mechanism of paralysis is diffusion of botox (2) around the muscular process of the arytenoids to the lateral cricoarytenoid muscles which led to an increased activity oft the posterior cricoarytenoid muscle. The Wagner – Grossman (3) hypothesis explained the vocal fold position on the basis of cricothyroid activity since years. Authors like Gayle E. Woodson(4). J.A. Koufman (5), have dispelled the notion of a role of the cricothyroid muscle for the adducting force in vocal fold position. The authors of that presentation will underline that position based on the pathophysiological model of the rare complication of botox injection.

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Depression and Anxiety in Patients with SD: A Case-Control Study

INTRODUCTION
There is evidence supporting an association between depression and anxiety in patients with chronic disease. Spasmodic Dysphonia (SD) is a chronic, incurable, and disabling voice disorder. Reported rates of depression and anxiety in SD range from 7.1% - 72%, with a maximum n of 18 patients. The goal of this study is to define the co-prevalence of depression and anxiety with SD.
MATERIALS AND METHODS
A single institution case-control study was performed from May to July 2010. Consecutive patients with SD and benign voice disorders were enrolled prospectively. On enrollment, patients were asked to fill out a questionnaire that reviewed the duration of the voice disorder and personal history of anxiety and depression, including current and lifetime diagnosis.
RESULTS
146 controls with benign voice disorders and 128 patients with SD were enrolled.
Patients with SD were no more likely to be diagnosed with depression or anxiety than the control group (OR= 0.985; 95% CI 0.59 to 1.63 and OR = 1.314; 95% CI 0.75 to 2.3, respectively). Additionally, duration of disease was a risk factor for depression in both the SD group and the control group, and the association was not significantly different between groups.
CONCLUSION
Patients with SD were no more likely to have depression or anxiety than those with other voice disorders. It is important for otolaryngologists to be aware of the increased rates of depression in patients diagnosed with chronic diseases, including voice disorders, and to refer to psychiatry when appropriate.

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Quantitative investigation of the spatial distributions of vocal fold's proteins using histology and laser microscopy

Problem definition
The viscoelastic properties of human vocal folds (VFs) determine their vibration response. These properties depend on the extracellular matrix (ECM) composition and structure. A change in ECM composition and structure may lead to voice disorders. Endoscopic or microsurgical manipulation of VFs simultaneously can induce scarring, which means an alteration in protein's configuration. Scarred tissue is very stiff, which impairs voice production. Hyaluronic acid-based hydrogels are investigated as an injectable biomaterial to restore the initial mechanical function.
To assess the effectiveness of injected biomaterials, the structural composition of proteins and cells is needed. A method must be developed to quantify structural elements including elastin, collagen and glycosaminoglycans (GAGs) in VF tissue. The volume fractions of these constituents will be quantified for healthy, scarred and treated tissues. The spatial structures of GAGs obtained by confocal laser scanning microscopy (CLSM) will enhance knowledge of their arrangement in the LP.

Research objectives
1. Developing a protocol for histological investigation of animal VF tissue.
2. (Developing a protocol to) determine the 3D structure of GAGs with CLSM.
3. Comparisons between structures of proteins in healthy and scarred (or treated) VF tissue.

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The Spread and Severity of Tremor in the Speech Structures of Persons with Voice Tremor

Vocal tremor affects over half a million Americans and this number is expected to grow as baby-boomers age. Treatment of vocal tremor is challenging, as limited data is available on the structures affected by tremor throughout the vocal tract. Most often, the true vocal folds are examined as the potential source of tremor. The purpose of this study was to document the extent/spread and severity of tremor in the respiratory, laryngeal, and articulatory systems using clinical examination, Respitrace recordings, and laryngoscopy.   Twenty subjects with benign essential tremor participated in the study. Tremor severity and was rated in each of 14 structures during sustained /i/, /s/, /h/, and the Rainbow Passage. In addition, perceptual severity was rated during these same tasks to determine the relationship between the physical presence and severity of tremor and the perceptual severity of tremor. Analysis of the data is not yet complete. Preliminary results suggest that the most common structures affected within the larynx/pharynx included the true vocal folds, supraglottic structures (i.e., false vocal folds, aryepiglottic folds, and epiglottis), and pharyngeal walls; these structures were also most highly correlated to the perceptual tremor severity during sustained phonation. The velopharyngeal walls and velum were highly correlated to the perceptual severity of tremor during voiceless sounds. A positive correlation was found between the extent and severity of structural tremor and the perceptual severity of tremor during sustained phonation.

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Relationship between the presence of and perception of laryngeal mucus

Over 4 million patients with voice disorders present with abusive clearing. The reported cause of their clearing is typically an irritating laryngeal sensation caused by mucus. This study sought to link patient perception of mucus aggregation to the presence of visible laryngeal mucus. Forty-six persons, 22 with and 24 without voice disorders, were asked whether or not they felt irritation in their larynx and the intensity of the irritation. This information was compared to visual ratings of mucus type (types 1, 2, 3), pooling (not apparent, mild, severe), thickness (not apparent, mild, severe), and location (anterior, medial, posterior). Correspondence between laryngeal sensation and mucus aggregation was highest for persons with type 2 mucus only (50%), mucus types 1 and 2 (64%) and mucus types 1, 2, and 3 (71%). The presence of type 2 mucus, alone or in combination with other mucus types, and the rating of laryngeal sensation matched in 75% of cases. Ratings of severely thick mucus and severe mucus pooling corresponded to ratings of laryngeal sensation in 63% and 68% of cases, respectively. Mucus location was less predictive of complaints of an irritating laryngeal sensation with anterior (50%), medial (47%) and posterior (52%) locations being similar. This is the first study to determine the relationship between patient reports of laryngeal mucus and actual presence of mucus on the vocal folds. The outcomes of this study have clinical implications for the use of patient report of sensation in diagnostic- and treatment-decision making.

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Analysis of vocal fold function from acoustic data simultaneously recorded with high speed endoscopy

Background

Acoustic and endoscopic voice assessments are routinely administered to determine the vocal fold vibratory function as part of voice assessment protocol in clinic settings. Routinely these data are separately recorded, resulting in information being obtained from two different phonation segments and increase of time for the voice evaluation process. This study explores the use of acoustic data, simultaneously recorded during high-speed endoscopy (HSE), for the evaluation of vocal fold function.

Methods

HSE and acoustic data were recorded from the subjects simultaneously. by using a rigid 90°-laryngoscope and a mounted microphone. The data included voices of 73 healthy subjects, 148 paresis, 210 functional dysphonias, and 119 benign lesions of vocal folds. The subjects performed sustained phonation of the vowel /i/. For this study, only acoustic data was analysed using Doctor Speech software. Twelve parameters (e.g. HNR, SNR) were computed. 550 out of 672 acoustic voice recordings could be analysed. Statistical analysis was performed with SPSS 17.0.

Results

Acoustic data was easily recorded simultaneously allowing analyses of the same phonation segment to determine vocal fold function therefore eliminating the need for another voice recording. The acoustic voice parameters differed between genders in the healthy voice group. Majority of the parameters show significantly differences between healthy and pathological groups.

Discussion

Simultaneously recorded endoscopic and acoustic data is valuable. Differentiation between healthy and pathological groups was possible using acoustic data only. We suggest that the synchronously recorded acoustic signal is of sufficient quality for objective analysis yielding reduced examination time.

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Vibrational characteristics in vocal mass lesions.

Nyquist plots, visual depictions of vibratory characteristics obtained from high speed imaging, portray open-close timing and perturbation values. These plots have been used to describe normal patterns of young adults and geriatrics but to date have been limited in application to individuals with dysphonia. In the current paper we did a prospective preoperative study of patients with mass lesions(nodules, cysts, Reinke's edema) and paralysis (unilateral and bilateral adductor paralysis). Perceptual consensus of 3 voice experts rated the voices as moderate to severe. Patterns among the four groups varied in terms of closure timings and perturbation across age and pathology. Patients with paralysis and Reinke's edema showed predominantly breathy patterns whereas those with cysts and nodules showed either a more pressed or breathy patterns. Most interesting is the age interaction with outcomes demonstrating that older patients showed higher perturbation in frequency and amplitude than their younger counterparts regardless of pathology. Equally intriguing was the observation of varying lengths of stable vibrations interspersed with segments indicating instability and chaos across the pathologies. Though numbers are small in this case based study(N=30), patterns are suggestive of possible differentiation of groups of pathology based on their age, gender, vibratory dynamics and stability segments. Post treatment analyses and interpretation will be included in the presentation.

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Effect of Spread and Severity of Tremor on the Efficacy of Botox Injections

Essential Voce Tremor (EVT) affects approximately .5 million Americans. It can be treated with laryngeal botulinum toxin injections. Approximately 70% of voice tremor patients benefit from botulinum toxin injections. Of those who improve, the degree of improvement is a variable. This variablility in outcome may be due in part to differences in the spread and severity of the tremor. The purpose of this study is to test the hypothesis that subjects who had more widespread and severe tremor would respond less to botulinum toxin injections of the thyroarytenoid muscle.

Subjects with Essential Voice Tremor were recruited from the laryngeal movement disorder clinic at the University of Iowa Hospital and Clinics Department of Otolaryngology. Before botulinum toxin injection, subjects were evaluated for tremor spread and severity. Eleven structures (of the respiratory, laryngeal, velopharyngeal, and oral subsystems) were rated on a 7 point scale for tremor severity. Oral and respiratory structures were assessed via clinical evaluation, laryngeal and pharyngeal structures via nasendoscopy.

Subjects' voices were also rated perceptually using a 7 point scale during production of a sustained /a/ and a standard paragraph. These perceptual ratings were repeated at 4 and 8 weeks after botulinum toxin injection. The V-RQOL was completed pre and post treatment as well.

Preliminary results (based on 4 subjects) indicate that severity and spread are not the only determinants of responsiveness to botox. However, this is an ongoing study, we expect to have data from an additional 6 subjects prior to the June presentation.

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Computational flow acoustics in a dynamic driven 3D glottal model

The three-dimensional kinematics of the vocal folds leads to a complex flow field in the vocal tract. The glottal jet flow is known to have influence on the primary voice signal. In order to characterize in detail the flow structures, especially the vortex dynamics, a dynamic driven 3D glottal model has been developed in a former study.

Multiple typical vocal fold motions are prescribed with this model. The full 3D flow field in the near-glottal region is simulated with Computational Fluid Dynamics (CFD) by solving the Navier-Stokes equations for time-dependent incompressible flow. From these data aeroacoustic sound sources are derived according to Lighthill's acoustic analogy. In a second step these sources are used to solve the inhomogeneous wave equation with Computational Aeroacoustics (CAA) for the propagation of sound further downstream in the vocal tract model. This hybrid CFD/CAA approach allows us to determine the Harmonic-to-Noise-Ratio (HNR) as an integral value for the primary signal of voice production.

The comparison of these characteristic HNR values for different glottal closure types shall help physicians in the retrieval of the reasons for deterioration of the voice of the

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Effects of temporal resolution on objectively assessed vocal fold parameters via high-speed imaging.

Among current visualization techniques for examining vocal fold vibratory functions, High-Speed Videoendoscopy (HSV) is the technique that permits determination of vibratory patterns within the actual glottal cycle along the entire length of the vocal folds. HSV becomes more and more accepted as a clinical and research tool to investigate vocal fold vibratory biomechanics in healthy and disordered voices to further the accuracy of voice assessment and treatment. Also, HSV makes the objective quantification of vocal fold vibratory characteristics possible. Current clinically available HSV systems have temporal resolution ranging from 2000-4000 frames per second (fps) with spatial resolutions up to 512 x 512 pixel including a 2-8 seconds recording capability (KayPENTAX High-Speed Video System Model 9700 and 9710, Wolf Highspeed Endocam 5560). As research tools, color HSV systems can have temporal resolution up to 8000 fps (Phantom v7.3) in color and 20,0000 fps (Photron SA-1.1) in monochrome, with spatial resolutions up to 640x480.

The goal of the study was to determine the effects of the temporal resolution on extracting vocal fold vibratory characteristics. For this purpose, two phonation segments captured initially using (Photron SA-1.1, 80 mm lens, 70° rigid endoscope) with 20.000 and 16.000 fps from a female subject while producing habitual pitch were downsampled to 15,000, 10.000, 9000, 8000, 7000, etc. to a minimum of 1000 fps.

Glottal parameters as well as left-right symmetry parameters were objectively quantified. The findings and their implication for the future HSV research will be discussed during the presentation.

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Physical Relations Between Continuum and Lumped Mass Models of Vocal Fold Vibration

Low-order models of phonation are still the choice of preference by many researchers to study complex problems in voice production. Although extremely simple in nature, lumped-element models capture many essential elements of phonation. However, there is a surprising lack of research aimed at bridging the gap between continuum models and lumped models. Lumped model parameters are typically estimated or altered (manually or through an optimization scheme) to produce the desired response. Model parameters obtained in this way are not directly related to vocal fold physiology. Using a finite element model of the vocal folds, displacement patterns, kinetic energy, and modal frequency information were used to derive lumped models that matched the finite element model in these aspects. This method of determining lumped model parameters eliminates the need for model tuning and is based on the physical properties of the vocal folds. Simulations were performed to compare with various historic lumped models. Finally, distributions of lumped model parameters were obtained by independently varying the continuum model parameters to investigate the relations between physical characteristics of the vocal folds and lumped mass models.

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Transient Material and Shape Optimization of a Physical Multi-Layered Vocal Fold Model

Understanding the physical fundamentals of human voice generation is a challenging and interdisciplinary task. Our work takes a closer look towards building physical models of the human larynx, in which the vocal folds are modeled by multi-layered elastic silicon bodies.
We already successfully developed and applied an optimization method varying material parameters in a three-layered 2d model with fixed geometry. The model showed capable of resembling the major part of vocal fold movements. We now plan to enhance our optimization to additionally search for optimal layer geometries, so that movements of the surface of the model match human vibration patterns more precisely.
For this purpose we will employ a simultaneous material and shape optimization concept based on a linear-elastic transient finite-element simulation. This concept was already successfully used for the static situation, i.e. no time or frequency dependency. In addition to isotropic material, which is easy to manufacture, we will also look at transversalisotropic materials, which is appropriate for modeling fibrous tissue as occurring in human vocal folds, especially in the lamina propria. Hence we expect significantly better agreement for the vibrations. Furthermore parameters for a Rayleigh damping model will be optimized to improve modeling the frequency dependency of the material parameters.
The reference movements are obtained from human in vitro experiments, where the surface deformation is measured over time, while a specific force is applied and released.
We will present the computed quantitative parameter values and discuss the usefulness and applicability of the proposed mathematical approach.

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Effect of Dehydration on Vocal Fold Nonlinear Mechanical Properties

The amount of force required for the adduction of vocal folds is directly related to water content of the tissue. Tissue dehydration, which can be caused by anti-metabolism medications, may affect the performance of the vocal folds. This study is developed to consider the effect of water loss on the mechanical properties of the vocal folds. Porcine vocal folds are exposed to a hypertonic solution as well as a normal solution. A mechanical traction test is then performed on the vocal folds in low frequency range and at large strains. Digital image correlations are utilized to extract the surface deformations. The results of both solutions are then compared. The key objectives are to quantify the differences in the axial stiffness and the energy loss of the tissue. The polymer eight-chain model of hyper-elasticity is applied to simulate the nonlinear behavior of the tissue. Mass history during the mechanical experiment is recorded to verify the water loss in the tissues. Knowledge of the effect of dehydration on the muscle stress could be useful in the clinical assessment of dehydration.

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The potential role of transepithelial ion transport in vocal fold epithelial defense to gastric contents

Objective/Hypothesis: The vocal fold epithelium is the first layer of the vocal folds that is exposed to laryngopharyngeal reflux. However, little is known about the immediate response of the epithelium to the gastric contents associated with this condition. The current study examined (i) whether gastric contents immediately affect transepithelial ion transport, a basic homeostatic function of the vocal fold epithelium and consequently (ii) whether altered ion transport is associated with anion or cation movement.

Experimental Design: In vitro design in porcine vocal folds with challenge and control groups

Methods: Healthy, porcine vocal fold epithelia were exposed on the apical surface to either pepsin (pH7) or acid (pH3) challenges. Ion transport immediately following challenge exposure was measured utilizing electrophysiological techniques. To examine specific cation and anion transport mechanisms, vocal folds were pretreated with either amiloride or NPPB (cation and anion channel inhibitors, respectively).

Results: Within 45 seconds, exposure to pepsin and acid challenges transiently increased ion transport in porcine vocal fold epithelium. This immediate increase in ion transport was eliminated (pepsin challenge) or reduced (acid challenge) in the presence of an anion channel inhibitor.
Conclusion: The current data suggest that porcine vocal fold epithelia immediately increase transepithelial ion transport following exposure to gastric contents. This increase is linked with secretion of chloride and/or bicarbonate anions. The contribution of active chloride and/or bicarbonate secretion in vocal fold epithelial defense to gastric contents will be presented

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Histological Study of the False Vocal Folds

PURPOSE: To identify the normal muscular and non-muscular anatomy of the false vocal folds.
HYPOTHESIS: The false vocal folds contain muscular tissues configured in such a way as to medialize or lateralize the false fold upon contraction.
RATIONALE: The false vocal folds have been observed to move medially during both normal and disordered voice production, although with some degree of inconsistency both within and between speakers. Systematic study of the comparative anatomy and histology of this structure in male and female specimens will contribute to our understanding of false vocal fold form and function.
METHOD: Human larynges are being obtained through the Deeded Body Program at the University of Iowa. A block of tissue is harvested from each specimen that contains the following boundaries: inferior – laryngeal ventricle; anterior – thyroid cartilage; posterior – arytenoid cartilage; superior – epiglottis. Following decalcification, each block is embedded in a cryogenic gel and frozen (-80° C). Each frozen block is then sectioned horizontally at a thickness of 10 μm with a cryostat. Using a CryoJane tape transfer system, sections spaced 1mm apart are mounted and stained using Masson trichrome to provide contrast among all major tissue types of interest.
RESULTS: In specimens studied to date, muscle tissue coursing in an anterior – posterior direction has been observed laterally in the false vocal folds. Some of these fibers appear to course posteriorly beyond the lateral edge of the arytenoid cartilage. More anteriorly positioned fibers, observed in previous research, have not been observed.

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Transforming Growth Factor beta3 for the prevention of vocal fold scarring

Objectives/Hypothesis
Vocal fold scarring occurs after inflammation, injury or surgical treatment. It causes hoarseness and decreases quality of life. There has been no satisfactory treatment for scarring, thus the prevention of scarring remains an important area of research. Transforming Growth Factor beta3(TGFb3) is a promising anti-scarring factor. It is highly expressed in fetal wound that is known to heal without scarring. In this study, we examined the effect of TGFb3 for the prevention of vocal fold scarring in canine model.
Study Design (randomized, prospective, etc.) Prospective study using animal model
Methods
A half mL of TGFb3 (0.5 ug/mL) or saline was injected into the lamina propria of unilateral vocal fold of canine. Fifteen minutes after the injection, the vocal folds were injured by stripping the entire layer of the lamina propria down to the thyroarytenoid muscle. Six months after the operation, vibratory examinations and histological examinations were performed.
Results
TGFb3-treated group showed rapid re-epithelialization compared to saline-treated group. Mucosal vibration showed significant improvement in the TGFb3-treated vocal folds. Histological analyses revealed favorable restoration of extracellular matrices in the lamina propria of the TGFb3-treated vocal folds.
Conclusions
TGFb3 is considered to be effective for better restoration of extracellular matrices of injured vocal fold mucosa, leading to the prevention of vocal fold scarring.

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Quantifying the influence of implants on voice production through the use of self-oscillating synthetic vocal fold models

Phonosurgical intervention methodologies to correct for glottal incompetence include implanting materials into the vocal folds. Due to the complex interaction between flow, tissue, and acoustic dynamics during voice production, however, the way in which implant parameters (e.g., geometry, stiffness, etc.) alter vocal fold dynamic response is not well-understood. In this presentation, we discuss the results of a study aimed towards improving our understanding of the influence of implants on vocal fold vibratory response. The study consists of obtaining flow, acoustic, and structural measurements of synthetic vocal fold models containing implants of various configurations. The silicone-based models are life-sized, multi-layered, and self-oscillating, with frequency and amplitude responses similar to those of the human vocal folds. Models that resemble normal vocal folds are considered, in addition to models with geometric alterations that resemble pathological conditions. For the "pathological" models, experiments are performed to quantify the model responses before and after insertion of implants. Parametric variations on implant stiffness, size, and target site are studied. Implant stiffness is varied by using implants fabricated from addition-cure silicone mixtures in which the Young's modulus can be controlled. Measurements to quantify the flow-induced responses of the various models include: three-dimensional surface deformation and mucosal wave propagation using stereoscopic high-speed imaging, glottal and supraglottal jet dynamics using flow visualization and particle image velocimetry, onset pressure, frequency, and radiated sound production. By comparing the measured data using models with and without implants, the sensitivity of the models to implant stiffness, size, and location is quantified.

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Tracking changes in a child's fundamental frequencies during daily activities: A preliminary case study

This case study investigates the effect of communication environment on the fundamental frequency (F_0) of a male child (5 years, 7 months). For four days, the child wore a voice dosimeter, which can measure continuous day-long voice use. During analysis, the data were divided into four general environments to represent typical speaking environments of school-age children. With adults, the child's F_0 patterns were similar to the range found in literature (mode, 258.4 Hz; median, 312.2 Hz; mean, 334.4 Hz). While playing with peers, similar to recess or after-school playtimes, the child's F_0 patterns were much higher (mode, 366.1 Hz; median, 409.1 Hz; mean, 423.4 Hz). Between these two were the F_0 values produced in an organized classroom setting and at home with family. The relation between dB SPL and F_0 were closest to adult relationship for 'with adult' environments (0.55-0.7 ST/dB) where 'free play time' resulted in a relationship of over on semitone per dB, nearly twice the average adult relationship. The child produced significantly different vocal level and F_0 patterns dependent on type of activity and conversational partners. If future studies substantiate this pattern, the effect of the broad F_0 range children use in less controlled communication environments (contrasting with classroom or therapy) must be considered by schools' speech-language therapists. In addition, the resulting statistics of long term-monitoring call into question the use of the statistical mean when reporting F_0 from similar long-term monitoring.

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Modeling and Predicting Vocal Recovery

Vocal fatigue has become a catch-all description of a patient's reduced ability to phonate without increased effort or other perceptual quality. Vocal fatigue may be a symptom of a yet undiagnosed underlying problem, such as LPR or glottal incompetence from a slight weakness of the vocal folds. It also may be a result of poor vocal technique or vocal overuse, likely causing a combination of laryngeal muscle fatigue and lamina propria fatigue (break down of extra cellular matrix from excessive vibration). The vocal non-pathologic recovery trajectories of vocal fatigue like symptoms found previously seem to have a short-term and long-term component. Using these components, perceived vocal fatigue was predicted using the NCVS vocal dose database as an input (~8400 hrs of observational data). A vibration dose exposure and recovery model which has been developed (recovery being based on two aspects of dermal wound healing). From the results and continued work, safety limits for vocalization and guidelines will be discussed. It will be presented how such a model of perceived vocal fatigue and recovery can give insights on optimal vocal vibration exposure and vocal rest periods.

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Wavegrams: A new technique for visualizing vocal fold dynamics noninvasively using electroglottographic signals

A new method for analyzing and displaying EGG signals (and their first derivative, DEGG) is introduced: the electroglottographic wavegram (short: wavegram). It (a) allows monitoring the EGG (or DEGG) signal over time; and (b) provides an intuitive means for quickly assessing the duration of glottal closure and its variation over time.

Based on the EGG or DEGG signal, the time-varying fundamental frequency is calculated and consecutive individual glottal cycles are identified. Each cycle is locally normalized in duration and amplitude and the cycles are then plotted consecutively. The plotting process resembles that of a spectrogram, but instead of spectral amplitudes, the signal deflections are encoded by color intensity. The wavegram maps time on the x-axis, normalized cycle duration on the y-axis and the signal deflection on the color-intensity-coded z-axis.

Variations in vocal fold contact appear in the wavegram as a sequence of events, rather than single phenomena. These events take place over a certain period of time and change with pitch, loudness and register. Multiple DEGG peaks are revealed in wavegrams to behave systematically, indicating subtle changes of vocal fold oscillatory regime. As such, EGG wavegrams promise to reveal more information on vocal fold contacting and de-contacting events than previous methods.

In this presentation, wavegrams of human and mammal phonations are shown. Their physiologic relevance is discussed in relation to glottal configurations and vocal fold vibratory patterns, as seen in laryngeal imaging.

Reference: Christian T. Herbst, W. T. S. Fitch, Jan G. Švec (2010). "Electroglottographic wavegrams: a technique for visualizing vocal fold dynamics noninvasively." J. Acoust. Soc. Am., *in press*

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Impact of Voice Quality on Vowel Intelligibility: Evidence from Pathological Voices with and without Glottal Competence

This study investigated the relationship between voice quality and vowel intelligibility. A simultaneous acoustic-electroglottographic technique and a perceptual study were employed. Voice samples were obtained from 26 voice patients, including 13 cases showing complete and 13 cases showing incomplete glottal closures based on a videostroboscopic examination of the larynx on the day of voice recording. The "complete glottal closure" (COMP) group included 7 males (aged from 32 to 65 years; Mean = 46.7, SD = 12.2) and 6 females (aged from 29 to 54; Mean = 40.0, SD = 9.9) and the "incomplete glottal closure" (InCOMP) group 7 males (aged from 24 to 81; Mean = 48.4, SD = 20.3) and 6 females (aged from 43 to 68; Mean = 55.3, SD = 10.8). Vowel segments extracted from sustained vowels (/a/ and /i/) and sentences in the "Rainbow passage" (/i/, /a/, /o/, and /u/) were used to derive a selection of acoustic and electroglottographic measures. With sustained vowels, the dominance of the first harmonic relative to the second harmonic (H1-H2 amplitude difference) was found to be significantly higher in the InCOMP group than in the COMP group [$F(1, 47) = 5.267$, $p = 0.026$]. The vowel segments representing different levels of H1-H2 amplitude difference were subsequently used as stimuli in a vowel identification task and a pair-wise vowel clarity comparison task to determine whether this breathiness-related acoustic change affected the perception of vowel identity and clarity. Results from the perceptual study revealed that voice quality and vowel intelligibility were related.

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Objective Voice Analysis and Gender Variation

Backgrounds
Objective measurements in general and acoustic measurements in particular have become a substantial aspect of voice assessment during the last few decades and the mentioned measurements are related to gender characteristics of speakers. On the other hand, comparatively little is known about the characteristics of female voice as compared with male voice. Therefore, the present study aims to provide a more complete picture of the relationship between acoustic measurements and gender.

Materials and Methods
A group of 90 unpaid, healthy, randomly selected subjects with normal voices (45 Iranian men and 45 Iranian women), was selected for this study. All test subjects were between 20 and 50 years of age. Males and females were divided into three subgroups based on the following age ranges, with six total groups (n = 15 per group): 20-30 years, 31-40 years, and 41-50 years. Data collection was carried out, using the Dr. Speech Software version 4.0 from Tiger Electronics (subprogram: vocal assessment) at the speech therapy clinic under comfortable phonation and was used the sustained vowels /a/ and /i/, in a comfortable and habitual way, for more than 3 seconds.

Results
The value of (vowels /a/ and /i/) was greater for females than for males and the F0 of vowel /i/ was significantly higher than the F0 of vowel /a/ in all populations ($P < 0.05$). Conversely, the value of MPT was greater for males than for females ($P < 0.05$). There were no significant differences in average shimmer and jitter between females and males ($P > 0.05$).However, the value of HNR was greater for females than for males ($P < 0.05$).

Conclusions
All in all there are many reasons for differences between acoustic parameters of males and females. We would think that some of these differences definitely are based on physical sex and general differences in the vocal organs of men and women. But we also think that there are additional aspects based on social gender.
Therefore, In light of the differences that emerged for acoustic measurements between males and females, a person's gender should be taken into account when applying spectral analyses to research or clinical situations.

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Abstract

Teachers often have to speak loudly for a long period of time competing with a noisy environment and possibly in a poor acoustical environment, which leads to vocal abuse due to the high vocal demand (Preciado, Garcia, & Infante, 1998; Simberg, Sala, Vehmas, & Laine, 2005). A poor acoustic environment not only affects teaching but also affects the learning efficiency of the students. Studies have shown that students, especially younger ones, have poorer speech comprehension in noisy environments when compared to quiet environments (Arnold & Canning, 1999; Nelson & Soli, 2000). The present study measured the noise and speech level in different types of schools and classrooms and evaluated the impact of noise on teachers' voice quality.

Acoustics measurements were obtained from 9 pre-schools, 9 primary schools, 11 secondary schools and 9 special schools. Acoustic facilities available in each classroom were noted. The noise level during class time and the speech levels of teachers were also measured. The teachers' vocal health was determined by the Voice Handicap Index (VHI).

The results showed that the VHI score of the teachers and the speech and noise levels in the classrooms did not differ across the different types of schools. The noise level was on average 6.5 dB lower than the teachers' speech level, which is far from the level (15 dB) recommended by ASHA. Suggestions on how to further improve the classroom acoustics will be discussed in the presentation.

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The Role of Social-Cognitive Factors in Voice Therapy Adherence and Outcomes

Adherence to treatment presents a challenge in voice therapy. In research outside of speech-pathology, social cognitive factors have been found to be predictive of task performance, patient adherence, and patient outcomes. In addition, social cognitive factors and treatment adherence have shown to be mutable. Therefore, the predictive role of social cognitive factors and the effect of an adherence intervention were examined in this study. Thirty-five individuals referred for voice therapy for vocal hyperfunction were randomized into an experimental "video group" consisting of voice therapy enhanced with provision of video examples of treatment tasks or a "non-video standard of care therapy" condition. For the video group, clinician, self-as-model, and former patient videos were placed on portable digital media players to support adherence between therapy sessions. The social-cognitive factors of self-efficacy, goal commitment, skill attribution, and the therapeutic alliance were measured weekly for 4 sessions. Adherence was measured through self-report of weekly practice and generalization of resonant voice use. Results showed that self-efficacy to overcome barriers to practice predicted a significant amount of practice variance, and the therapeutic alliance was significantly predictive of generalization and voice outcome. Video support resulted in significantly greater generalization and overall self-efficacy for generalization, and a higher therapeutic alliance. Qualitative results demonstrated differential utility of clinician, self-as-model, and peer videos. Results speak to the importance of patient social-cognitive beliefs about therapy and the therapist in determining adherence, and encourage the use of video models and portable digital media players to support voice therapy adherence between sessions.

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Effects of Spanish Vowel Timbres on the Glottal Source during Professional Spoken Phonation Shown by Electroglottography.

It has been shown (Titze 2006; Titze 2008; 2008) that lip-trills, humming, and phonation into straws enhance the interaction between the vocal tract and the glottal source to the point that vocal folds behavior can be modified by building acoustic pressure somewhere in the vocal tract. Bickley and Stevens (1987) also show that constricting the vocal tract helps the outward excursion of the vocal folds during phonation.

The present study shows how the parameters of EGG are significantly different for the 5 Spanish vowel timbres: this implies that acoustic pressure at the mouth can be built up without constriction and nevertheless be strong enough to shape laryngeal function.

For the study, 6 professional Spanish TV and radio female speakers were recorded reading twice (neutral and professional) the same phonetically balanced Spanish text. Both audio and EGG signals were recorded. The EGG waveforms were analyzed in a cycle-by-cycle basis, and the different parts were quantified as the parameters: Peak Amplitude, Maximum Rise and Decay Slopes, Rise and Decay Slopes and Times, Vibratory Cycle, Contact Phase. Contact Index, Contact Quotient and Index of Asymmetry were calculated, and F0 (from the EGG) and radiated intensity level (dB) were extracted.

The results show that professional speech provokes a more differentiated glottal behavior across different vowels, leading to the conclusion that the firmer a vocal tract is at its end (mouth - lips), the more interaction it creates with the glottal source.

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Speaker Identification in Disguised Speech Using Perceptual Analysis

Speaker recognition is any decision making process that uses some features of the speech signal to determine if a particular person is the speaker of a given utterance. Each speaker is bestowed with uniqueness and hence different speakers can be identified based on their individual speech characteristics. However, this task becomes difficult when an individual consciously manipulates his speech in order to disguise his identity. The purpose of the study was to find out the effectiveness of perceptual analysis across normal and different disguised conditions which is used in speaker identification.

Perceptual analysis was carried out considering two groups of subjects who participated in the study. Group I had ten Malayalam speaking normal subjects (five males and five females) in the age range of 18 – 25 years, who were not familiar to the listeners participating in the study. Group II had twenty Malayalam speaking age matched normal participants (ten males and ten females). Five Malayalam sentences which are commonly used were used as stimuli. Participants in group I were instructed to speak these sentences in their normal pitch and also in six disguised conditions, high pitch, low pitch, lip protrusion, pinched nostrils, pipe smokers speech and object in the mouth. And later the listeners were asked to match these disguised speech samples of the speakers with that of their normal speech. Results revealed that listeners were not able to perceptually identify the speakers in disguised conditions.

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Increased Fundamental Frequency in Kindergarten Teachers

Introduction and aims: It is commonly acknowledged that kindergarten teachers raise their fundamental frequency (F_0) during their conservations with the children in the classroom, and that this increased F_0 inflicts higher risk at developing a voice problem. The present study therefore aimed at (1) comparing the kindergarten teachers' F_0 inside and outside the classroom, (2) quantifying the difference between them, and (3) investigating whether this difference helps cultivating voice problems.

Methods: Approximately thirty minutes of habitual speech of kindergarten teachers was recorded in two settings: normal conversation and conversation with the children in the classroom. Median F_0 of these recordings was determined and compared between settings. Furthermore, the Voice Handicap Index (i.e., VHI) and questions regarding a history of voice problems were administered from all participants. The latter data served as the criterium based upon which it was investigated whether increased F_0 contributes to problems with the professional voice.

Results and conclusions: At the time of submission of this abstract, the study was ongoing and there were no statistical results. Preliminary investigation of some individual data, however, revealed remarkable differences in median F_0 between settings.

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Wave propagation approach for viscoelastic characterization of soft tissues

The viscoelastic characterization of vocal fold tissue is needed to create mathematical models of phonation, for therapeutic applications such as the development of injectable materials which are widely used in healing scarred tissues, for diagnostic purposes to distinguish between scarred and healthy tissue, and to evaluate surgical methods used in vocal fold treatment. Pervious studies have mostly used parallel plate rheometry to measure the viscoelastic properties of human vocal folds, which does not offer the possibility of *In vivo* measurements. In contrast, studies which have done *in vivo* measurements, have not dealt with the frequency-dependency of the viscoealstic properties of the tissue.

In the present study, a wave propagation approach was used to measure the frequency-dependent viscoelastic properties of synthetic materials. A synthetic silicon model with the approximate size of the vocal folds was excited by a shaker over a wide frequency range. The acceleration of the top and bottom ends of the model was measured using an accelerometer and a Laser Doppler Vibrometer (LDV). Assuming one dimensional planar compression wave propagation, a transfer function between the velocities of the two ends of the model, the longitudinal complex elastic modulus and loss factor were obtained. The advantages of the wave propagation approach are that viscoelastic properties are obtained over a wide frequency range, and the possibility of applying the technique *in vivo*. Results were compared to those from a rheometer at low frequencies. Future work to apply this method to porcine vocal fold is planned.

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The vocal score profile/voice range profile ratio (P/Pratio) in artistic voice evaluation: application tested on opera and musical singers

Performances of unsuited repertories to singer's vocal/technical features can cause increasing risks of vocal effort (VE) and fatigue or glottic injury (GI), then it's important to find the right repertory for artist's vocal/technical features.

We made manual voice range profiles (VRP) and interviews regarding performed/studied/not studied roles in professional singers (10 opera and 7 musical). The dynamic agility (DA) curve, that is the differentials' curve (note by note) between loud and soft phonation curves, was obtained from VRP. This type of curve allows to assess the phonation system capacity all range long. We realised for each operatic/musical role a vocal score profile (VSP), that is a statistic method for vocal score semeiotic and highlights the vocal role various musical features through histograms. Then we superimposed the DA graphs on VSP graphs creating a new graph (P/Pratio) that gives a synoptic summary of suitableness of examined singers' vocal/technical features in regard to considered role, revealing hard and critical moments eventually causing higher VE/GI risks. At last we compared data from P/Pratio with those from interviews, valuating correspondence between subjective and objective data.

This study describes explicative examples of graphs analysis; in all cases analyzed through P/Pratio we found easiness in data interpretation, reliability in suitableness evaluation and expectation, good correspondence between subjective and objective data.

P/Pratio aims especially recognizing a suitable repertory to DA and expecting likely performing risks of VE/GI in roles choice. Anyway, a singer without a suitable DA to a specific role can all the same excel in performing it, even if under higher vocal risks. P/Pratio could be used in phonetician counselling, in right repertory choice, in follow-up during study or career, in planning adequate speech therapy or artistic training.

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Normative Study of Vocal Attack Time in Adults

Clinical methods for objective evaluation of vocal initiation tend to measure the rise-time of the acoustic or a related vocal signal. Yet, it is not easy to demarcate the precise point at which voice first appears in the sound pressure record, nor is there a clear and easily-applied definition for the point at which signal growth has reached its maximum. In 1998, Baken and Orlikoff proposed a technique that measures the time lag between the rise of the sound pressure (SP) and electroglottographic (EGG) signals at vocal initiation. They named this interval the vocal attack time (VAT). The method was later validated by comparison to measures obtained directly from high-speed video recordings. The investigation reported here was undertaken to gather normative data for the VAT measure.

Fifty-seven females and fifty-five males met inclusionary criteria for this study. EGG and SP signals were digitally recorded for productions of the sustain vowel /a/ at self-selected, comfortable pitch and loudness (44.1 ksps sampling rate and 16-bit resolution / channel). Signals were monitored on a two-channel oscilloscope throughout data collection.

VAT measures were extracted using a computer-based system. The automated data analysis process consists of four components, each of which includes graphical display and optional acoustic playback of intermediate processing stages to ensure measurement integrity.

The VAT holds promise as a meaningful clinical indicator of the normality of vocal fold function. Future research will clarify its relationship to both tissue pathology and functional disorders of phonation.

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The Effect of Change in Spectral Slope and Formant Frequencies on Perceived Loudness

The aim of the present study is to investigate how changes in spectral slope influence changes in perceived loudness. The stimuli will be generated using the Aladdin DSP Workbench synthesizer. Three different source signals will be synthesized with varying slopes of-9, -12, and -15 dB/octave. A total of 6 source signals will be synthesized - 3 each at 0dB and -3dB RMS amplitudes. Each source signal will be filtered using 2 eight-formant models of the vowel /a/, the first with formants 1-4 appropriate for a mezzo soprano, the second with formants 1-4 appropriate for a soprano. This procedure will be performed at four pitches, A3, C4, D3 and F5. For each pitch and each formant pattern, all possible pairs of stimuli varying on source slope and amplitude will be constructed for a total of 120 stimulus pairs. Each stimulus pair will be played twice, resulting in 240 paired stimuli. Listeners with normal hearing will be presented with the paired stimuli in random order. Their task will be to indicate the magnitude of difference in loudness using a scroll bar ranging from "same" to "very different". They will also need to indicate which of the paired stimuli sounds louder. Results will be discussed in terms of sensitivity of human ear to perceived spectral slope differences and its significance. Also, the interaction of RMS amplitude and spectral slope will be determined.

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Viscoelastic properties of supraglottic structures capable of vibration.

Objectives:

The purpose of this study was to quantify the viscoelastic properties of the human false vocal fold and the aryepiglottic fold mucosa at phonatory frequencies, in comparison with those of the true vocal fold cover.

Study Design: Rheometric investigation of human laryngeal tissue in vitro.

Methods:

Linear viscoelastic shear properties of human false vocal fold mucosamucosa and aryepiglottic fold mucosa specimens were determined as functions of frequency covering the phonatory range, and compared to those of the human vocal fold cover. Measurements of elastic shear modulus (G') and dynamic viscosity (η') were made at frequencies of up to 250 Hz with a controlled-strain simple-shear rheometer. Linear least-squares regression was conducted to curve-fit log G' and log η' versus log frequency, and statistical analysis was performed with one-way ANOVA.

Results:

 All specimens showed similar frequency dependence of the viscoelastic functions, with G' gradually increasing with frequency and η' monotonically decreasing with frequency. Although G' and η' of the false vocal fold mucosa (n = 7) and the aryepiglottic fold mucosa (n = 7) were higher than those of the vocal fold cover (n = 7), no significant differences in G' and η' were observed among the structures.

Conclusions:

As the viscoelasticity of the human false vocal fold and the aryepiglottic fold mucosa was not significantly different from that of the true vocal fold cover, these supraglottic structures could become viable candidates for tissue vibration and phonation for select patients with true vocal folds that are severely compromised in vibratory properties.

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Vocal Fold Structure in a Transgenic Mouse Model

This study investigated the effects of a unique elastin genotype (human elastin gene = *ELN*; mouse elastin gene = *Eln*) on vocal fold phenotype, as a function of vocal fold protein levels, in order to better understand the role of *ELN* in structural development of the vocal fold. Two groups of mice, six transgenic mice with a human elastin transgene (*ELN* +/+) but null for both alleles of the mouse elastin gene (*Eln* -/-), labeled as the hBAC-NULL group, and six wild-type c57BL/6 mice (*Eln* +/+), labeled as the WT group, were utilized for this study. Vocal folds were obtained from each animal and stained for the proteins elastin and collagen using histochemical methods. Qualitative visual inspection of the vocal fold lamina propria revealed greater staining density (e.g., a greater quantity) for elastic fibers but not collagen fibers in the hBAC-NULL animals, and marked differences in the overall thickness of the lamina propria (thicker in WT animals). Quantitative measurements using digital pixel analysis of staining density confirmed these findings, suggesting that this unique transgenic genotype results in measureable differences in vocal fold structure compared to normal genotypes, and should allow for the use of this animal model for investigating the biomechanical effects secondary to vocal fold elastic fiber abnormalities in the presence of normal collagen fiber quantity and structure. A framework for use of this animal model for investigating vocal function via acoustic measurements of ultrasonic vocalizations will be presented.

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Synthetic, Natural, and Combination Scaffolds: The Future of Lamina Propria Regeneration and How Peptides Fit In

It is estimated that 5-10% of the United States population suffers from some form of communication disorder resulting in estimated economic losses of $154 to $186 billion per year. Many of these communication disorders may be associated with glottal incompetence. Unfortunately, the current options to treat glottal incompetence are rudimentary and focused strictly on the patient regaining phonation capabilities in the short term by injecting materials, like autologous fat or collagen, into the vocal folds. Alas the temporary nature of these treatments does not provide a long term solution to the problem. Researchers have therefore been working diligently to develop materials that can facilitate more robust long term restoration of glottal incompetence. One such basis for the development of new materials is the construction of synthetic hydrogel materials that can be engineered to mimic the mechanical and biological characteristics of the lamina propria. Other approaches for the development of new materials include decellularizing, manipulating, and implanting natural extracellular matrix into the lamina propria, or combining synthetic/natural scaffolds with stem cells or other types of cells to facilitate lamina propria regeneration. Our approach incorporates peptides as the bioactive component of a scaffold. The potential advantages of peptides are that they can be engineered to communicate multiple biologically relevant signals to the cells via simple modification of their amino acid sequence. In this poster, we will review current approaches to develop biomaterials to correct glottal incompetence with special emphasis on our approach of using peptides.

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Psychometric Properties of a Matching Task for Quantifying Perception of Roughness

Background:
Matching tasks are a relatively bias-free method to quantify perception of psychophysical continua. These are used to study a number of psychophysical relationships, including breathy voice quality. Two factors critical for the successful use of a matching task are, (i) the determination of a suitable matching stimulus, and (ii) knowledge of the psychometric properties of that stimulus in the context of the test stimuli. Here, a modified method of constant stimuli was used to identify a suitable matching stimulus for the measurement of roughness.

Purpose:
The goal of this study was to identify a suitable matching stimulus for roughness by evaluating the psychometric properties of three different candidate stimuli. The ideal stimulus would encompass the range of roughness observed in dysphonic voices and be applicable for a wide variety of stimuli.

Methods:
Twenty five participants judged the roughness of 21 disordered voices using three different matching stimuli – (i) a low-pass filtered sawtooth wave with squared cosine amplitude modulation, (ii) a low-pass filtered sawtooth wave with quadratic cosine amplitude modulation, and (iii) a natural vowel with quadratic cosine amplitude modulation. The natural vowel used here was rated to have minimal roughness in a prior experiment using a rating scale, rank-ordering and a matching design. The psychometric functions for each of the three stimulus were determined by fitting a sigmoid function.

Results:
The results indicated that matching judgments obtained using a sawtooth waveform with quadratic cosines amplitude modulation was most successful in spanning the range of roughness observed for natural stimuli.

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A new method for reconstruction of the human laryngeal architecture using micro-MRI

OBJECTIVE: A realistic 3D model of the larynx could be of value for the understanding of normal laryngeal motion and for studying pathological changes as well as in modeling potential therapy outcomes. The objective of this research was to present a new method of creating a computer model of the human larynx using data obtained through micro-MRI scanning.
METHODS: A 7 Tesla micro-MRI scanner was used to scan a human larynx. MRI data was manually segmented and compiled into 3D images using Mimics12.1 reconstruction software. Measurements of the reconstructed structures were also calculated using Mimics12.1.
RESULTS: The 3D larynx model contained the thyroid, cricoid and arytenoid cartilages. Nearly all of the intrinsic muscles could be segmented. While the cricoarytenoid joint could be visualized, the features of the cricothyroid joint were not clear. Muscle and cartilage volumes and surface areas were calculated from the 3D model.
CONCLUSION: The combination of MRI and 3D reconstruction generates promising results in the hopes of creating a highly realistic and detailed model of the human larynx.

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A voice acoustic analysis of thyroid adenoma patients after a unilateral thyroid lobectomy

Objective: The objective of this study was to investigate the features of voice changes in thyroid adenoma patients secondary to a unilateral thyroid lobectomy that did not result in laryngeal nerve injury.

Study Design: Prospective study.

Methods: Preoperative and postoperative fibrolaryngoscopic and voice acoustic analyses were performed on 32 adult patients (8 males and 24 females) with unilateral thyroid adenoma. Forty adults (20 women and 20 men) with normal voice function were grouped as controls.

Results: The vocal cords before and after surgery in all patients appeared to be normal under the fibrolaryngoscope. The preoperative voice was slightly abnormal in female patients and normal in male patients. One week after surgery, the F0 and Fhi levels of both male and female patients decreased significantly from the values recorded before surgery (P<0.05). One month after the surgery, the F0 standard deviation (STD), fundamental frequency perturbation (Jitt), amplitude perturbation (Shim), harmonic noise ratio (NHR), voice turbulence index (VTI) and degree of subharmonics (DSH) in female patients decreased significantly from the values observed before surgery (P<0.05). Three months after surgery, the values of these indicators returned to normal. But the Fhi value was still lower than the levels observed in the control group (P<0.05).

Conclusions: After a unilateral thyroid lobectomy, which did not result in injury of the laryngeal nerve, the voice of male patients consequently became slightly abnormal and returned to normal within one month. The voice quality of female patients improved from that demonstrated prior to surgery.

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Laryngeal electromyography guided hyaluronic acid vocal fold injection for unilateral vocal fold paralysis

Background:

For predicting prognosis of unilateral vocal fold paralysis (UVFP), LEMG has been widely used in USA. It also has been used for guidance of Botox vocal fold injection (VFI) for spasmodic dysphonic. Hyaluronic acid (HA) is a safe injectable material that can be used for VFI to improve the glottal closure of UVFP. The purpose of this study is to report our experience in using injectable needle electrode to guide HA VFI during LEMG for UVFP.

Methods:

From Mar. to Jun. 2010, 20 UVFP patients received LEMG examination at our clinic. Before completion of LEMG, 1.0 cc HA (Restylane Perlane®) was injected via 26 Gauge mono-polar injectable needle electrode into paralyzed thyroarytenoid muscle. The data before, 1 week after and 3 months after injection including normalized glottal gap area (NGGA) from stroboscopy, maximal phonation time (MPT), phonation quotient (PQ), mean airflow rate (MAFR), perceptual evaluation of voice (GRBAS scale), voice handicap index (VHI) and self-grading of choking (grade 1 to 7) were analyzed with Wilcoxon signed rank test.

Results:

After injection, NGGA was significantly reduced from 8.28 ± 4.45 units to 0.52 ± 0.70 units (1 week) and 1.79 ± 3.11 units (3 months). The MPT was prolonged from 5.66 ± 3.88 seconds to 11.73 ± 4.78 seconds and 11.25 ± 4.66 seconds respectively. Other analyzed data also showed statistically significant improvement.

Conclusion: LEMG guided HA VFI for UVFP is feasible and short-term result is satisfactory.

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Diagnosing Adult Laryngomalacia with Rest and Exercise Flexible Laryngoscopy

Laryngomalacia is best known as a self-resolving infantile disorder characterized by inspiratory stridor with occlusion of the larynx by collapse of arytenoid tissues due to Bernoulli forces. Adult laryngomalacia has been sporadically described in the literature, typically associated with exercise but also with advanced age, neurological diseases, trauma or refractory asthma. A series of five patients evaluated in our Otolaryngology clinic with adult laryngomalacia presented with complaints ranging from noisy breathing to dyspnea with exertion. They were diagnosed using rest and exercise flexible laryngoscopy. Symptoms resolved in all patients who underwent traditional or modified supraglottoplasty. These patients, all with abnormal corniculate/cuneiform motion which occluded the airway during forceful inspiration, provide evidence of the wide disease spectrum in adult laryngomalacia.

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Hyoid Bone Syndrome: A Retrospective Review of Patients Treated with Triamcinolone Acetonide Injections

Hyoid bone syndrome was first described over 50 years ago.[1] Although many in the medical community are not familiar with the diagnosis, it should be considered in the differential when patients present with neck and throat pain. It manifests as pain at the greater cornu of the hyoid bone that may radiate to the ipsilateral ear, temporal region, pharynx, sternocleidomastoid muscle or supraclavicular area.[2] Histopathological analysis has shown this syndrome to be a form of insertional tendinosis or tendinitis.[4,5] Treatment has included non-steroidal anti-inflammatory drugs (NSAIDs), physical therapy, injections of analgesics and steroids and excision of the involved greater cornu. We report the largest study to date of patient outcomes after treatment with injections of triamcinolone acetonide into the affected greater cornu. Fifty-nine patients (71%) had complete resolution of their symptoms. Of these patients 41 (69%) had complete symptom relief after a single injection.

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The Vocal Load of Jewish Reform Cantors in the USA

Objective: Jewish Cantors comprise a subset of vocal professionals that is not well understood by vocal health professionals. This study aimed to document the vocal demands, vocal training, reported incidence of voice problems, and treatment seeking behavior of reform Jewish cantors. **Methods**: The study utilized a prospective observational design to anonymously query reform Jewish Cantors using a 35 item multiple-choice survey distributed online. Demographic information, medical history, vocal music training, cantorial duties, history of voice problems, and treatment seeking behavior were addressed. **Results:** Results indicated that many of the commonly associated risk factors for developing voice disorders were present in this population including, high vocal demands, reduced vocal down-time, allergies, and acid reflux. Greater than 65% of the respondents reported having had a voice problem that interfered with their ability to perform their duties at some time during their career. **Conclusion:** Reform Jewish cantors are a population of occupational voice users who may be unidentified and underserved by vocal health professionals. This presentation will include results of the survey and information regarding the impact of cantorial duties and the Jewish calendar on cantors perceived voice difficulties.

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Effect Dietary Hydration Gap on Voice Qualities in Normals

Introduction: Descriptive case history reveals low fluid intake especially of water and other non-caffinated drinks (Greene & Mathieson, 1989) causing speech discomfort. This is based on the assumption that these dehydrating factors dry outs mucosal lining and put an increased strain on the phonatory apparatus (Sunderberg, 1986).

Aim: To assess quantitatively and perceptually whether poor hydration status affects voice production.

Method: Nineteen healthy participants of age range twenty to fifty years participated in study. Data was obtained for phonation, reading and conversation tasks. Acoustic analysis was done using PRAAT while perceptual analysis was done using GRBAS scale. Pretest data was obtained after 14hours fasting while posttest recording was done half an hour after comfortable dietary hydration.

Results: No statistically significant changes, but rear numerical changes were observed for fundamental frequency, loudness, voice breaks. GRBAS rating revealed that reduction in overall scales by one unit across dehydration and rehydration conditions.

Discussion: The results obtained from the study are inconclusive but they indicate hydration status had a particular marked influence on quality related parameters. It was observed that subjects showed variation in their average habitual frequency for phonating /a/, /i/ and /u/, passage reading and conversational mean frequencies.

Conclusion: Slight variation on quality related parameters infers that 14 hour dehydration does not influence water equivalence of laryngeal structures in great deal. Encouraging people to improve their hydration level may not be justified in terms of improving finer aspects of voice qualities.

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Pain Related to Voice Usage

Pain while talking is a rare symptom of voice disorders, however, when present can be detrimental to a good communication. This study aims to identify and characterize the presence of body pain (proximal and distal to the larynx) related to voice usage in the general population (GP) and professional voice users: singers (classical and popular), speech-language pathologists (SLP) and telemarketing operators (TMKT). A questionnaire investigating self-reported voice problems and presence of body aches as well as a vocal self-assessment were administered to 600 participants. 13 types/sites of aches were investigated: temporomandibular joint, tongue, throat, neck, back of the neck, shoulder, pain while speaking, head, back, chest, arms, hands and ear. General results indicate a negative correlation between vocal quality self-assessment and body aches and voice problems. SLP reported more pain than any other groups probably due to the challenging situation of treating individuals with communication disorders. The average number of aches was also higher for SLP (4,8) followed by TMKT (4,5), whereas classical singers reported the least average number of aches (2,4) probably due to systematic vocal training. When pain is present in singers, throat is the privileged site; to all others, back pain is on first position. Therefore, investigating pain has to be valued when dealing with professional voice users. Challenging speakers in treatment setting (the SLP scenario) or excessive vocal load under stress (TLMK daily activity) can be a risk factor to developing pain. Our data also suggests that formal training can be protective to pain in general.

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The impact of average F_0 and formant frequencies on perceptions of gender from voice

Male-to-female transsexuals often consult speech pathologists in order to attain gender appropriate voices. Both mean fundamental frequency (F_0) and formant frequencies are thought to convey vital information about a speaker's gender and are likely to influence the perception of a female voice (Hillenbrand & Clark, 2009). Past researchers have indicated that a mean F_0 above 155-160 Hz is necessary for biological male speakers to be perceived as female (Spencer, 1988; Wolfe et al., 1990), however the lowest F_0 value above which a speaker may be perceived as female warrants further examination. The significance of higher formant frequencies for the perception of a female voice has also been emphasised in past research (Coleman, 1971; Mount & Salmon, 1988), yet the perceptual salience of formant frequencies for perception of speaker gender remains unclear.

This presentation reports the results of a study evaluating the influence of F_0 and formant frequencies on the perception of female voice in adults. Praat Software (Boersma & Weenink, www.praat.org) was used to independently and simultaneously manipulate median F_0 and formant frequencies of the voices of biological males to varying levels. Males, females and male-to-female transsexuals subsequently judged the gender of the manipulated voice samples as well as of habitual voice samples produced by biological males and females. Results indicated that biological male voices were perceived as female only when median F_0 was increased to 200 Hz and formant frequencies were simultaneously increased to approximate average female levels. The manipulated voices were, however, easily distinguishable from those of adult women. The findings of this research will be discussed in relation to both the scientific aspects of perception of speaker gender and in relation to their implications for clinical practice with transsexual clients.

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Personality traits conveyed by dysphonic voice in children

Studies have shown that dysphonic voice quality prompt specific beliefs about the personality of dysphonic children, as compared to normophonic children. Although a relation between specific personality types and childhood dysphonia is supposed, no former study has tried to investigate possible objective underpinnings to the beliefs about personality type of dysphonic children.

The aim of our study was to investigate whether the personality types attributed to dysphonic children (nodules) were linked to the personality types that have been pointed out as being in relation with nodular lesions in children.

30 naïve judges listened to and rated 24 voice samples (8 nodules and 4 normophonic on a sustained /a/ and on three sentences) according to a personality scale based on the five factor model.

In parallel, the mothers of 60 age and sex matched children (dysphonic: 30, normophonic: 30), including the voice sample children, evaluated their children by means of the same personality scale and the Child Behavior Checklist.

The judges rated the dysphonic voices as belonging to more extroverted ($p < 0,001$) and less agreeable ($p = 0,011$) children, which is in relation with what can be found in the literature concerning the personality of dysphonic children. However, the parents' evaluation of their children failed to show any significant difference between the groups.

Our results confirm that dysphonic voice quality conveys specific personality traits but do not support that they would have any objective ground.

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Profiling of Phonatory Characteristics in Gullian-Barre Syndrome – A Rare Case Report

Aim

The present study was designed to highlight and profile the phonatory characteristic observed in a case of Gullian berre syndrome. Guillain-Barré syndrome is an autoimmune disorder that affects the peripheral nervous system followed by viral infection.

Methods and Materials:

Detailed voice evaluation was carried our in a subject who had Gullian Barre Syndrome and come with complaint of voice problem and respiratory failure at the age of 3 years. She was tracheostomized. Repeated micro laryngeal excisions with laser surgery were not successful for closure of stoma till the age of 17 years.

Her voice problem noticed following tracheocutaneous fistula, post laryngotracheal reconstruction/post tracheocutaneous fistula repair. Stroboscopic evaluation to visualize the status of the vocal folds.

Results and Discussion

Subjective voice evaluation revealed severely creaky and tensed voice with voice breaks in a sustained phonation. It was seen that weak cough production, reduced voice motor control with poor endurance, monoloudness, monopitch, inappropriate stress, and rhythm and hyponasal speech with posterior tongue carriage

Maximum phonation duration was around 4-5 sec indicating reduced interaction between respiratory and laryngeal systems. Phonation of s/z ratio suggested laryngeal pathology. All perturbation parameters were affected indicating varied vocal fold vibration. Breathy quality of voice was observed. Stroboscopic evaluation revealed bilateral thin tissue seen on vocal folds with (?) abductor vocal cord palsy and pin point opening posteriorly.

Conclusion:

The present study highlights the phontory problems seen in individual with gullian barre syndrome.

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Voice characteristics in congenital laryngeal web - A case report

Introduction:

Laryngeal webs are uncommon congenital anomalies which occurs due to incomplete recanalization of the laryngotrachael tube. Defect involves the anterior part of the vocal folds.

Individual with laryngeal web may exhibit dysphonia to significant airway obstruction.

Management of laryngeal web ranges from observation to tracheotomy. The goals for congenital laryngeal web management are to provide a patent airway by undergoing tracheostomy and to achieve a good voice quality. The treatment for laryngeal web is laryngofissure and placement of keel.

Methods and Materials.   .

The present study reports a client aged 12 years with the history of laryngeal web. He presented with a complaint of reduced loudness of voice. History revealed that he had undergone surgery for laryngeal web thrice. Surgery involved the excision of laryngeal web, laryngofissure and insertion of keel. ENT and stroboscopic evaluation confirmed the presence of recurrent laryngeal web. Objective evaluation included acoustic analysis of voice using MDVP and Dr. Speech software. Subjective evaluation included maximum phonation duration and s/z ratio.

Results: Maximum phonation duration of /a/, /i/, and /u/ revealed that restricted duration of phonation. Objective evaluation indicated aperiodicity in the vocal fold movement. Degree of voiceless is significantly high indicating the restricted mobility of the vocal fold giving rise to breathy voice.

Conclusion:

A course of Intensive voice therapy is advised to our client.

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The impact of teacher's dysphonia on children's skills to process the spoken language.

The high prevalence of voice disorders among teachers is known (Roy et al, 2004). Authors (Morton et al, 2001, Rogerson et al, 2005) have shown the impact of a hoarse voice in teachers on student performance. Our aim is to analyze how 68 students (mean age: 8 years 5 months) processes dysphonic speech on a language comprehension task (MCQ on a short story) and on a minimal pair discrimination task (alike/not alike).
Our hypothesis is that student performance will change depending on the modality of the tasks: dysphonic versus normophonic voice.
Our results: For both the comprehension and the discrimination tasks, the scores of the students were significantly lower in the dysphonic voice modality (F (1,67) = 11.83, p <0.05) regardless of gender, the order of voice presentation and type of school. Moreover, we observe a greater effect of the dysphonic voice modality in the discrimination task (F (1,67) = 9.52, p <0.05). Thus the dysphonic voice disturbs the students the most in the process of discriminating between two isolated words. Finally, when children judge the dysphonic voices, their comments are mostly slighting (98.33%). To conclude, these results support the necessity to prevent voice disorders among teachers and to create specific voice care programmes.

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An investigation of factors affecting the quality of resonant voice production.

In order to maintain the quality of resonant voice, it is crucial to properly control the factors that may affect the reliability and validity of the measurement. The present study investigated the effects of pitch and vowels on the extent of facial bone vibration using vibro-detectors. Thirty females and 30 males aged from 20 to 30 years with healthy voice were given a session of resonant voice training. Vibration measurements using vibro-detectors on nasal bridge, upper lip were taken. Laryngeal muscle activities were detected using sEMG electrodes placed over the thyrohyoid and orofacial sites during resonant voice production. Results showed that the extent of facial bone vibration can be affected by different pitch levels but not by different vowels. While after resonant voice training, there was a significant increase in bone vibration within the pitch range around G4, but the EMG values remained relatively stable. These results suggested that the resonance increase is not due to higher laryngeal muscle activities. Those quantitative data of "optimal pitch range" for better resonance acquisition can be used as visual feedback and will form a valuable database which useful for the resonant voice training.

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Novice vs experienced clinician behaviors in the prepractice phase of voice therapy: a preliminary investigation

Purpose: The principles of motor learning (PML) can be separated into those applying to the prepractice and the practice phases. Behaviors observed in the prepractice phase are: *motivation*, *modeling*, *verbal information*, *physical attempts* and *feedback* (McIlwaine, Madill & McCabe, 2010). Differences between novice and expert clinicians are well documented. Experts act holistically using clinical experience, while novices rely on context-free rules (Benner, 1982; Kamhi, 1995). The current study aimed to compare the use of prepractice behaviors by novice and experienced clinicians in simulated voice therapy sessions. Method: Five final-year students and four experienced speech-language pathologists with a current voice caseload completed a simulated therapy session with a standardized patient. The participant's role was to teach the standardized patient a vocal siren to practice at home. Each session was transcribed, and two trained raters rated clinician behaviors according to the PML Prepractice Schema (McIlwaine, et al., 2010).
Results: There was high overall inter-rater reliability between the raters (75-92.3%). High intraclass correlation coefficients (0.846-0.998) indicate similar reliability would be obtained by a larger group of trained raters. Both groups used significantly more behaviors involving talking than behaviors involving physical activity (*modeling* and *attempts*) ($F_{1,7}=50.7$, p<0.001). The raters independently identified a *problem solving* category, which was used by the experienced clinicians and the only novice clinician with clinical voice therapy experience.
Discussion/Conclusion: The Schema has reliable and valid application to voice therapy, indicated by the reliability measures. *Problem solving* appears to be a distinguishing feature between those with and without clinical experience. The greater use of talking behaviors over doing behaviors prompts further investigation into the most efficient and effective use of the prepractice variables.

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Rehabilitation of Speech After Lyrngo Phayngo Esophgetomy with Gastric Pull Up Following A Road Traffic Accident - A Case Study

Aim: The present study designed to study the rehabilitation strategies used in a patient of total laryngopharyngo-esophagectomy with gastric pull-up followed by a road traffic accident.

Methodology: The study involved a 43y male who had undergone laryngectomee with gastric pull up following road traffic accident. History revealed that larynx was crushed and developed a 7 cm long trachea-esophageal fistula for which a failed repair resulted in a surgical procedure as total laryngopharyngo-esophagectomy with a gastric pull-up. After a detailed evaluation, gastric speech as a mode of speech rehabilitation adopted along with artificial laryngeal speech. A video recording of the client's alaryngeal speech was carried out. The sample included 5 monosyllabic, bisyllabic, polysyllabic words and five sentences Recorded material was presented to 10 naïve and experienced listeners to identify the words and rate the speech intelligibility. The presentation was in auditory and audio-visual mode. They were then asked to write down the verbatim of the patient.

Results: The patient is using an artificial larynx for communication. Analysis of the data collected using the alaryngeal speech sample revealed most of the listeners could understand his speech fairly well.

Discussion: An artificial larynx is used in cases where the patients has an immediate need to communicate verbally and cannot wait for long or in cases where individual is unable to develop another form of alaryngeal speech, as seen in our patient.

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Phonetory characteristics in individuals with dysarthria- Dysarthrophonia

Introduction:
Aim: The purpose of this study was to find the detailed voice characteristics observed in individuals with dysarthria usually termed as dysarthophonia. .

Method: This study involves retrospective analysis of voice. Four individuals with complaint of dysarthria served as subjects for this study. Each of them had different onset of dysarthria and were classified as having flaccid dysarthria (n=), . Detailed voice analysis was done by both subjective and objective voice evaluation included MPD, quality of voice analysis, s/z ratio and multidimensional voice analysis of 32 parameters.

Results: It was found that due to the onset of the condition, each individual showed unique feature of voice characteristics that can be termed as dysarthrophonia. Various parameters were analyzed such as Maximum Phonation Duration, s/z ratio. Quality of Voice, Voice Handicap Index and Multidimensional Voice Profile.

Discussion: Voice parameters differ from individuals to individuals with the same condition. A detailed voice analysis will give us a better insight to the various acoustical parameters of the voice. From the statistical analysis various parameters were found to be significantly different from Normal vs. Dysarthrophonic voice

Conclusion: The present study concludes that voice can be significantly after with individuals with Dysarthria. A systematic assessment will help in the better diagnosis of these individuals

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Issues in the acoustic analysis of transgendered voice.

This case study documents acoustic changes over the course of therapy to feminize the voice in a male-to-female (M-F) transgendered individual. Perceptual tests show that higher speaking fundamental frequency (F0) may be the only significant difference in voices perceived as female rather than male. Paradoxically, however, changes of F0 alone are not sufficient to produce a feminine sounding voice. Low pitched voices may sound feminine, and high pitched voices may sound masculine. Besides F0, acoustic characteristics related to resonance, patterns of inflection, voice quality, and speech rate contribute to the perception of a feminine voice. This presentation documents acoustic changes of a M-F transgendered speaker who specifically did not wish to pursue alterations of F0, but wanted to achieve a more feminine voice by other means. Therapy goals focused on changing speech rate, altering voice quality (reducing glottal fry and increasing breathiness), altering prosodic patterns, and raising the F0 "floor" of the speaker's voice (the lower limit of the F0 range as distinct from average F0). Acoustic measures examined over the course of therapy included average F0, minimum F0, F0 variability, speech rate (syllables per minute), RMS intensity, signal to noise ratios during selected vocalic segments, and visual-auditory judgments of vocal fry (using waveform and spectrographic displays to identify episodes of vocal fry). Values did not always change in the expected direction, and acoustic analyses raised methodological questions about the quantification of noise components in the voice.

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The Effects of NMES on Vocal Range

NMES is widely used for the treatment of dysphagia and voice disorders in the U.S. Previous research findings have documented variable changes in acoustic measures (F0, SPL) following 30 and 60 minute applications of NMES to the anterior neck. Data have also shown that some young, healthy speakers experience fatigue or delayed onset muscle soreness (DOMS) following these same durations of NMES sessions. Although fatigue and DOMS have been associated with NMES, it is not known whether these sensations are indicative of changes in the contractile forces of the muscle fibers recruited by the electrical currents. Finding a method for determining whether NMES causes a loss in muscle strength would contribute to establishing safe and effective exercise prescriptions that include NMES as an adjunctive treatment modality. Given that vocal range is the measure of the breadth of pitches that a person can phonate, it can also be used as an indirect measure of the contractile forces of the laryngeal muscles involved in phonation. To complete this study, 10 men and 10 women will receive NMES for 1 hour, administered via VitalStim[®]. The electrodes will be applied to the thyroid lamina and to the cricothyroid space. Measures of vocal range and subjective perceptual ratings will be obtained before, at quarter intervals, and after the NMES session. These data will be used to determine if the perception of muscle fatigue correlates with any shifts or changes in the extent of vocal range.

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Characteristics of the supranormal speaking voice: perceptions of radio employers

Introduction: In the past, a successful radio speaker was defined very specifically: medium to low pitch, good resonance and clear enunciation, with marked pitch, rate and volume variations. A good vocal delivery was crucial for success in the radio medium. More recent literature has identified vocal flexibility and naturality as key attributes for successful radio announcers. This study was conducted to determine the desired characteristics of radio performers in Australia.

Method: Semi-structured interviews were conducted with radio program directors, educators and creative directors from radio casting agencies (n = 10). Participants were asked:
1) what they believe makes a good voice for radio, 2) what they might look for if employing a radio performer and 3) the training that radio performers usually have.

Results/Discussion: Thematic analysis of interview data revealed three primary roles on radio: voice-over-artists, radio announcers and newsreaders. In all these roles, the "big", "round", "golden" radio voice of the past is now perceived as "contrived" and "false" and has been replaced by voices that sound "authentic" and "real". Some voice-over artists and radio announcers are employed to produce a standard, generic radio voices which are "deeper", "animated", "resonant" and "easy on the ear" with a good pace and intelligible articulation. These qualities, together with "downward inflections" are also desirable characteristics for newsreaders as they convey authority and credibility. For other radio performers, particularly voice-over artists "little imperfections" in voice and speech are acceptable, as they contribute to the "sincerity" and "distinctiveness" of the delivery.

Implications: A thorough understanding of a radio performer's role is necessary for vocal training and for appropriate diagnosis and treatment of voice problems in these individuals. These results will inform further quantitative analysis of radio voices, particularly in terms of the desirable auditory-perceptual characteristics in this population.

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Effects of Irritants on Acoustic Measures of Voice and Subsytems

Aim

To identify the long term effect of irritants (Ammonia, Hydrochloric acid and H_2SO_4) on voice quality and to identify the long term effect of irritants on subsystem function.

 Method

Forty three participants with age range of 35- 48years took part in the study. All the subjects were working in a latex factory and had a minimum experience of 10years with an exposure time of 8hrs/day in the factory. Control group consisted of 43 individuals with age range of 30years to 50years (mean age- 40.5years).

Four tasks were used, which include monolog, s/z ratio, and phonation duration of /a/, /i/, /u/ and reading meaningful words in VCV context for /a/, /i/ and /u/. Acoustic parameters such as Fo, SFF, jitter percent, shimmer dB and Harmonic to Noise Ratio were determined from the recorded sample using PRAAT software 5.1.22.

Results

Results were consistent with the previous studies. There was significant difference between the mean values ($p < 0.001$) for F0, SFF, Jitter, MPD and shimmer parameters when paired sample T test was conducted, there HNR and s/z ratio showed no significant difference between 2 groups ($p>0.05$).

Conclusion

This result clearly states that exposure to irritants for a longer time will result in vocal pathologies. Effects of irritants on voice can have significant impact on individual voice which in turn causes various pathologies in larynx and other sub system. This will have direct impact on occupation and social life. This data will help SLP s to provide good hygiene measures and to reduce exposure time to irritants

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Acoustic Analysis of Voice in Young Active and Passive Smokers-A Comparative Study

Background:

Vocal abuse can take many forms that are due to extreme use of voice or due to consumption of substance like alcohol and tobacco, which can cause damage to the vocal apparatus there by resulting in voice problems. One common form of abuse is smoking tobacco. Several studies have found change in the voice following smoking. The present study aims to compare of vocal parameters of young subjects aged 20-30 years Active & Passive smokers to the control group.

Method:

Fifteen subjects in each group were selected and all were screened not to have any history of speech and language impairment or neurological or psychiatric problem. Monologue and phonation duration of /a/, /i/, /u/ are recorded. Measures considered for acoustic analysis included F0, Jitter, Shimmer and HNR.

Result:

It also showed significant difference between active smokers and controlled group for MPD. The mean scores for jitter in active smokers was significantly different than the control group

Conclusion:

The presented study was an attempt to find out whether the non smoking group but who are exposed to the smoke has any major voice characteristic change due to that. Results have shown that even these groups are at risk as that of smokers. This may help in assessment and intervention of non smokers but who were exposed to smoking in work place, home etc who come up with voice complaints. The implications with respect to the effect of smoking in both professional and non professional voice users will be discussed

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Voice Characteristics of Radio Jockeys Before And After Broadcast Session

BACKGROUND

Radio jockeying is a relatively new profession in the field of media and RJs are totally dependent on their speech for their livelihood, and hence it is imperative for them to maintain their voice quality. Knowledge regarding Radio Jockey's awareness of strategies to maintain vocal health is yet to be understood in the Indian context. The present study aimed to compare the acoustic characteristics of Radio Jockeys before and after broadcast session.

METHODS

Twelve professional Radio Jockeys were asked to phonate sustained vowels /a/, /i/, /u/ in quiet condition and were recorded. Praat software (5.1.37 version) was used to extract voice related parameters. MPD, F_0, F_1, F_2, F_3, Jitter, Shimmer, Intensity, HNR were determined and compared between pre and post broadcast sessions.

RESULTS

Paired t-test was used for comparisons. When comparing male subjects, vowel /a/ showed significant difference in MPD and vowel /i/ showed significant difference in shimmer between pre and post broadcasting. In female subjects, vowel /i/ showed significant difference in F_1 and MPD and vowel /u/ showed significant difference in F_2 and MPD

CONCLUSION

The result from the present study reveals variations in certain acoustic characteristics of voice in radio jockeys, which can lead to hazardous effect on voice in future. This can be due to the reason that voice of the RJs has frequent pitch fluctuations during the broadcasting sessions. Present study strengthens the importance of counseling about vocal hygiene program in RJs and promotes research of voice disorders in this population. Using these results, a training module can be developed for RJs.

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Praat Norms for Indian Adolescent Voices

AIM:
To analyze and establish norms for acoustic measures of voice for PRAAT software in typically developing children, within the age range of 11 – 16 years.
METHODOLOGY:
Study group comprised 40 boys and 40 girls within the age range of 11 – 16 years. Inclusion criteria for subjects were, children with normal health and no vocal history and symptoms inferred through s/z ratio and MPD. Habitual pitch was analyzed on counting task. Sustained voice samples were recorded for vowels /a/, /i/, /u/ and phonemes /s/, /z/. Subsequently, MPD and s/z ratio was calculated. Middle portion of sustained /a/ voice sample was analyzed using PRAAT software for all the subjects to determine the various voice parameters.
RESULTS:
Results indicated an expected decreasing trend in Fo and SFo for both the groups. First group 10 – 11 year olds had a mean Fo of 265 Hz, 12 – 13 year olds 208, 14 year olds 195 Hz and 15 year olds 158 Hz. Same trends were seen in girls group, but with lesser degree of changes; 40 Hz in 10 – 11 years group to 50 Hz by 15 years. Similar trend was observed in parameters jitter and shimmer. It was clear from the data, that there were increased jitter and shimmer values at the age range of 10-11yr following lowered values at 11-12. Subsequently a sharp raise was observed for 12-13 and 13-14yrs for both the groups.
CONCLUSION:
From the present study it can be concluded that, the reduction in the Fo, observed pubertal changes and variations in the other parameters, followed normal developmental trends, thereby indicating the data can be implemented clinically as a normative for PRAAT software in Indian population.

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Vowels in adult Malayalam speakers using three dialects- acoustic study

Background

Within a language, there are dialects which consist of further variation in pronunciation (accent), sentence construction (syntax), and words used to name things (lexical). The present study aimed at to compare the acoustic characteristics of vowels in adult Malayalam speaking individuals with three different dialects namely, Kasargod, Ernakulam, Trivandrum used across Kerala state of India.

Method

Mean Fundamental frequency (F0), F1, F2, F3 and HNR at the acoustic vowel midpoint is reported. A total of 30 young adult participants within the age range of 20-30 years were taken. 10 adult males from each regional dialectical zone that is Kasargod, Ernakulam, Trivandrum. The vowels were recorded in three contexts that is Isolation, words and sentence.

Results

MANOVA was done to obtain significance values across all the parameters. Results revealed highly significant difference between all the 3 groups. These results indicate that the regional varieties of language are of most importance in the study of vowels. Significant differences were seen in F0 & F1 of 3 groups. This study strengthens the assumption that the variation in the different dialects is perceived in the vowels (Ainsworth etal1972).

Conclusion

Results revealed consistent variation due to region of origin, particularly with respect to the production of vowels mainly in Isolation, words and sentences. Dialects are one of the challenging aspects in the field of assessment Speech Language Pathology. This study provides an insight in the area of assessment. Further research can be focused on creating norms of acoustic characteristics of different speech sounds in various regional dialects.

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Acoustic analysis of the effects of sustained wakefulness on speech

Exposing healthy adults to extended periods of wakefulness is known to induce changes in psychomotor functioning [J. Sleep Res. 14, 21-27, 2005]. The effect on speech is less well understood. To date, no studies have examined the pitch and timing of neurologically healthy individuals over 24 hours of sustained wakefulness. Therefore, speech samples were systematically acquired (e.g., every four hours) from 18 healthy adults over 24 hours. Stimuli included automated and extemporaneous speech tasks, sustained vowel and a read passage. Measures of timing and frequency were derived acoustically using Praat and significant changes were observed on all tasks. The effect of fatigue on speech was found to be strongest just before dawn (after 22 hours). Specifically, total speech time, mean pause length, and total signal time all increased as a function of increasing levels of fatigue on the reading tasks; % pause and mean pause length decreased on the counting task; F4 variation decreased on the sustained vowel tasks /a:/; and alpha ratio increased on the extemporaneous speech tasks. These findings suggest that acoustic methodologies provide objective data on central nervous system functioning and that changes in speech production occur in healthy adults after just 24 hours of sustained wakefulness.

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Modified Voice Therapy for the Aging Voice: Single Case Study

Vocal fold atrophy can lead to a significant change in quality of life. Management includes voice therapy and vocal fold augmentation. Along with other techniques, vocal function exercises (VFE) as a voice therapy approach has reported to show significant improvement in these patients. This case study is about a 77 year old female with vocal fold atrophy who had difficulty demonstrating the VFE regimen. Voice therapy techniques were modified for this patient. Post therapy examination showed significant improvement in perceptual, objective, and self-perceptual analysis of voice. The modified version can be an option for those patients unable to follow the instructions of VFE.

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The Effects of Computerized Visual Feedback on the Production of Maximum Phonation Time

The purpose of this study was to investigate the impact of providing computerized visual feedback on the elicitation of maximum phonation time (MPT). Fifty-nine (59) normal voice subjects were randomly assigned to one of two groups:

(1) A no-feedback (NF-MPT) group provided with standard instructions for the elicitation of MPT;
(2) A visual-feedback (VF-MPT) group provided with computerized visual feedback regarding the duration of production and an estimated goal for MPT based upon the subjects vital capacity.

The study followed an A-B-A format in which standard MPT elicitation instructions were provided in the A phases vs. use of computerized visual feedback for the VF-MPT group in the B phase. Each subject was observed in three testing sessions (a one-week period between sessions).

Results indicated no significant difference in MPT between the NF and VF groups in the initial baseline phase (19.83 vs. 19.93 s), but significant differences between the groups in the Tx phase (19.57 vs. 24.08 s) and in the follow-up return to baseline phase (18.55 vs. 21.85 s). Results indicate that computerized visual feedback results in a significant and substantial increase in MPT (a difference on approx. 4.5 s between control and experimental groups in the Tx phase of the study), and that the benefits of visual feedback are maintained up to 1 week post-visual feedback. The positive implications of this study regarding the use of visual feedback for MPT elicitation in diagnostic testing as well as in therapy tasks such as Vocal Function Exercises will be discussed.

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Quantifying Singer's Perceptions of Reflux Symptoms

Laryngopharyngeal Reflux can be present in the absence of heartburn or lower esophageal symptoms (Spencer, 2006). Anecdotal clinical reports typically indicate that many singers experience voice related disturbances but are unaware that these disturbances may be the result of LPR disease. These symptoms tend to be different than those associated with the general population. From a retrospective analysis of the participants case histories who had visual evidence of LPR as evidenced by a high Reflux Finding Score (Belafsky, Postma, & Koufman, 2001) it became obvious that these singers were complaining most often of increased effort when singing, loss of vocal range, difficulty with producing soft sounds, vocal fatigue, a change in vocal quality, and hard tonal onset, which were not listed items on the Reflux Symptom Index (Belafsky, Postma, & Koufman, 2002) used to quantify reflux symptoms. The subtle tissue changes that occur in the larynx may result in noticeable changes in voice quality to the singer but not to the general population of occupational voice users. Therefore, the purpose of this study is to test the sensitivity of above-mentioned 6 items related to reflux symptoms in singers. Participants for this study included 60 male and female professional and nonprofessional singers from the greater Orlando area, ages 18 to 60. The discussion focuses on the benefit of implementing these 6 items into patient's case profiles in hopes that it will assist in identifying low-level changes before they become a more serious pathology and disturbance to a singer's vocal production.

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The development of communications professional journalists from television, radio and internet

Rede Record group is composed of a broadcast television, 24-hour channel news, radio, internet and Record International, broadcasted to more than 150 countries around the globe. The speech therapist acts in all areas of the station in Sao Paulo and coordinates speech therapy professionals whom work for Record in nine Brazilian states. The goal of this work is to develop communication of reporters, newscasters and presenters of entertainment according to aspects as quality and health of voice, articulation of speech sounds, modulation, intonation, communicative intent, psychodynamic parameters, etc. Regional accent is also worked because of Brazilian diversity of communication. Modern communication on media demands natural and spontaneous speech and the difficulty of some professionals is to transform the reading in regular speech. It is necessary to adapt communication professional for different type of media: broadcast television, radio and internet. The speech therapy visits may be weekly, each 15 days or monthly. The therapy is indicated to professionals based on: evaluation of the therapist after the appreciation of performance in video, request of editors or decided by own professional. The professional development of many reporters and newscasters depends on success of speech therapy. Each 15 days meetings with directors have been conducted as well as meetings with speech therapists from other states. These meetings have been held monthly by internet and once a year all speech therapist professionals have been brought together to discuss main cases and difficulties. The professional speech therapy work has been developed since 2005. During this period, the station became the second largest in the audience in Brazil. News programs have grown in quantity audience as well as professional communication quality and patterns have been changed.

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Vibrato training in Pop and Classical Singers

The vocal vibrato is considered one of the most important acoustic features to characterize the voice quality in singers. Vibrato can be acoustically described by the rate, extent and periodicity of frequency and amplitude modulations. Physiologically, the vibrato can be separated into two types of productions. The first relates to the rhythmic production of subglottic pressure pulses produced by abdominal muscles contractions to modulate the fundamental frequency (F0). The second type of vibrato is mediated through the larynx, in which the F0 modulation is mainly produced by the modulation of CT muscle activity. In this work a new method to train, correct, and develop vibrato in classical and pop singers is presented. The development of the vibrato is done through the rhythmic pulse subdivision or time unit during a vowel emission with constant "tempo" or speed. Subsequently, there is a variation in pulse speed, vowels and melody. In the final step, the trained vibrato is integrated into the repertoire. The vibrato production is done in a conscious directed way using abdominal and laryngeal muscle activity at the same time. The abdominal activity is decreased on the last stage of this method. During the training process the spectrography is used as a visual feedback, and the patient is encouraged to decrease the vocal intensity and increase the phonatory muscle relaxation through the "opened throat sensation". This method allows singers to produce a good vibrato, technically with rate, extent, and regularity inside the normal range.

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A Screening and Voice Improvement Program for
Future Music Educators, Singers, and Speech Language Pathologists

This poster board presentation will relate the process and results of the program designed, initiated, and currently operating at Saint Xavier University in Chicago. The program identifies undergraduate and graduate students who are at risk for voice problems, educates them, and improves their speaking voices.

This collaboration between the Departments of Music and Communication Sciences and Disorders resulted in a literature review, development of an appropriate screening tool, and a Voice Improvement Program. Graduate students in Communication Sciences and Disorders provide screenings under the supervision of a certified SLP. Screenings include a questionnaire, perceptual voice ratings, s/z ratio, and acoustic measures using Visi-Pitch IV (KayPENTAX) on sustained vowel /a/ measuring fundamental frequency (Fo), relative average perturbation (RAP), shimmer, noise to harmonic ratio (NHR), and voice turbulence index (VTI). Participants who exhibit atypical findings on two of the voice screening measures qualify for participation in the program.

Participants attend a one-hour group session weekly for six weeks focusing on vocal hygiene, exercises to eliminate vocal abuses, and information regarding hydration, environmental modifications, appropriate speaking pitch, breath support, resonation, and relaxation techniques. The program concludes with a re-administration of screening items and a written evaluation by the participants. Post program data for the January-March 2010 program will be available on this poster, as well as a summary of findings and implications for future research and clinical activities to support and improve the speaking habits of undergraduate and graduate level students of music and speech language pathology.

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The Role of Posture in Breath Support During Speaking Tasks

There are many factors that contribute to breath support. This study looked at the effect of body position and posture on speech breathing. Ten adults (five male, five female) with normal speech completed three types of tasks (breathing maneuvers, reading, and conversation) in two body positions (standing, seated) in three different postures (normal, slouch, and post-posture manipulation). Measures were obtained using respiratory inductive plethysmography (Respitrace, Ambulatory Monitoring, Inc., Ardsley, NY). The results indicated the (a) ribcage excursions in seated (17%) and standing (15%) body positions were greater than abdominal wall excursions (10% seated and 5% standing); (b) no statistically significant differences were found for overall lung volume measures when comparing slouch and normal postures, but ribcage excursions initated and terminated at a higher percent ribcage capacity for slouch (49% and 34%, respectively) than normal (47% and 29%), and abdominal excursions terminated at higher percent abdominal capacity for slouch (34%) than normal (29%); (c) average lung volume initiation and termination were found to be at a higher percent lung capacity pre-posture manipulation (56% and 41%, respectively) than post- posture manipulation (53% and 39%), but there was no change in the amount of lung volume excursion between the two groups. In addition, a comparison of rest and speech breathing indicated little to no effect of task on lung volume excursions. In conclusion, it was surprising what little effect position and posture had on speech breathing. The ramifications of these findings for voice therapy will be discussed.

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Advocating for Voice Therapy: Physician Practices

Voice therapy is effective in the treatment of dysphonia (Thomas & Stemple, 2007). Physicians have been encouraged to "advocate voice therapy for patients diagnosed with dysphonia" (Schwartz et al, 2009). Otolaryngologists' referral patterns for voice therapy are unknown. The aim of this study was to investigate otolaryngologists' decisions regarding the use of voice therapy in the treatment of non-malignant dysphonias.

Method: Members of the Georgia Society of Otolaryngology were requested to participate in an anonymous online survey. Response rate was 19% (N=51). Questions targeted voice therapy referral practices for six frequently occurring diagnoses causing dysphonia. Data were analyzed with a multivariate analysis of variance (MANOVA) and Tukey post hoc analyses using the PASW Statistics 18.0 Software.

Results: The majority of respondents always or frequently referred patients for voice therapy for a diagnosis of vocal fold nodules, muscle tension dysphonia, or presbyphonia. Patients with polyps, cysts, or unilateral vocal fold paralysis were more likely to be treated surgically. For both polyps and cysts, physicians with 11-20 years of experience referred to voice therapy significantly more often than those with over 20 years of experience ($p<.05$). Across all diagnoses, the most common reason given for not referring to voice therapy was patient disinterest. Respondents overwhelmingly (94%) indicated they spend time advocating for voice therapy.

Conclusions: The hoarseness guidelines recommend advocating for the use of voice therapy. While physicians in this survey indicated they do advocate for voice therapy with several diagnoses, poor patient adherence and patient disinterest impede the referral process.

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Effect of Spread and Severity of Tremor on the Efficacy of Botox Injections

Essential Voce Tremor (EVT) affects approximately .5 million Americans. It can be treated with laryngeal botulinum toxin injections. Approximately 70% of voice tremor patients benefit from botulinum toxin injections. Of those who improve, the degree of improvement is a variable. This variablility in outcome may be due in part to differences in the spread and severity of the tremor. The purpose of this study is to test the hypothesis that subjects who had more widespread and severe tremor would respond less to botulinum toxin injections of the thyroarytenoid muscle.

Subjects with Essential Voice Tremor were recruited from the laryngeal movement disorder clinic at the University of Iowa Hospital and Clinics Department of Otolaryngology. Before botulinum toxin injection, subjects were evaluated for tremor spread and severity. Eleven structures (of the respiratory, laryngeal, velopharyngeal, and oral subsystems) were rated on a 7 point scale for tremor severity. Oral and respiratory structures were assessed via clinical evaluation, laryngeal and pharyngeal structures via nasendoscopy.

Subjects' voices were also rated perceptually using a 7 point scale during production of a sustained /a/ and a standard paragraph. These perceptual ratings were repeated at 4 and 8 weeks after botulinum toxin injection. The V-RQOL was completed pre and post treatment as well.

Preliminary results (based on 4 subjects) indicate that severity and spread are not the only determinants of responsiveness to botox. However, this is an ongoing study, we expect to have data from an additional 6 subjects prior to the June presentation.

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Voice impact of prolonged reading task at two different intensity levels

The purpose of this study is to evaluate the impact on voice of both duration and intensity level of 2 hours of continuous oral reading. Fifty normophonic women undergo two sessions of voice loading in which the required intensity level of voice varied: 60-65 dB(A) for the first session, and 70-75 dB(A) for the second session. Serial voice quality objective data is obtained every 30 minutes during the oral reading tasks, by use of Multi-Dimensional Voice program (Average fundamental frequency (AvF0), Jitter percent (Jitt), Shimmer percent (Shim), Noise-to-Harmonic Ratio (NHR)). Serial measurements of maximum phonation time (MPT) and voice range are also carried out every 30 minutes of the oral reading tasks, by use of Kay Elemetrics Computerized Speech Lab.

Results indicate that AvF0, lowest frequency of voice range and softest output of phonation rise during prolonged oral reading. On the contrary, Jitt tends to decrease and Shim decreases significantly with the passage of time during the voice loading. NRH does not vary statistically. MPT decreases after the first 30 minutes but increases afterwards. AvF0 is the only parameter influenced by the required intensity of oral reading task: AvF0 is significantly higher in the 70-75 dB session compared to the 60-65 dB session. Evolution of the observed data with the passage of time can be interpreted as a vocal warm-up effect after the first 30 minutes of oral reading. Further temporal evolution of data can be interpreted as a normal adaptation to voice loading.

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Automatic Spectral/Cepstral Analyses for Classifying Normal and Dysphonic Voices

This study evaluated the effectiveness of a custom software application in differentiating between normal and dysphonic voices using a multi-parametric spectral/cepstral analysis procedure, which computed acoustic measures automatically after the input of a target signal. Digitized recordings of sustained vowels and connected speech from 32 speakers (16 normals and 16 treatment-seeking) were collected and analyzed. Four measures (cepstral peak prominence (CPP), standard deviation of CPP, low-high spectral ratio (L/H ratio or spectral tilt), and standard deviation of L/H ratio) were automatically computed (i.e., a one-step process after opening input signal). Both CPP and L/H ratio were significantly different between groups in both speaking conditions; the CPP sd was significantly different in continuous speech samples. Receiver operating characteristic (ROC) analyses demonstrated the highest degrees of sensitivity and specificity for the measures of CPP and CPP sd in differentiating dysphonic individuals from normal individuals. These results support previous research which has indicated that spectral and cepstral measures are valid and effective tools for differentiating normal and dysphonic voices.

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Glottal closed quotient measurements by electroglottograph validated through videokymography

There is evidence that high closed quotients (CQs) are a characteristic feature of certain types of robust male operatic voice production, a fact that makes an accurate estimate of CQ an important item in singing voice assessment. The non-invasive electroglottograph (EGG) signal offers a convenient measure of CQ in both studio and laboratory, provided that such measurements can be validated. This experiment compares CQ measurements made with EGG to those made with simultaneous videokymographic (VKG) recordings. Preliminary results show closed quotients of approximately 75% in both EGG and VKG signals in well-produced tones in the upper middle range. The implications of such CQs for vocal sound and vocal pedagogy are discussed.

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The Perception of Acoustic Interactions in Evaluating the Male *Passaggio*

Current pedagogic wisdom suggests that a stable larynx position (vocal tract length) is a necessary condition for effective range development and *passaggio* training for male western classical vocal timbre. A stable tube length and shape results in a characteristic harmonic/formant interaction, in which the second harmonic of the voice source passes through the first formant of the vocal tract of given vowels at predictable locations. This acoustic interaction—H2 passing through F1—has been identified (Miller 2008, Bozeman 2008) with what pedagogic literature calls "turning over" or vocal "cover." If this is the case, this event should be 1) perceivable to trained listeners (singers and voice teachers), and 2) identifiable by them as characteristic of favorable *passaggio* management. An initial pilot project was undertaken to test perception of the H2/F1 crossing locations with a group of undergraduate vocal pedagogy students and voice teachers, using the Madde voice synthesizer and formant settings characteristic of a bass baritone. The modal judgments of where the vocal "turnings" occurred were 1 to 4 semitones above the H2=F1 frequency match, a variance that may be a result of F1 bandwidth. Further refinements of the testing procedures, including the design and use of training modalities for the auditors, are planned and will be presented.

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Relations between total phonation time and body composition and physical activity parameters in student singers

Aim. Maximal phonation time (MPT) measurement is a simple method of vocal function assessment however it differs widely among healthy persons. Although it is assumed that singing training correlates with prolonged MPT there have been no studies examining in details its relation to physical capacity and anthropometric parameters in classic singers. Long phonation time known as long phrase among singers is important for performing many arias from Bach's, Wagner's, R.Strauss's and Mahler's operas

Methods. Fifty eight students of the vocal faculty were examined (16 M, 42F; mean age 22.7±3.6 yrs, 4.7±3.3 yrs of classic singing experience). In all students the MPT (vowel "a") was recorded in triplicate and the longest one was analyzed. Other measured parameters included body anthropometrics, body composition assessed with electric bioimpedance method (total body fat and body water), skinfold thickness, Harvard test of physical performance and self-reported physical activity level (International Physical Activity Questionnaire long form).

Results. Mean MPT was 22.4±6.3s. It was independent of age but men have longer MPT than women (26.9±6.3 vs 20.6±5.4s, p=0.001). MPT significantly correlated with total duration of professional singing (R=0.30, p=0,04), leisure moderate activity (r=0.29, p=0.03), active daily transportation activity (r=0.25, p<-0.05), body height (r=0.49, p=0.001), body mass (r=0.34, p=0.01), % body fat (r=-0.25, p=0.05), handgrip strength (r=0.45, p=0.001), the difference in thoracic circumference between maximal inspiration and maximal expiration thoracic circumference (r=0.33, p=0.02).

Conclusions. Not only singing experience but also the level of physical activity and capacity (healthy lifestyle) may influence the phonation time and therefore vocal quality.

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Fanning Physical and psychological benefits of Vocal Yoga (VY) therapy and training on first VY student-teachers

Objective: (VY) trains the body within and without to hold sound correctly while coordinating the corresponding organs and incorporates it into vocal strengthening asanas. Preventing vocal cord (VC) displacement, one of the major causes of vocal pain, hoarseness and nodules, is a primary focus in this study.

Method: (5)VY) studentS, 3M/2F, ages 32 to 50 completed a 65 hr. 4/prt. workshop and: 1 – filled VY form; 2 - read <u>Vocal Yoga VY</u> and tested to a 100% score. Then they received (VY) diaphragm development notebooks and (VY) Manual. *Part 1* photographed each open mouth with tongue placement pre and post yawn for file. *Part 2* taught 5 basic exercises of (VY). *Part 3* the (VY) practice integrated these movements into asanas with (VY) controls to resist (VC) displacement by the air pressure of the exhale.

Results: 1 out of 5 students had noted chronic larynx pain on VY form. All pain ceased within 12 hours of practice due to VY application. 4 out of 5 students wrote testimonials of their psychological experiences on vocalyogavy.com..

Conclusions: This preliminary study suggests that (VY) therapy may aid in vocal health and be useful for the prevention of vocal cord displacement and alleviation of larynx pain. At the psychic level all the students testified to an increase in energy, awareness and psychological releases of impact.

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Longitudinal and Transverse Elasticity of the Human Vocal Folds

Longitudinal and transverse elastic properties of human vocal folds are measured in *in vitro* experiments from cadaveric tissues. Elasticity of vocal fold is not only a key factor in the control of fundamental frequency of phonation, but also a major requirement for any vibration modeling of vocal folds. In particular, continuum models of the true and false vocal folds currently use canine elastic data and simplifying assumptions to fulfill their needs for elastic constants. This study aimed to quantify the transverse elasticity of human vocal folds and compare it to its longitudinal values. Samples were obtained from cadaveric human larynges that were snap frozen 48 hours postmortem and kept at -82 degrees and thawed overnight in saline solution. Once the sample was used in a longitudinal direction, two special brackets were glued to the side of each sample and the sample was mounted with brackets in the transverse direction. Using a slow cyclic stretch and release, stress-strain data of human vocal fold was obtained in the range of 0-40% strain based on *in situ* length. Results indicate that vocal fold transverse elasticity is nonlinear similar to its longitudinal counterpart, but its low strain Young's modulus is about 10 time smaller. The current study provides quantitative data for the longitudinal and transverse elastic properties of the human vocal fold tissue and indicates that nonlinear behavior and relative difference of these properties may lead to wide ranges of oscillation frequency and amplitude in human larynges. Work supported by NIDCD grant # DC009567.

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