

Changes in Vibrato Rate, Vibrato Extent, and Vibrato Jitter in Soprano Voices in Response to Changes in Mouth Opening: A Pilot Study

Objective: To determine the relationship between vibrato rate, vibrato extent, and vibrato jitter of the [a] and [o] vowels and the degree of mouth opening in soprano voices.

Methods: Using the vocal fry method described by Miller, formant frequencies of the [a] and [o] vowels were obtained from 13 collegiate sopranos. Subjects were then recorded as they sang 3 trials of sustaining the [a] vowel for 5 seconds “with their best classical production and habitual mouth opening” on A440. A sound level meter was used to track SPL during all recordings. This process was repeated using the [a] vowel with a narrow (1.5 cm) mouth opening at the mid-point of the mouth, and with a large (4 cm) mouth opening. The entire procedure was repeated using the [o] vowel. Formant frequencies, vibrato rate, vibrato extent, and vibrato jitter for each vowel and each singer were determined using VoceVista 3.4.3b.

Results: Paired sample t-tests indicate that in the majority of cases there was a minimal influence of mouth opening on vibrato extent, rate, and jitter. However, there was a significant difference in vibrato extent between the habitual and wider mouth openings for the [a] vowel. Testing of changes in intensity vibrato as a result of mouth opening variation is ongoing.

Conclusion: The effect that mouth opening has on the vibrato extent, rate, and jitter on these vowels in the soprano voice may be minimal, but further exploration of other voice types and vowels is warranted. This pilot study tested a protocol which can be applied to other voice types and vowels in the future.

Key words: vibrato, mouth opening, jitter, rate, amplitude, extent

Paul M. Patinka MM, Adjunct Faculty, Lone Star College-Montgomery, Graduate Student, University of Texas at San Antonio, San Antonio, Texas, USA, (607) 431-3077, paul.patinka@utsa.edu

John Nix MM, MME, Professor of Voice and Voice Pedagogy, University of Texas at San Antonio, San Antonio, Texas, USA, (210) 458-5678; john.nix@utsa.edu

Assessment of Vocal Fold Elongation by Diffusion Tensor Imaging

Objective: To analyze the diffusion direction and the fractional anisotropy (FA) of water molecules under different degrees of vocal fold elongation and discuss the value of the diffusion tensor imaging method in evaluating the effects of varying vocal fold tension.

Methods: Vocal folds were elongated to 0%, 10%, and 20% in each excised canine larynx. Images of all vocal fold samples under the different elongation degrees were collected using a Bruker BioSpec 9.4T animal MRI system, and the Diffusion Trace and FA were calculated for each sample. The results were compared using a one-way ANOVA to test for significance.

Results: In the lamina propria of the vocal folds, there was a significant difference in Diffusion Trace between the 0% and 20% elongation degrees ($P < 0.05$). There was no significant difference in Diffusion Trace between the 0% and 10%, and 10% and 20% elongation degrees ($P > 0.05$). There were significant differences in FA between all three elongation levels ($P < 0.05$).

Conclusion: The diffusion tensor imaging MR parameters are effective parameters to measure the structural changes of the vocal folds under different degrees of elongation.

Peiyun Zhuang, MD, MS, Professor, Dept. of Otolaryngology, Xiamen University, Zhongshan Hospital, No 201, Hubin South Road, Fujian, P.R. China, +861300398989,
peiyun_zhuang@yahoo.com

Jie Cai, MD, MS, student, jiecai_alex@163.com

Liu Ting, PhD, Professor

Effect of Ventricular Folds on Vocalization Fundamental Frequency in Domestic Pigs (*Sus scrofa domesticus*)

This study investigates the effect of the ventricular folds on fundamental frequency (f_o) in the voice production of domestic pigs (*Sus scrofa domesticus*). The larynges of six subadult pigs were phonated *ex vivo* in two preparation stages, with the ventricular folds present (PS1) and removed (PS2). Vocal fold resonances were tested with a laser vibrometer, and a four-mass computational model was created. Highly significant f_o differences were found between PS1 and PS2 (means at 93.7 Hz and 409.3 Hz, respectively). Two tissue resonances were found at 115 Hz and 250–290 Hz. The computational model had unique solutions for abducted and adducted ventricular folds at about 150 Hz and 400 Hz, roughly matching the f_o measured *ex vivo* for PS1 and PS2. The differing f_o encountered across preparation stages PS1 and PS2 is explained by distinct activation of either a high or a low eigenfrequency mode, depending on the engagement of the ventricular folds. The inability of the investigated larynges to vibrate at frequencies below 250 Hz in PS2 suggests that *in vivo* low-frequency calls of domestic pigs (pre-eminently grunts) are likely produced with engaged ventricular folds. Allometric comparison suggests that the special “double oscillator” has evolved to prevent signaling disadvantages.

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Christian T. Herbst, Mag. art., Ph.D., Affiliated post-doctoral researcher, Bioacoustics Laboratory, Department of Cognitive Biology, University of Vienna, Althanstrasse 14, 1090, Vienna, Austria, +43 660 6675792, herbst@ccrma.stanford.edu

Takeshi Nishimura, PhD, Associate Professor, Primate Research Institute, Kyoto University, Inuyama, Aichi 484-8506, Japan, +81-568-63-0534, nishimura.takeshi.2r@kyoto-u.ac.jp

Maxime Garcia, PhD, Post-doctoral researcher, Department of Evolutionary Biology and Environmental Studies, University of Zurich, Winterthurerstrasse 190, 8057 Zurich, Switzerland, +33 782 251 290, maxime.garcia@gmail.com

Kishin Migimatsu, Student. Department of Mechanical Engineering, Ritsumeikan University, Noji-higashi, Kusatsu, Shiga 525-8577, Japan, +81-77-561-2832, rm0054ih@yahoo.co.jp

Isao Tokuda, PhD, Professor, Department of Mechanical Engineering, Ritsumeikan University, Noji-higashi, Kusatsu, Shiga 525-8577, Japan, +81-77-561-2832, isao@fc.ritsumei.ac.jp

Comparing Manufacturers and Measured Response Curves for Studio Microphones

Voice quality is regarded as a prime factor in commercial recordings, but it is obviously influenced by the response curve of the recording microphone. Here we explored the agreement between the response curves provided by the manufacturers with those measured. A female singer, professionally performing in the pop music style, sang an 87 sec long excerpt of a song fifteen times in a professional recording studio. The song was simultaneously picked up by six studio microphones typically used for recording singing plus a measurement microphone as reference (Earthworks SR30). The microphones were placed in two arrangements. One of the microphone arrangements was used in two distances from the singer. The 105 recordings (7 microphones, 5 takes, 2 arrangements, one of which was used in two distances) thus obtained were analyzed in terms of long-term-average spectra (LTAS) with a 1024 point FFT, frequency range 150 Hz – 20 000 Hz. The standard deviation for the mean of the 15 LTAS recorded with the reference microphone was 1.3 dB. This shows that the singer accurately replicated her performance of the song. For each microphone, all 15 LTAS curves were averaged and subtracted from the corresponding average of the reference microphone. The difference thus obtained showed the true frequency curves of the tested studio microphones. In some cases and at some frequencies these curves deviated between +5 and -7dB from the manufacturer's response curves. The results indicate that microphone response curves provided by manufacturers may have a limited accuracy, confirming that careful listening to the voice quality obtained with a given microphone should be decisive.

Katri A Keskinen, Master of Music, Voice teacher, Sibelius Academy, University of the Arts, Helsinki, Finland, +358503263326, katriakeskinen@gmail.com

Olli Erik Keskinen, Bachelor of Music, Audio DSP Engineer, Sibelius Academy, University of the Arts, Helsinki, Finland, +358505371177, olli@oeksound.com

Johan Sundberg, PhD, Department of Speech Music Hearing, School of Electrical Engineering and Computer Science, KTH, Stockholm and University College of Music Education Stockholm, +4687907873, jsu@kth.se

Johan Stark, researcher, Department of Linguistics, Stockholm University, +468162330, johan.stark@ling.su.se

Peter Branderud, researcher, Department of Linguistics, Stockholm University, +468161248, peter.branderud@gmail.com

Cricoid – Thyroid – Approximation in Gender-Dysphoria (Transwomen) with Type A Cricothyroid Joint: An Outcome Study

Objective: Cricoid-Thyroid-Approximation (CTA) is a well-known surgical technique to elevate the pitch in Transwomen. The type of the Cricothyroid Joint (CTJ) directly influences the outcome of the pitch elevation which type A having the best outcome. Aim of this study was to analyse the stability of the pitch level of type A CTJ over a long period.

Methods/design: Between 2009 and 2018, 22 patients were treated with a CTA. In order to evaluate the CTJ type (type A vs type B/C) a pre- and postoperative HRCT scan was performed in all patients. Preoperatively, all patients underwent speech therapy. Middle speaking level (MSL) was measured before and after speech therapy, and, in addition, pre- and postoperatively (2 days, 30 days, 6 months and annually post-op).

Results: The mean of the MSLs before speech therapy was 117Hz (100-130Hz, SD 8Hz), 134Hz (110-160Hz, SD 13Hz) preoperatively, 206Hz (160-360Hz, SD 40Hz) postoperatively (2d, 30d, 6 month, 1 year), after 2years and 5 years in mean 210Hz (190-240Hz). In 21/22 patients a postoperative speech therapy was performed over 6 sessions.

Conclusions: This is the first study to analyse the outcome in the pitch level after CTA surgery in type A CTJ larynges over a long period. Our data shows that the outcome of type A CTJ is stable over a long period.

Claudio Storck, MD, Assistant Professor, Head of Laryngology and Phoniatics, University Hospital Basel, ENT - Dept., Petersgraben 4, 4031 Basel, Switzerland, +41-61-265-41-31, claudio.storck@usb.ch

Jan Thommen, MD, University Hospital Basel, ENT - Dept., Petersgraben 4, 4031 Basel, Switzerland, +41-61-265-25-25, jan.thommen@unibas.ch

Flurin Honegger, PhD, University Hospital Basel, ENT - Dept., Petersgraben 4, 4031 Basel, Switzerland, +41-61-265-25-25, flurin.honegger@usb.ch

Fabian Unteregger, MD, Graduate, Comedian Artist, University Hospital Basel, ENT - Dept., Petersgraben 4, 4031 Basel, Switzerland, +41-61-265-25-25, Fabian@unteregger.net

An Old Myth: The Prediction of the Correct Singing Register! True or Not?

Objective: It is an old myth to predict the correct singing register based on the laryngoscopy. Short vocal folds (VF) are typical for sopranos, long VFs are typical for altos. It is obvious, that physical measureable parameters influence the voice range. Aim of this study was to analyse different anatomical parameters between professional sopranos and altos and to find out, if a multivariate measurement of anatomical parameters can predict the singing register.

Methods/design: We examined 49 professional female singers (25 sopranos, 24 altos). HRCT scan was performed during singing of F0, in each singer. DICOM scan data were rendered and 3D-visualized using the software MIMICS®. In all singers, we measured the length of the VF and of the glottis and the distance of the anterior commissure orthogonally to the vertebral spine and the antero-posterior distance of the trachea 1cm and 2cm below the glottis. In addition, the length and the volume of the resonance space was measured.

Results: In all singers, we could measure all data. VFs were measured 17.4mm (S) and 18.5mm (A), The glottis was 17.7mm (S) and 18.8mm (A), distance anterior Commissure to vertebral spine was 28.4mm (S) and 30.0mm (A), the subglottic diameter 1cm below the glottis was 16.6mm(S) and 16.8mm (A) and 2cm below the glottis 15.0mm (S) and 14.5 (A). Logistic regression analysis yields positive predictive values of 79.3% for sopranos and 70% for altos respectively.

Conclusions: There are anatomical differences between sopranos and altos. The positive predictive value for sopranos is relatively good. With the knowledge of our study, it should be discussed to perform a HRCT scan before starting a professional career in the soprano register.

Chantal Rast, MD, University Hospital Basel, ENT - Dept., Petersgraben 4, 4031 Basel, Switzerland, +41-61-265-25-25, chantal.rast@usb.ch

Fabian Unteregger, MD, Graduate, Comedian Artist, University Hospital Basel, ENT - Dept., Petersgraben 4, 4031 Basel, Switzerland, +41-61-265-25-25, Fabian@unteregger.net

Salome Zwicky, MD, Otolaryngologist and Phoniatician, Orschlieren and Zurich , University of the Arts, Dep. for Music, Uitikonerstrasse 8, 8952 Schlieren, Switzerland, +41447323010, zwicky@orlschlieren.ch

Flurin Honegger, PhD, University Hospital Basel, ENT - Dept., Petersgraben 4, 4031 Basel, Switzerland, +41-61-265-25-25, flurin.honegger@usb.ch

Claudio Storck, MD, Assistant Professor, Head of Laryngology and Phoniatics, University Hospital Basel, ENT - Dept., Petersgraben 4, 4031 Basel, Switzerland, +41-61-265-41-31, claudio.storck@usb.ch

Is Nasalance Frequently Used for Voice Stabilisation during the Tenors' Passaggio

Objects

The passaggio of untrained voices is characterized by sudden pitch jumps due to nonlinear properties of the phonatory system. Professional tenors are able to stabilize vocal fold oscillations during the passaggio. However, the mechanisms for stabilisation are not clarified, yet. In a study by Sundberg et al., it was shown that increased nasalance could stabilize the voice within the passaggio. The present study aims to analyze if nasalance is frequently used for stabilisation of vocal fold oscillations during the passaggio.

Material and Methods

In this prospective study eight vocally healthy professional tenors were asked to perform pitch glides from A3 (fo 220Hz) to A4 (fo 440Hz) on the vowel /i/ 1) with a register shift from modal to falsetto and 2) from modal with continuation to the stage voice above the passaggio (SVaP). During the experiment transnasal highspeed videoendoscopy (HSV, 20.000fps) with simultaneous electroglottography (EGG), audio, accelerometer, oral and nasal flow signals were simultaneously recorded. As in previous studies, detection of EGG derived sample entropy was used to verify greatest instability during the transition.

Results and Conclusion.

For almost all voices the transition to SVaP showed greater vocal fold oscillatory stability than the transition to falsetto. However, only a minority increased nasalance during the passaggio for the modal to SVaP task. In some other subjects there was a greater supraglottic compression visible during the passaggio. As a consequence, it seems that nasalance is only used in some of the subjects in order to stabilize vocal function during the passaggio.

Matthias Echternach, MD, Provisional Head of the Division of Phoniatics and Pediatric Audiology, Department of Otorhinolaryngology, Munich University Hospital (LMU), Campus Großhadern,, Marchioninistraße 15, 81377 Munich, Germany, +49 (89) 44 00 7 38 61, Fax: +49 (89) 44 00 7 86 85, matthias.echternach@med.uni-muenchen.de

Marie Köberlein, marie.koeberlein@uniklinik-freiburg.de

Michael Döllinger, PhD, Professor, University Hospital Erlangen, Medical School, Dept. of Otorhinolaryngology – Head and Neck Surgery, Dept. of Phoniatics and Pediatric Audiology, Bohlenplatz 21, 91054 Erlangen, +491318533814, michael.doellinger@uk-erlangen.de

Bernhard Richter, MD, Institute of Musicians' Medicine, Freiburg University Medical Center, Breisacher Str. 60, 79106 Freiburg, Germany, +4976127061610, bernhard.richter@uniklinik-freiburg.de

Pitch-Synchronous Analysis of Singing Voice

Objective: To develop a universally applicable and high-precision software capable of analyzing singing voice, especially for the timbre spectrum and the energy evolution in each pitch period. Although a number of software packages are available either commercially or as open-access packages, those are based on a pitch-asynchronous analysis method. Pitch information and timbre information are mixed; thus accuracy is not high. By completely separating pitch information and timbre information, timbre spectrum and the power evolution in each pitch period can be obtained and displayed accurately.

Methods: As it is well known, a voiced section of human voice is a superposition of a sequence of elementary waves, each such elementary wave is triggered by a glottal closing event. This fact is formulated as the hand-clapping analogy of Robert Sataloff and the water-hammer analogy of Ronald Baken. Using a theorem in Fourier analysis, we show that those elementary waves can be extracted from a continuous stream of voice signal. After implementing an ends-matching procedure, those elementary waves are Fourier-analyzed to generate accurate timbre spectra. The power evolution of the signal in each pitch period can also be obtained to provide information about the effect of glottal opening and glottal closing. For systems with accompanying electroglottograph (EGG) signals, the EGG signals provide a reliable basis for pitch-synchronous segmentation. For singing signals without accompanying EGG signals, the glottal closure moments are extracted from the voice signal.

Results: The pitch-synchronous software for analyzing standard speech signals for the speech technology was already demonstrated. We have tested an improved version of the software on a number of samples of recorded singing voice with EGG signals and received high accuracy timbre spectrum as well as the temporal evolution of voice energy within each pitch period. We also tried on voice signals without accompanying EGG signals and demonstrated good accuracy, especially some pieces of voice recordings from Luciano Pavarotti. Therefore, the software may also be used also for studying archived singing recordings.

Conclusions: Pitch-synchronous analysis of singing signals can provide more accurate information on timbre spectrum and the evolution of voice power within each pitch period, which is a better alternative to the currently available voice analysis software packages (based on pitch-asynchronous methods). We are working hard to provide a software package for the analysis of singing voice available to all research communities.

C. Julian Chen, PhD, Adjunct Professor and Senior Research Scientist, Department of Applied Physics and Applied Mathematics, Columbia University, 500 West 120th Street, New York, NY 10027, USA, (212) 854-8027, jcc2161@columbia.edu

Relationship Between Manipulation Of Specific Parameters Of Laryngeal Function And Acoustic Voice Characteristics In Vocally Healthy Speakers

Objectives: This study examined the effects of manipulation of specific parameters of the larynx and vocal tract on acoustic voice measures.

Study design: Within-subject, experimental study

Methods: Eleven vocally healthy speakers (age range 19-36 years) read the vowel /a/ and Rainbow Passage in eight laryngeal configurations that involved laryngeal constriction (CON) and release of constriction (ROC) of false vocal fold activity (FVFA), thick and thin true vocal fold mass (TVFM), and normal and low larynx height (LH). Voice data were analysed for fundamental frequency (f0), smoothed cepstral peak prominence (CPPS), and harmonics-to-noise ratio (HNR).

Results: Significant effects of FVFA were observed for vowel CPPS [$F(1,10) = 21.399$, $p = 0.001$, partial $\eta^2 = 0.682$] and connected speech CPPS [$F(1,10) = 61.949$, $p < 0.001$, partial $\eta^2 = 0.861$]; in both tasks CPPS was lower in CONS than in ROC. There was also significant effect of FVFA on HNR [$F(1,10) = 71.882$, $p < 0.001$, partial $\eta^2 = 0.878$] with this measure being lower in CONS (8.7 dB) than in ROC (22.6 dB). There was significant effect of TVFM on vowel CPPS [$F(1,10) = 54.151$, $p < 0.001$, partial $\eta^2 = 0.844$] and connected speech CPPS [$F(1,10) = 74.997$, $p < 0.001$, partial $\eta^2 = 0.882$]; in both tasks CPPS was higher in thick than in thin vocal folds. Larynx height did not have any significant effect on CPPS and HNR but it affected f0 in both tasks; low LH had lower f0 than normal LH. Other configurations had no significant effect on f0. However, there was a trend for f0 to be lower in CONS than in ROC and in thick than in thin vocal folds.

Conclusion: Manipulation of larynx and vocal tract parameters results in measurable acoustic changes in f0 and voice quality.

Catherine Madill, PhD, BAppSc., CPSP, Senior Lecturer, Speech Pathology, Faculty of Health Sciences, Doctor Liang Voice Program, Voice Research Laboratory, University of Sydney, 75 East Street, Lidcombe, NSW2141, Australia, +61293519692, cate.madill@sydney.edu.au

Acoustic and Perceptual Correlates of Reduced Vibratory Capability of the Vocal Folds

Objective: To study the correlation between reduced vibratory capability of the vocal folds and acoustic and perceptual data, such as characterization of spectrograms, Soft Phonation Index, Voice turbulence Index, ADSV parameters and GRBAS scale.

Methods: This retrospective study is based on preliminary data from a pilot study. 60 patients (XX females and XX males) that demonstrated reduced bilateral vibratory capability of the vocal folds of varying severities on a stroboscopic exam were included in the study. The randomized sample contained laryngeal diagnoses of bilateral scar and chronic or acute laryngitis (ulcerative, fungal, bacterial). Stroboscopic exams were evaluated by 3 blinded laryngologists; severity of vibratory impairment was rated using a VAS scale. The blinded voice recordings were analyzed perceptually (GRBAS) and the noise component of the spectrograms was rated by 2 blinded voice pathologists using a VAS scale. The following parameters were also evaluated: Cepstral Peak Prominence (CPP), Low/High (L/H) ratio, Voice Turbulence Index (VTI) and Soft Phonation Index (SPI). The voice samples included a sustained /a/ vowel and “The Rainbow Passage”.

Results: The inter-rater reliability of the stroboscopy vibratory capability of the vocal folds and of the spectrogram of a vowel will be examined using paired differences between each pair of readers using sign tests. The mean of the 3 readers will be used to look for associations with the other variables. The difference between the mean vibratory capability of the vocal folds and the spectrogram of a vowel, the CPP, L/H ratio, SPI and VTI will each be examined separately using a sign test of the paired differences. The difference between the mean vibratory capability of the vocal folds and the 5 GRBAS scores will be examined using Kruskal-Wallis tests.

Conclusions: This study aims to show the correlation between reduced vibratory capability and specific acoustic data, and to find an acoustical parameter that correlates best with the degree of noise found in the narrow band spectrogram.

Juliana Codino, MS, CCC-SLP, PhD Candidate, Lakeshore Professional Voice Center, (305) 301-5731, julianacodino@gmail.com

Anthony Howard, DO, Otolaryngology, Michigan

Austin Collum, CCC-SLP, MA, BA Mus, Clinical Fellow Speech Language Pathologist and Singing Voice Specialist, (256) 702-3672, jaustincollum@gmail.com

Adam Rubin, MD, Laryngologist, Director of Lakeshore Professional Voice Center, Department of Surgery, Oakland University. William Beaumont School of Medicine, Detroit, Michigan; and the Department of Otolaryngology, (248) 798-8720, rubinad1968@gmail.com

Longitudinal Variation in Solo Singing Tuning Accuracy in English Cathedral Girl Choristers

We have been recording girl choristers at Wells Cathedral in Somerset, UK at approximately six month intervals for many years, where the English Cathedral tradition of regularly sung services is a centuries-old tradition maintained to this day. A considerable amount of longitudinal data has been recorded for a number of individual choristers during their time singing in the choir. The data are stereo recordings of speech pressure (microphone) and electrolaryngograph signals for a series of spoken and sung tokens including a read passage, VCV (vowel-consonant-vowel) tokens, a sung scale and a short sung piece of music. In this paper, we report on longitudinal variation in tuning in their recordings of a short piece of music which is either the first verse of the carol 'This is the truth sent from above' or for younger choristers, the nursery rhyme 'Baa baa black sheep'. The average fundamental frequency on a note-by-note basis is measured and compared against equal tempered tuning on a longitudinal basis in order to evaluate overall tuning accuracy and improvements are noted over time.

David M. Howard, FEng, PhD, BSc, Head of Dept., Dept. of Electronic Engineering, Royal Holloway, University of London, +447766232928, david.howard@rhul.ac.uk

Graham F Welch, UCL Institute of Education, London, UK, graham.welch@ucl.ac.uk

Evangelos Himonides, UCL Institute of Education, London, UK, e.himonides@ioe.ac.uk

A New Singing Performance Controller for the Vocal Tract Organ

The Vocal Tract Organ (Journal of Voice, <http://dx.doi.org/10.1016/j.jvoice.2017.09.014>) is a musical instrument consisting of 3-D printed vocal tracts placed atop loudspeakers to which synthesised larynx acoustic output stimuli are input. In the original version of the instrument, these stimuli were originally output from either a music keyboard controlling a Pure Data synthesis system or a Arduino-based hand-held controller. This work greatly improves both the sound output quality and degree of fine control available from the initial Arduino-based hand-held controller as it makes use of a central processor that has both a faster clock speed and greater bit width. This enables far finer variation in user control of fundamental frequency enabling far more subtle regulation of both tuning and vibrato. In addition, there is provision for larynx waveform shape variation enabling voice source quality modifications to be made. The controller is tested with Royal Holloway student choral scholars in performances in which they sing the vocalise line and then repeat the piece using hand-controlled Vocal Tract Organs. Direct comparisons are made between their fundamental frequency outputs in each case.

David Howard, FEng, PhD, Professor of Electronic Engineering, Royal Holloway University, University of London, +441784443655, david.howard@rhul.ac.uk

Voice Source and Vocal Fold Vibration in Flow Phonation

Background: Phonation type can be varied within wide limits by changing the combination of glottal adduction and subglottal pressure. This represents an important aspect of voice production from a clinical point of view.

Objective: To examine flow phonation characteristics with regard to vocal fold vibration and voice source properties in vocally healthy adults using multimodality voice measurements.

Methods: Vocal fold vibration, airflow, audio, electroglottograph signal and subglottal pressure were simultaneously recorded in 12 untrained voices (6 female and 6 male). They repeated the syllable /pae/ (1-2 per second) using breathy phonation, neutral phonation, flow phonation and pressed phonation with neutral and loud voice. Glottal vibration was captured by high-speed imaging equipment; glottal flow was derived from inverse filtering the airflow or the audio signal; and subglottal pressure was measured as the intraoral pressure during /p/-occlusion. The inverse filtered flow signal, derived from a Rothenberg flow mask attached to a Glottal Enterprises MSF-1 unit, was presented in real time to the subjects as a visual feedback of the phonation type.

Results: The results will elucidate on various vibrational characteristics that underlie different flow glottogram parameters.

Johan Sundberg, Department of Speech, Music & Hearing, School of Electrical Engineering and Computer Science, KTH, Royal Institute of Technology, Lindstedtsv. 24, SE-10044, +4687907873, jsu@kth.se

Rita R. Patel, PhD, CCC-SLP, Associate Professor, Indiana University, Dept. of Speech & Hearing Sciences, 200 S. Jordan Avenue, Bloomington, IN 47405-7002, (812) 855-3886, patelrir@indiana.edu

Brian Gill, DMA, MM, BM, Associate Professor, Indiana University, brpgill@iu.edu

M. Filipa La, BSci, MMus, PhD, Associate Professor, Institute of Interdisciplinary Research, University of Coimbra, Portugal Address: Casa Costa Alemão - Pólo II, Rua Dom Francisco de Lemos, 3030-789 COIMBRA, PORTUGAL, +351 239 247 800, filipa.la@uc.pt

The Effect of Unilateral Hearing Protection on Vocal Intensity with Varying Degrees of Background Noise

Introduction:

The Lombard effect (LE) is a phenomenon in which speakers adjust their vocal production by raising the volume in noisy environments. As a result, the LE can create problems of vocal strain, fatigue and potential injury.

Objectives:

This study aims to examine the difference in vocal intensity output in subjects wearing unilateral hearing protection versus no hearing protection in the presence of background noise.

Methods:

We will examine the effect of unilateral occlusion of the auditory feedback loop on vocal intensity at varying levels of freefield background noise. Subjects will be seated inside a sound booth wearing a head-mounted microphone. Participants will be asked to read an excerpt from “The Rainbow Passage” while various levels of background noise is played: 50, 60, 70 and 80 dB (Multi-talk Babble). Each noise level will be played while the subject is with and without unilateral ear protection (Optime 98 Earmuff (3M)). This reduces noise by 25 dB. The conditions will be presented in a random order for each participant. After each reading of the text, subjects will be asked to answer questions about disturbance and discomfort during talking.

Results:

Preliminary analysis shows that the LE, reflected as the slope of the increase in the voice level when the background noise is increased, was not influenced by the presence of the earplug. The LE for both conditions (with and without earplug) was 0.29 dB/dB. However, when the participant was wearing the earplug there was decrease in the voice intensity of 3.9 dB, constant in all the conditions.

Conclusions:

Initial results suggest that unilateral hearing protection decreases vocal intensity while not affecting the magnitude of the LE. We intend to increase our sample size to achieve adequate power for the study.

Juliana Codino, M.S., CCC-SLP, Ph.D. Candidate, CCC-SLP, Lakeshore Professional Voice Center, St. Clair Shores, Michigan, jcodino@lakeshoreent.com

Pasquale Bottalico, PhD, Assistant Professor Department of Speech and Hearing Science. University of Illinois, Urbana-Champaign,

Austin Collum, M.A., CCC-SLP, The Center for Voice Care and Swallowing Disorders, Orlando, Florida,

Anya Costeloe, DO, ENT Resident Ascension Macomb-Oakland Hospital, Michigan, anyacosteloe@gmail.com

Michael M. Johns, III, MD, Director - USC Voice Center, 1540 Alcazar Street, Suite 204M, Univ. of Southern California, Los Angeles, CA 90033, (404) 686-7797, michael.johns@med.usc.edu

Adam Rubin, M.D., Director Lakeshore Professional Voice Center. Department of Surgery, St. Clair Shores, Michigan; Oakland University William Beaumont School of Medicine, Rochester, Michigan; Department of Surgery, Michigan State University, College of Osteopathic Medicine

Seeing Voice: Visualization of Vocal Tract Shaping with Magnetic Resonance Imaging (MRI)

Summary: Objective/Hypothesis. The vocal instrument is unique. Singers play a hidden, biological instrument and rely on secondary (proprioceptive, aural) feedback for knowledge of results. Voice pedagogy as a field has been evolving to train singers in an increasingly fact-based framework, incorporating direct knowledge of the vocal instrument's structure and function. The development of vocal tract models built on actual physiological measures has pedagogical implications for the training of singers.

Study Design. In this feasibility study design we develop and evaluate two rapid 3Tesla-MRI protocols for vocal tract visualization. The first protocol enables imaging the full vocal tract with high spatial resolution in a short scan time (15 sec), and the second protocol enables rapid single slice dynamic imaging of vocal tract shaping (at a frame rate of ~55 frames per second).

Methods. A professional voice user was recruited to participate in the study. MRI studies were conducted on a GE 3T scanner (equipped with high performance gradients) at the University of Iowa in accordance with the institutional review board. To evaluate the acceleration capabilities of different commercial coils as applicable to vocal tract imaging, imaging was performed with three different coil arrays (32 channel head coil, 16 channel head and neck, 16 channel flex coil). For rapid 3D imaging, a fast 3D gradient echo sequence was implemented (3D GRE; flip angle: 5 degrees; FOV:24x24x12cm³; spatial resolution: 2x2x2 mm³ isotropic resolution; TR=3.5 ms TE=1.0 ms ; parallel imaging x2; scan duration=15 sec). Four sung vowels were sustained during each scan with reasonable natural effort. For 2D dynamic imaging, a fast short readout spiral gradient echo sequence was implemented (21 interleaves; readout length =1.8 ms; TR =6.2 ms; FOV = 20x20 cm²; spatial resolution: 2.4x2.4 mm² frame rate: 55 frames per second after a view sharing reconstruction). With this sequence, snippets of running speech and singing samples were acquired. Image quality (SNR) was evaluated and compared amongst the three coils. Image quality was also assessed empirically for blurring between air tissue interfaces. Four selected vowel scans were converted into 3D models that will be shared under a creative commons license. Models were printed at Royal Holloway, University of London

Results. The head and neck coil produced images with good sensitivity and minimal g-factor losses compared to the head only and flex coils. The 3D sequence enabled rapid imaging of the various vocal tract postures while the subject was sustaining sounds with minimal natural effort. The 2D dynamic sequence enabled robust characterization of vocal tract dynamics with minimal blurring between air-tissue interfaces

Conclusion. High quality MR vocal tract imaging of singing tasks is possible with rapid MRI sequences that exploits acceleration capabilities with the head and neck coils, and also spiral sampling. The construction and 3D printing of vocal tract models based on MRI scans is feasible.

David Meyer, DM, Director, Janette Ogg Voice Research Center; Associate Professor, Shenandoah Conservatory, 1460 University Drive Winchester, VA 22601; (540) 665-4544, dmeyer2@su.edu

Sajan Goud Lingala, PhD, Assistant Professor, Department of Biomedical Engineering, 5609 Seamans Center, University of Iowa, Iowa City, IA 52242, (319) 467-0320, sajangoud-lingala@uiowa.edu

David M. Howard, FEng, PhD, BSc, Head of Dept., Dept. of Electronic Engineering, Royal Holloway, University of London , +447766232928 , david.howard@rhul.ac.uk

Calibration Method for Laser-Projection Transnasal Flexible High-Speed Videoendoscopy

Objective: An automated method for calibrating a laser-projection transnasal flexible high-speed videoendoscopy (HSV) system was developed. The optical principle employed is to project a grid of spots across the field of view (FOV) at an angle relative to the imaging axis, such that (after calibration) each laser spot position within the FOV encodes distance to the tissue. The calibration method compensates for variations in camera rotation, in position of the FOV within a frame (the endoscopic image does not fill the whole frame), and in distance between the target and the tip of the endoscope. A parametric design is used for compatibility with different makes of laser-projection endoscopes.

Method: A transnasal flexible endoscope was used to project a grid of 7x7 green laser spots on FOV and the images were recorded using a color HSV system. The position of the FOV within the image frame can vary between endoscopes and each time the endoscope is mounted on a camera. First, statistical image processing and pattern recognition were used to detect the FOV, the center of FOV, and the fiducial marker. This step normalizes frames to a standard coordinate system. Second, a calibration protocol was developed for learning the trajectories of all laser spots and then the learned trajectories were added to the parametric design. This step used a gradient-based approach for automatic detection of laser spots in the images. Finally, a set of experiments was conducted to measure the accuracy and reliability of every step of the procedure.

Results: The results from the experiments demonstrate that the parametric design effectively handles the variabilities in the recordings. Furthermore, the distance to the tip of the endoscope was successfully estimated.

Conclusion: The proposed parametric design has resolved one of the biggest challenges toward achieving calibrated measurements and 3-D reconstruction of vocal-fold kinematics.

Hamzeh Ghasemzadeh, MSc, PhD student in Department of Communicative Sciences and Disorders, Michigan State University; PhD Student in Computational Mathematics Science and Engineering, Michigan State University, (517) 353-8780, ghasemza@msu.edu

David S. Ford, MS, PhD student in Department of Communicative Sciences and Disorders, Michigan State University, (517) 353-8780, forddav5@msu.edu

Dimitar D. Deliyski, PhD, Professor and Chair, Department of Communicative Sciences and Disorders, Michigan State University, (517) 353-8780, ddd@msu.edu

James B. Kobler, PhD, Department of Surgery, Harvard Medical School; Division of Laryngeal Surgery, Massachusetts General Hospital, James.Kobler@mgh.harvard.edu

Robert E. Hillman, PhD, Professor, Department of Surgery, Massachusetts General Hospital and Harvard Medical School hillman.robert@mgh.harvard.edu

Daryush D. Mehta, PhD, Assistant Investigator, Department of Surgery, Center for Laryngeal Surgery and Voice Rehabilitation, Massachusetts General Hospital; Assistant Professor of Surgery, Department of Surgery, Massachusetts General Hospital–Harvard Medical School; Adjunct Assistant Professor, MGH Institute of Health Professions, (617) 643-0820, daryush.mehta@alum.mit.edu

Dehydration and Estrous Staging in Rat Larynx: An In Vivo Prospective Investigation

Background: Women report a variety of voice changes associated with their menstrual cycle. It has been speculated that these voice changes may relate to hydration changes in the vocal folds associated with the menstrual cycle. This novel study sought to untangle the relationship between the estrous cycle and hydration state in the larynx. We hypothesized that there would be changes in tissue morphology with the estrous cycle and that these changes would vary depending on hydration state of the animal.

Study design: Prospective, *in vivo* study design with random allocation to groups.

Methods: Estrous stage of female Sprague Dawley rats (N = 28) was determined via cytological evaluation of vaginal smears. Based on the vaginal smears, rats were identified as being in one of three estrous stages (proestrus, estrus, or diestrus). Of 28 rats, 16 rats were systemically dehydrated to an average of 10% reduction in body weight by withholding water. Twelve rats were assigned to non-dehydrated, control condition. Hence the final design included animals that were assigned to dehydration or control in each of the three estrous stages. Following euthanization, larynges were prepared for histological staining with hematoxylin and eosin (HE) and Masson's trichrome. To quantify hyaluronic acid (an important glycosaminoglycan implicated in vocal fold hydration state), Alcian blue staining was completed pre- and post-hyaluronidase incubation. Relative collagen distribution, hyaluronic acid quantity and tissue morphology were the outcome measures.

Results: There was greater collagen distribution in the vocal folds following dehydration ($p < 0.05$). Collagen distribution varied with estrous stage with lower collagen spread in the diestrus stage. There was a trend towards reduction in the quantity of hyaluronic acid after dehydration ($p = 0.07$). Hyaluronic acid quantity did not vary with estrous stage. No other morphological changes were observed between dehydrated and control groups.

Conclusions: The data reveal that estrous stage does not impact the quantity of vocal fold hyaluronic acid, tissue morphology, or collagen distribution. Systemic dehydration is associated with changes in vocal fold collagen spreading. Future studies will expand this work to investigate additional components of the vocal fold extracellular matrix to fully elucidate the relationship between estrous cycle and hydration state in the larynx.

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Abigail Durkes, DVM, PhD, DACVP, Assistant Professor, Department of Comparative Pathobiology, College of Veterinary Medicine, (765) 494-6063, adcox@purdue.edu

Naila Cannes do Nascimento, PhD, Research Associate, Department of Comparative Pathobiology,, College of Veterinary Medicine, (765) 494-2628, ncannes@purdue.edu

Andrea Pires dos Santos. DVM, PhD, DACVP, Assistant Professor, Department of Comparative Pathobiology, College of Veterinary Medicine, (765) 494-4923, santos1@purdue.edu

Preeti Sivasankar, PhD, CCC-SLP, Professor, Speech, Hearing & Language Sciences Department, College of Health and Human Sciences, Purdue University, West Lafayette, IN, (765) 494-3788, preeti@purdue.edu

Airway Pressures Position the Vocal Folds with Semi-Occluded Vocal Tracts

Objective

The objective was to show that adduction with laryngeal muscles does not produce the final shape of the vocal fold for vibration. It is hypothesized that subglottal pressures and supraglottal pressures have a significant impact on the shape of the medial surface of the vocal folds.

Methodology

The approach was computational. A simple soft-wall vibration model was used to define convergent, divergent, parallel, and bulging medial surfaces of the vocal folds. After pressures for phonation were applied, the surface contours were re-computed to determine the final shape around which oscillation took place.

Results

Steady supraglottal pressures separate the top of the vocal folds, while subglottal pressures separate the bottom of the vocal folds. In general, this produces a more convex (bulging) shape of the medial surface.

Conclusions

A greater variety of medial surface shapes for phonation in different registers is achievable with a supraglottal pressure developed by a semi-occlusion at the mouth. The thyroarytenoid muscle can then be used to target a shape for the lowest phonation threshold pressure, and therewith ease of phonation.

Ingo R. Titze, PhD, Executive Director, National Center for Voice and Speech, 136 South Main St., Salt Lake City, UT 84101, Adjunct Professor in the Department of Otolaryngology/Head and Neck Surgery at the University of Utah in Salt Lake City, 720 217 6512, ingo.titze@utah.edu

Mapping Individual Effects of Voice Quality Changes in Singers with Suspected Laryngopharyngeal Reflux (LPR) following Six Weeks of the VFEs Protocol with the Voice Profiler System

Introduction: The Voice Profiler System is designed to comprehensively analyze an individual voice. The present study aims to analyze the functional and qualitative effect of utilizing the VFE protocol in individual singers with suspected LPR.

LPR affects the upper airway, irritating the mucosal lining of the supra-glottal and glottal tissues and can have serious health consequences including voice disorders. Singers with LPR are acutely affected by any irritation and edema in the vocal folds, often utilizing maladaptive singing behaviors leading to loss of range and voice breaks.

Vocal Function Exercises (VFEs) are direct physiologic voice exercises developed to decompensate maladaptive voicing behaviors. VFEs aid in reclaiming balance between airflow, laryngeal muscle activity and supraglottic placement of tone.

Method/Study Design: Twenty subjects with suspected LPR were randomly divided into two treatment groups. Both groups met with the principal investigator weekly (over the course of six weeks) and the treatment group was instructed to complete on their own a daily VFE protocol. Compliance with the protocol was monitored through participant journaling. Spectral voice range profiles (VRPs) were recorded pre and post and correlated with three perceptual measures: Adapted Borg CR10 for Vocal Effort Rating after completion of VRP task, the Singer Specific Questionnaire (SSQ) and the Reflux Symptom Index (RSI).

Results: Voice metrics captured by the Voice Profiler System were chosen that revealed spectral power development used to derive the function and quality of each voice. While total area of the treatment group VRPs were significantly expanded, analysis of the changes in each individual VRP contour and interior will be discussed in greater detail.

Kathleen Bell, DMA, Adjunct Associate Professor of Voice, Shenandoah University, (305)-205-6815, kbell11@su.edu.

Peter Pabon, PhD, Institute of Sonology, Royal Conservatoire, The Hague, DSP teacher, Voice Researcher, pabon@koncon.nl.

David Meyer, DM, Director of the Janette E. Ogg Voice Research Center; Associate Professor of Music, Shenandoah University, (540) 665-4544, dmeyer2@su.edu.

Individual Variation in Speech Accommodation to Vocal Fatigue

Introduction: Vocal fatigue is a common complaint in occupational voice users. Vocal fatigue is associated with prolonged use of the voice (vocal load) but is not experienced the same by everyone. To understand the relationship of these important concepts, it is necessary to study the possible inter- and intra- variability of individuals experiencing vocal fatigue.

Objectives: This study aims to identify variations of speech accommodation of vocal fatigue within and across individuals after a prolonged speaking task.

Methods: Ten participants were given an out-loud reading at alternating vocal load dB goal for 36 minutes. Vocal effort was cued from the participants at set intervals during the load period. Participants repeated this vocal load protocol three times with, at least, one week between each vocal load experiment. Using the recorded vocalizations throughout the loading task, coupled with the vocal effort ratings, individualized responses to the vocal load were quantified.

Results and Conclusion: As expected, subjective ratings of vocal effort during the vocal loading tasks were mostly invariant within each subject but highly variant across the subjects. The change in vocal effort ratings were drastically different across the participants. An inverse relationship between self-rating of vocal fatigue and habitual voicing intensity was found. Other acoustic changes within a vocal loading task and their variations across the participants will be discussed. Individual variations in speech accommodation to vocal fatigue exist and provide valuable insight to the study of vocal fatigue mechanisms.

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Mark L. Berardi, BS, PhD Student, Dept. of Comm Sciences & Disorders, Michigan State University,
(309) 712-6991, mberardi@msu.edu

Eric J. Hunter, PhD, Professor, Dept. of Comm Sciences & Disorders, Michigan State University,
ejhunter@msu.edu

Perceptual and Acoustic Quantification of URI-Based Voice Changes in a High Load Situation

Introduction: Upper respiratory infections (URIs) are a common occurrence that may put the vocal system at risk for laryngitis. Often, this risk can be exacerbated when a talker is required to speak extensively (e.g., teachers, broadcasters, coaches). Therefore, having a better understanding of the impact of URI-based laryngitis would help improve the quality of life of individuals, not only preventing, reducing, and treating its occurrence but also understanding when it would be safe to re-introduce vocal load.

Objectives: This study aims to quantify the vocal quality and acoustic signature of URI-based laryngitis and its recovery. Improved techniques to track this vocal impairment will lead to an understanding of the identification of onset risk factors and recovery features of physiology. **Methods:** Using the recordings of several individuals, the vocal quality (GRBAS) and acoustic metrics (e.g. cpps, pitch strength) were obtained from during and after incidence of URI-based laryngitis. One individual was a professional voice user (broadcaster) with multiple recordings over multiple years showing vocal recovery in a high vocal load situation. Non-professional voice users with URI-based vocal quality deficiencies were used as a comparison.

Results: As would be expected, vocal quality and acoustic metrics showed that the professional voice user's vocal quality in later years was different during laryngitis than younger years. The time course of recovery across the individuals will be compared. Individual differences in recovery will be discussed.

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Ethan Hunter , Student, Haslett High School, ut2mi2013@gmail.com

Mark L. Berardi, BS, PhD Student, Dept. of Comm Sciences & Disorders, Michigan State University, (309) 712-6991, mberardi@msu.edu

Eric J. Hunter, PhD, Professor, Dept. of Comm Sciences & Disorders, Michigan State University, ejhunter@msu.edu

Validation of Novel Clinical Scales for Voice Quality Perception

Objective: Perceived voice quality (VQ) obtained using rating or visual analog scales are often biased by context, result in arbitrary units, and only inform us about the relative order of VQ. Over the years, we have developed ratio-level measurement scales for breathy and rough VQ with standard units. First, the relationship between perceived VQ and physical units were established using single-variable matching tasks (SVMT). Second, the relationship between a change in physical units from the SVMT and perceived VQ magnitude were established using magnitude estimation tasks. Third, single reference points were identified on breathy and rough VQ continuums. Finally, all points on the newly established VQ continuum were rescaled relative to these arbitrary reference points. Here, we seek to a) affirm/establish the standard reference points and b) validate the ratio-level scales, with natural dysphonic stimuli.

Methods: A set of magnitude estimation tasks were first used to determine the perceived magnitudes of breathiness and roughness (10 stimuli/listeners per VQ dimension). The resulting data were compared with previously acquired magnitude estimates of the comparison stimuli. Then, a novel set of listeners evaluated the same set of natural stimuli using the new clinical scales. Listeners judged the perceived magnitude of the dysphonic voice sample by matching it to the comparison and evaluated the natural stimuli in standard VQ units (e.g., twice as breathy as the comparison = 2 breathiness units).

Results: Through the comparison of psychometric curves for the comparison and natural stimuli, the standard reference units and the full clinical scales were adjusted. The strength of the relationship between the functions for the natural stimuli and the predicted values from the clinical scales were evaluated using r^2 .

Conclusions: Such formal VQ scales support quantitative comparisons of perceptual judgments and represent a critical step in the clinical translation. Work supported by NIH-NIDCD DC009029.

David A. Eddins, PhD, CCC-A, Professor, Dept. of Communication Sciences and Disorders, University of South Florida, Tampa, FL, (813) 974-4148, deddins@usf.edu

Supraja Anand, PhD, Assistant Professor, Dept. of Communication Sciences and Disorders, University of South Florida, Tampa, FL, (813) 974-3213, suprajaanand@usf.edu

Rahul Shrivastav, PhD, CCC-SLP, Vice President for Instruction, University of Georgia, Athens, GA, (706) 583-0690, rahuls@uga.edu

Vocal Fold Vibratory Consistency in Adductor Spasmodic Dysphonia

Objective: High speed videoendoscopy (HSV) captures precise vibratory movement of the vocal folds during voice onset and steady phonation despite sudden voice breaks, pitch breaks or other non quasi-periodic events during phonation. Adductor spasmodic dysphonia (AdSD) is a voice disorder characterized by voice breaks and aperiodicity. Previous studies (Chen, Murry, Woo, in press; Patel, 2011) have demonstrated several vibratory characteristics (e.g., prolonged prephonatory phase, vibratory breaks during onset and steady phonation, motion irregularity, and micromotion) in patients with AdSD. The purpose of this study was to examine the consistency and frequency of presentation during voice onset and steady phonation in patients with AdSD.

Methods: High-speed video recordings of adults with AdSD were obtained. AdSD patients were diagnosed by a board certified laryngologist. All patients have been receiving routine Botulotoxin injections with benefit. At the time of data collection, all patients have not received botox injection for three or more months. Digital kymography (DKG) was used to obtain precise vibrogram data prior to, during voice onset, and during steady state phonation. Participants phonated approximately five tokens of /i/ at modal phonation as in standard larygscopy examination. These tokens were recorded using high-speed videoendoscopy at 2000 frames per second.

Results: AdSD demonstrated variation vibratory onset and steady phonation within patients. This is expected, as patients with AdSD present with intermittent episodes of laryngeal dystonia during voicing. Greater variability is observed in voice onset in comparison to steady phonation. Prolonged prephonatory phase, vibratory breaks during onset and steady phonation, motion irregularity, and micromotion were observed in patients with AdSD.

Conclusion: AdSD vibratory characteristics were observed in all AdSD patients. The use of HSV in examining voice onset and steady state motion provides additional physiological information regarding the vibratory consistency in AdSD.

Wenli Chen, MS CCC, Speech-Language Pathologist, Mayo Clinic, Phoenix, AZ, (646) 704-8399, Chen.wen@mayo.edu

Peak Woo, MD, FACS , Clinical Professor, Otorhinolaryngologist, Icahn School of Medicine at Mt. Sinai, New York, NY

Thomas Murry, Ph.D. CCC, Professor, Otolaryngology & Head/Neck Surgery. Loma Linda Health University, Loma Linda, CA

Investigating Laryngeal "Tilt" on Same-pitch Phonation-- Preliminary Findings of Vocal Mode Metal and Density Parameters as Alternatives to Cricothyroid-Thyroarytenoid "Mix"

Objectives: The objective of this work was to study the parameters "metal" and "density" and their combinatory conditions in relation to the vocal modes Overdrive, Edge, and Curbing from the pedagogical method Complete Vocal Technique by means of laryngostroboscopic imaging, high-speed videoendoscopy, electroglottography (EGG), long-time-average spectrum (LTAS), and acoustics.

Study Design: This is a three-subject exploratory study.

Methods: Three singers were recorded performing various metal and density conditions of Overdrive, Edge, and Curbing from the Complete Vocal Technique method by means of laryngostroboscopic imaging using a videonasosendoscopic camera system and the Laryngostrobe program, high-speed videoendoscopy, EGG, LTAS, and acoustic signals using *SpeechStudio*.

Results: A laryngeal tilt was discovered as related to the condition of "reduced density" on same-pitch phonation, with observations of the thyroid cartilage tilting forward, stretching of the mucosa covering the cricoid-arytenoid complex and the posterior cricoid, and an upward posterior, slightly superior, contraction of the middle constrictor muscle in the pharyngeal wall. A resulting associated reduced contact quotient was observed on EGG, as well as a lowered mean sound pressure level. On LTAS, the laryngeal tilt was associated with a decrease of spectral energy in areas between the 7th and the 20th harmonic. The subjects of the study were able to perform the tilt without changing pitch or volume.

Conclusions: Singers can perform laryngeal tilt during same-pitch phonation in the vocal modes Overdrive, Edge, and Curbing. The parameters of density and metal establish a more precise and anatomically grounded terminology than "mix register."

Mathias Aaen Thuesen, PhD, MA CC, BA MMC, Industrial PostDoc, Complete Vocal Institute, Nottingham University Hospitals, +45 31 31 62 42, mathias@cvi.my

Julian McGlashan, MB BS, FRCS(Otol), Hon.FRCSLT, Consultant Laryngologist and Head & Neck Surgeon, Honorary Clinical Assistant Professor, Nottingham University Hospitals, +44 7713093368, Julian.mcglashan@nottingham.ac.uk

Cathrine Sadolin, CEO, Complete Vocal Institute, Cathrine@sadolin.net

Laryngostroboscopic Exploration of Rough Vocal Effects in Singing and their Statistical recognizability: An Anatomical and Physiological Description and Visual Recognizability Study of Distortion, Growl, Rattle, and Grunt using Laryngostroboscopic Imaging and Panel Assessment

Objectives: To study vocal effects in singing from the pedagogical method Complete Vocal Technique as related to specific and discrete supraglottic structures and activities by means of laryngostroboscopic imaging and panel testing.

Study Design: This is a case-control study with a double-panel assessment.

Methods: Twenty singers were recorded performing four of the rough vocal effects from the method Complete Vocal Technique. Two studies were performed: 1) Laryngostroboscopic examination using a videonasosendoscopic camera system and the Laryngostrobe program; 2) two blind-panel assessments with a) voice clinicians and b) singing teachers to investigate the recognizability of the vocal effects in supraglottic structures.

Results: The four investigated vocal effects could be related to particular and discrete vibratory pattern of supra-glottic structures; Distortion as vibrations of the ventricular folds, Growl as vibrations of the arytenoid cartilages against the epiglottis, Rattle as the vibration of the arytenoid cartilages against one another, and Grunt as the vibrations of the whole supraglottic structure from level 1-4 at low frequencies with a large amplitude in the vibration of the vocal folds, with particular movement of the aryepiglottic folds. The two panels recognized the vocal effects with 91%/96% accuracy for Distortion, 91%/74% accuracy for Rattle, 90%/66% accuracy for Grunt, and 83%/99% accuracy for Growl, with an overall accuracy of 91%/84%.

Conclusion: Vocal Effects can be performed, identified and recognized as particular vibratory patterns of supra-glottic structures with no visible pathology in subjects performing the effects.

Mathias Aaen Thuesen, PhD, MA CC, BA MMC, Industrial PostDoc, Complete Vocal Institute, Nottingham University Hospitals, +45 31 31 62 42, mathias@cvi.my

Julian McGlashan, MB BS, FRCS(Otol), Hon.FRCSLT, Consultant Laryngologist and Head & Neck Surgeon, Honorary Clinical Assistant Professor, Nottingham University Hospitals, +44 7713093368, Julian.mcglashan@nottingham.ac.uk

Cathrine Sadolin, CEO, Complete Vocal Institute, Cathrine@sadolin.net

Pitch-Shifted Voice Feedback in Parkinson's and Alzheimer's Disease

Objective:

Very little research has examined whether the voice problems in Parkinson's disease (PD) are ultimately due to a *movement control* issue. We used a pitch-shift task to examine whether voice compensations to pitch errors in the auditory feedback have a neurological basis that differs based on lesion location. We predicted that the PD group (basal ganglia damage) would reveal electroencephalographic (EEG) event-related potentials (ERP) that show a reduced N100 suppression from healthy age-matched controls (HC) (based on Behroozmand and Larson, 2011) due to an impaired efference copy mechanism (Liu et al., 2012). We also predicted that responses would differ from individuals who have diffuse cortical impairment due to Alzheimer's disease (AD).

Methods:

Voice responses and EEG/ERPs were recorded in 34 subjects (PD=11; AD=8; HC=15). Subjects sustained an /a/ vowel while listening to their auditory feedback over headphones. In half of the conditions, participants' voice feedback was shifted at onset (0, 100, or 400 cents). Following each vocalization trial, participants listened to their shifted voice feedback without vocalizing. ERPs were averaged across trials within each condition after standard filtering, artifact/ocular motion rejection, and baseline correction within the epoch of analysis. The N100 and P200 amplitude and latencies for all conditions were computed.

Results and Conclusions:

Results show a similar difference in vocalization compared to listening (N100 and P200) for 100-cent shifts for the PD and HC groups, indicating that both groups responded similarly to small pitch shifts. However, a group difference in the N100 amplitude was observed for the 400 cents condition. Specifically, the PD group showed a suppression between vocalizing and listening during large pitch errors, while the control group did not (consistent with young adults). These findings suggest that the voice problems that occur in PD are due to an impaired efference copy arising from basal ganglia impairment.

Jisook Ahn, PhD, Lab Manager, Voice Analytics and Neuropsychology Lab at Seton Hall University, Nutley, NJ, Jisook.ahn@shu.edu

Sascha Fruhholz, PhD, Assistant Professor, University of Zurich, Zurich, Switzerland, sascha.fruhholz@uzh.ch

Charles R. Larson, PhD, Professor, Northwestern University, Evanston, IL, Clarson@northwestern.edu

Sona Patel, PhD, Assistant Professor, Seton Hall University, Nutley, NJ, Sona.patel@shu.edu

Mucosal Waves on the Vocal Folds Revisited: Updated Findings and Concepts

Introduction and aim:

Mucosal waves have been considered of crucial importance for healthy vocal fold vibration, but their appearance and variability has been understood relatively poorly. This paper aims at clarifying the mucosal wave phenomena and their appearance in kymographic images.

Methods:

Over 7,000 high-speed videokymographic (VKG) examinations of patients with various types of voice disorders were performed and recorded at the Voice and Hearing Centre in Prague. The VKG examinations were always preceded by stroboscopy. The real VKG images were compared with simulated ones produced via a newly developed kinematic vocal fold mucosal wave model.

Results:

There are two components of mucosal waves: 1) the vertical phase differences between the lower and upper margins of the vocal folds, which are reflected in sharpness of the lateral vibrational peaks in kymograms and 2) the waves propagating laterally over the vocal fold surface, which can be seen as diagonal traces in kymograms. The laterally travelling waves can be classified in two different types: 1) continuation of vertically travelling flow-induced waves and 2) collisional waves. Furthermore, different mucosal and geometrical properties of the vocal folds can be distinguished based on various features of the mucosal waves such as a) lateral extent, b) light reflections, c) spatial separation from the vocal fold margin and d) delay in appearance after maximum vocal fold excursion.

Conclusion:

A deeper understanding of visual appearance of mucosal waves is important for their proper detection and for more sensitive monitoring of the mucosal properties in clinical practice.

Jan G. Svec, PhD et PhD, Head Research Scientist, Voice Research Lab, Dept. Biophysics, Faculty of Science, Palacký University Olomouc, Czech Republic, +420 58 563 4151, jan.svec@upol.cz

Pravin Kumar Subbaraj, MTech, PhD, Research Scientist, Voice Research Lab, Dept. Biophysics, Faculty of Science, Palacký University Olomouc, Czech Republic, +420 58 563 4173, spravinkumarin@gmail.com

Jitka Vydrová, MD, Director, Head Laryngologist, Voice Center Prague, Španělská 4, Prague, Czech Republic, +420 733 329 365, vydrova@medico.cz

The Role of Motivation in Difficult Perceptual Evaluation

Objective: Previous research has shown that in a task identifying singers across pitch, inexperienced listeners perform very poorly compared to their experienced counterparts. This poor performance may partially be due to lower motivation and reduced attention on the part of inexperienced listeners. The current experiment is designed to examine the role of motivation in difficult perceptual tasks through use of an established methodology that uses singing voice stimuli.

Methods: This study uses a forced-choice paradigm, where listeners hear 2 different singers singing “ah” at the same pitch. Listeners must identify which singer produced a third “ah” at pitches that vary across 1.5 octaves. Inexperienced listeners are being randomly assigned to 1 of 3 conditions: (1) no feedback, (2) listener aware that a % correct score will be provided at the end of the experiment, and (3) listener aware that their ranking compared to other inexperienced listeners will be provided at the end of the experiment. Prior to the experiment, listeners will rate their motivation using the Situational Intrinsic Motivation Scale (SIMS). Data are being collected from 150 inexperienced listeners with no vocal training or interest in classical singing.

Results: Based on research showing that motivation can affect some aspects of attention, it is expected that listener percent correct scores should be related to scores on the SIMS and that these scores should vary depending on the type of feedback presented to the listener.

Conclusions: Listener motivation may prove to be an important factor in performance on difficult perceptual tasks. Measures of motivation may be a necessary component in perceptual research.

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Molly Erickson, MM, PhD., Associate Professor, Department of Audiology and Speech Pathology, University of Tennessee Health Science Center, merickso@uthsc.edu

Taylor Stone, BM, PhD Student, Department of Audiology and Speech Pathology, University of Tennessee Health Science Center, tstone6@uthsc.edu

Attention to Vocal Source Modulates Responses to Pitch-shifted Voice Auditory Feedback

Objective: It is known that auditory feedback is a major component of voice F0 control. It has also been shown that singers are better able to isolate and respond to relevant components of auditory feedback than non-musicians. However, it is not understood how these two mechanisms interact with each other in choral singing. The purpose of this study was to investigate how singers respond to pitch shifted feedback of their own voice compared to shifts in the voices of other singers when singing in a choir.

Design/Methods: 12 singers sang musical notes at the middle of their range. While singing, their auditory feedback was mixed with a pre-recorded chorus singing the same note. Pitch shifts (± 50 cents, 200 ms duration) were presented at random times during the vocalization on either the subject's own voice or the combined sound of the chorus. Subjects were not informed that the pitch of their feedback may be shifted. For 200 control trials, subjects were instructed to hold a steady note while listening to the combined auditory feedback with the choir and their own voice. Subjects were then asked to complete the same task for 300 trials while paying attention to only one component of the auditory feedback (choir or own voice) and 'tuning' out the other, i.e. not attending to the other.

Results: During the control trials, singers' compensatory responses to pitch shifts of their own voice had either equal or greater magnitude than responses to shifts on the choir. When instructed to listen to only one component of their auditory feedback (own voice or choir), they responded with a greater compensatory response to shifts on the stimulus they were attending to.

Conclusions: The results indicate a relationship between singers' aural capabilities and the magnitude of the pitch shift reflex. This suggests that there is a trainable cognitive component of the pitch shift reflex mechanism that filters which auditory stimuli are being processed. In a choral setting, this implies that singers can consciously tune how they respond to fluctuations in different voices. The same study is being conducted on non-musicians to obtain a baseline to compare singers' responses against.

Kirtana Sandepudi, Biomedical Engineering BS student – Northwestern University, Evanston, IL
(expected graduation: June 2020), 813-947-0033, kirtanasandepudi2020@u.northwestern.edu

Allison Hilger, MS, CCC-SLP, PhD student, Department of Communication Sciences and Disorders – Northwestern University, Evanston, IL, 630-479-3602, allisonhilger2020@u.northwestern.edu

Jason H. Kim, BS, PhD Candidate, Department of Communication Sciences and Disorders – Northwestern University, Evanston, IL, 253-722-9782, jasonkim2014@u.northwestern.edu

Charles R. Larson, PhD, Professor of Communication Sciences and Disorders, Otolaryngology – Head and Neck Surgery – Northwestern University, Evanston, IL, Feinberg School of Medicine, Chicago, IL, 847-491-2424, clarson@northwestern.edu

Computational Study of the Evolution of Vortical Flow Structures through the Blood-feeding Arteries of the Human Vocal Folds and Its Potential Impact on Drug Delivery for Laryngeal Cancer

Objective:

The available literature mainly concerns anatomy and morphology of the blood vessels of the vocal fold. Little is known about the morphologies of primary and secondary flow structures through the blood vessels leading to the human vocal folds. Yet, no in-vivo or in-vitro studies have been carried out to identify such flow structures. The present study is intended to non-invasively investigate the evolution of vortical flow structures through the major blood-feeding arteries of the human vocal folds, and to explore its potential impact on the transport of anticancer drugs to the Larynx using Computational fluid dynamics (CFD) techniques.

Methods:

Computer-based patient-inspired models of the blood-supporting arterial vasculature of the human vocal folds were constructed based on our knowledge of the morphology of the major blood-feeding arteries from the computed tomographic angiography (CTA) data available in the literature as well as the reported anatomical data regarding the size and location of the individual branches. The Navier-Stokes equations of continuity and conservation of momentum were considered as the constitutive equations. Non-Newtonian constitutive equations were used to more realistically mimic physiological blood flows. Rigid vessel walls are assumed, and no-slip velocity condition is applied at the artery wall. As for the inflow boundary condition, mean values of the cardiac input for one cardiac cycle was prescribed. The simulations were repeated for different arterial morphologies (C-shape, S-shape, and Out-of-plane arteries), and also for different values of the Reynolds and Dean numbers. The ANSYS software products (Ansys Inc., Canonsburg, PA) were used for the simulations.

Results:

Multiple pairs of secondary flow vortices were observed in the secondary flow fields. The velocity, vorticity, and circulation results along with a vortex detection analysis were used to illustrate the evolution of vortical structures through blood-feeding arteries under physiological inflow conditions. The potential impact of such vortical structures on local drug administration was assessed by tracking stream lines created by flow particle markers in the blood stream. The effect of different arterial morphologies and physiological conditions on hemodynamic flow, and their potential impact on drug transport will be discussed in details.

Conclusion:

Vortical flow structures associated with local hemodynamics of the Larynx and Hypopharynx can have considerable influences on local drug mixing and transport. We anticipate this work will properly contribute to the ongoing research on laryngeal and hypopharyngeal cancer and the concept of organ preservation.

Mehdi Shamshiri, MS, PhD Student, Department of Mechanical Engineering, McGill University, Montreal, Quebec, Canada; mehdi.shamshiri@mail.mcgill.ca

Rosaire Mongrain, PhD, Professor, Department of Mechanical Engineering, McGill University, Montreal, Quebec, Canada; rosaire.mongrain@mcgill.ca

Luc Mongeau, PhD, Professor, Department of Mechanical Engineering, McGill University, Montreal, Quebec, Canada; luc.mongeau@mcgill.ca

Vocal Potential in NVP-Embalmed Cadaveric Human Larynx

Background and Objectives: Recently, we have reported the utility of excised human larynx from N-vinyl-2-pyrrolidone (NVP)-embalmed cadaver to observe vocal fold vibration in experimental settings. In this study, range of air flow to be able to produce voiced sound, as well as the pitch range of produced voiced sound in NVP-embalmed human larynx were evaluated.

Methods: Artificial air-flow was applied from tracheal side of excised larynx with the range between 2 L/min (33.3 ml/sec) and 12 L/min (200 ml/sec). Either adduction and stretch of vocal folds were achieved manually during artificial phonation. Obtained voiced sounds were recorded (Roland R-26, Roland Corporation, Shizuoka, Japan), and analyzed using computerized acoustic analysis program (Multidimensional Voice Program: MDVP, Kay-PENTAX, NJ, USA).

Results: Minimum air flow of 2 L/min produced voiced sound with the pitch range of 97.5-175.5 Hz. Maximum air flow of 12 L/min produced voiced sound with the pitch range of 190.0-408.1 L/min. Pitch ranges of produced voiced sounds with artificial air-flow of 4-10 L/min in NVP- embalmed larynx were similar to those in live human (Table).

Conclusions: This is the first study to show the similarity of pitch range between experimental NVP-embalmed laryngeal phonation, and live human. Further studies to compare multiple vocal parameters between NVP-embalmed cadaver and live human are underway.

artificial air flow (L/min)	2	4	6	8	10	12
pitch range (Hz)	97.5 ~175.5	134.2 ~367.2	159.3 ~388.7	176.0 ~372.0	139.8 ~361.8	190 ~408.1

Makoto Miyamoto, MD, Research Associate, Kyorin University School of Medicine, Dept. of Otolaryngology-Head and Neck Surgery, Tokyo, Japan, +81-422-47-5511, miyamotm@ks.kyorin-u.ac.jp

Miki Nagase, MD, PhD, Professor, Kyorin University School of Medicine, Department of Anatomy, Tokyo, Japan, +81-422-47-5511, mnagase@ks.kyorin-u.ac.jp

Itaru Watanabe, MD, Research Associate, Kyorin University School of Medicine, Dept. of Otolaryngology-Head and Neck Surgery, Tokyo, Japan, +81-422-47-5511, itanabe413@yahoo.co.jp

Hideki Nakagawa, MD, PhD, Assistant Professor, Kyorin University School of Medicine, Dept. of Otolaryngology-Head and Neck Surgery, Tokyo, Japan, +81-422-47-5511, hnakagawa@seibokai.or.jp

George Matsumura, MD, PhD, Professor, Kyorin University School of Medicine, Department of Anatomy, Tokyo, Japan, +81-422-47-5511, george@ks.kyorin-u.ac.jp

Domingos Terra Tsuji, MD, PhD, Associate Professor, University of São Paulo-School of medicine, Department of Otolaryngology, São Paulo, Brazil, +11-3251-5504, domingostsuji@terra.com.br

Koichiro Saito, MD, PhD, Professor and Chairman, Kyorin University School of Medicine, Dept. of Otolaryngology-Head and Neck Surgery, Tokyo, Japan, +81-422-47-5511, k-saitoh@ks.kyorin-u.ac.jp

Increased Auditory Feedback Sensitivity Early in Phrasal Production

Objective: The purpose of this study was to investigate auditory feedback sensitivity during phrase production by measuring how the timing of a perturbation in voice pitch auditory feedback during phrasal production modulated the magnitude, latency, and direction of the reflexive vocal response. Previous work in Mandarin phrases has demonstrated that reflexive vocal responses to perturbations in voice auditory feedback are greater for perturbations earlier in the phrase than at medial and later time-points (Liu, Xu, & Larson, 2009). These results suggest differences in the sensitivity of the speech production mechanism to changes in voice auditory feedback early in a phrase. In this study, we sought to replicate the findings from Liu et al. (2009) in an English-speaking population.

Methods: Thirty healthy, native-English speaking adults produced the target phrase, “You know Nina?” while their voice output was perturbed in pitch ± 200 cents for 200 milliseconds on either the word “you” or the word “know” and fed back to subjects through headphones. We then measured the magnitude, latency, and direction of the reflexive vocal response based on the timing and direction of the perturbation in the phrase.

Results: We constructed separate linear mixed effects statistical models for response magnitude, latency, and direction with perturbation timing or direction as the fixed effects while controlling for subject variance. Response magnitudes were greater for perturbations on “you” than on “know” ($p = 0.0001$, $\eta^2=0.49$). No effect was found for latency for the timing of the perturbation ($p = 0.75$) but latency was increased for upward perturbations ($p = .007$, $\eta^2=0.23$). We also observed more opposing responses to upward perturbations than downward perturbations ($p < .001$, $\eta^2=0.94$).

Conclusions: We found that reflexive vocal response magnitudes were greater for perturbations earlier in the phrase (i.e. “you”) than medially in the phrase (i.e. “know”). These results support the findings from Liu et al. (2009) that earlier time-points in phrasal production are important for the planning of upcoming intonation targets and are therefore more sensitive to changes in auditory feedback. We also found that upward pitch perturbations were more disruptive than downward perturbations, resulting in longer response latencies and more responses that opposed the direction of the perturbation. These results support the findings from Franken et al. (2017) that speakers may oppose perturbations that are contrary to the intended direction of the f_0 trajectory. Overall, these results provide important insight into the role of auditory feedback during phrasal production.

Allison I. Hilger, MS, CCC-SLP, PhD Student, Department of Communication Sciences and Disorders, Northwestern University, Evanston, IL, 630-479-3602, allisonhilger2020@u.northwestern.edu

Charles Larson, PhD, Professor, Department of Communication Sciences and Disorders, Northwestern University, Evanston, IL, 847-491-2424, clarson@northwestern.edu

Survivors of Sexual Trauma: Do Their Voices Tell the Story?

Objectives: Evidence suggests that a relation between sexual trauma and voice may exist, particularly for psychogenic voice disorders, and that certain cues in body language are “tells” of previous victimization history. Psychopathic traits and previous perpetration tend to be predictors of accuracy in using such “tells” to target a potential victim. In this study, the authors investigate whether vocal cues can be indicative of previous sexual victimization.

Methods/Design: A sample of women was recruited for voice recordings. Listeners were instructed to assess the degree of vulnerability to future victimization of the voices they heard (9 survivors and 9 controls).

Results: Results showed several relationships between perturbation, speech, and trauma-related information (e.g. Irregularity/roughness in sustained phonation was predicted by a history of interpersonal violence, accounting for jitter and shimmer). Listeners’ accuracy in distinguishing survivors of sexual trauma from controls (listeners heard neutral speech or second phrase of The Rainbow Passage) was predicted by previous sexual perpetration, accounting for psychopathic traits and trauma history, assessed using self-report validated measures.

Conclusion: Results suggest that a relationship between sexual trauma and voice characteristics may exist, even in the absence of psychogenic dysphonia. The relationship between trauma and voice warrants further investigation. The ability to perceive trauma in voice may highlight the role of voice in prevention and intervention.

Elisa Monti, PhD Candidate, The New School for Social Research, 80 Fifth Avenue, New York, NY 10011, (347) 400-2603, monte991@newschool.edu

Wendy D'Andrea, PhD, Associate Professor, Psychology (Clinical), The New School for Social Research, 80 Fifth Avenue, New York, NY 10011, (212) 229-5727 x3257, dandrew@newschool.edu

Anne Maass, PhD, Professor, University of Padova, anne.maass@unipd.it

Noga Miron, BSW, Graduate Student, The New School for Social Research, 80 Fifth Avenue, New York, NY 10011, (347) 985-5497, noga321@gmail.com

Katherine Norton, BS, Research Assistant, The New School, 80 Fifth Avenue, New York, NY 10011, (215) 385-1232, nortk303@newschool.edu

Olivia Resto, Undergraduate Student, The New School, 80 Fifth Avenue, New York, NY 10011, (248) 259-4718, resto632@newschool.edu

Kayla Toscano, BS, Research Assistant, The New School, 80 Fifth Avenue, New York, NY 10011, (718) 440-2105, tosck140@newschool.edu

Linda M Carroll, PhD, CCC-SLP, ASHA/FASHA Fellow, 424 West 49 Street, Suite 1, New York, NY 10019, 33 Fox Run Road, Newington, NH 03801, (646) 644-3379, lmcarrollphd@aol.com

The Use of Iphone for Acoustic Analysis of Voice and Speech Measures: Is It Reliable?

Objective: To investigate the differences of voice and speech acoustic parameters between the recordings of an iPhone and of a professional microphone and also to determine the implications of compressed audio usage for voice and speech analysis.

Method: Voice samples of eight subjects were recorded (4 men, 4 women): four sustained vowels, two segments [a] and two segments [ε] (total of 32 sustained vowels) edited to achieve 5.7 seconds long. The recordings with the iPhone 7 (iOS 12) and the professional microphone (DPA 4066-B), were performed simultaneously in an acoustically treated room. The signal acquisition was carried out in an uncompressed audio format (.WAV), with 16-bit and 44kHz, and then compressed to Mp3 format with three different compression levels: 128kbps, 64kbps, 32kbps. The audios were segmented and synchronized using the Praat software. The synchronization was done by means of an acoustic criterion (peak of clapper intensity) in order to ensure that the extractions of the acoustic measurements were made at exactly the same point in each sample.

Results: Differences between DPA and the iPhone were found for HNR, CPP and Shimmer. For the HNR the difference was of 7.5% and 13.5% in sustained [a] and [ε], respectively. For CPP, the difference was of 3.5% for the vowel [a]. Differences in shimmer were also observed in the compressed versions of the files; the difference ranged from 112% to 230% from the reference sample (DPA). The HNR and CPP values increased even more with compression.

Conclusion: Three out of the nine measures analyzed have shown to be affected by the iPhone recording. For the non-compressed audio format this impact was smaller; however, the discrepancies concerning HNR and CPP remained, which reinforces the need of using proper equipment for voice and speech analysis.

Julio Cesar Cavalcanti, PhD Candidate, Speech Language Pathologist, UNICAMP - “Universidade Estadual de Campinas”, +55 82 9 9606 7708, juliocesarcavalcanti.o@gmail.com

Ana Carolina Constantini, PhD, Speech Language Pathologist, UNICAMP- “Universidade Estadual de Campinas”, +55 19 9 9199 2494, carolconstantini@gmail.com

Marina Englert, PhD Candidate, Speech Language Pathologist, UNIFESP – “Universidade Federal de São Paulo” and CEV – “Centro de Estudos da Voz”, +55 11 9 83669794, marinaenglert@gmail.com

Miguel Oliveira Jr., PhD, Linguist, UFAL - “Universidade Federal de Alagoas”, +55 82 9 9941 5551, miguel.oliveira.jr@gmail.com

Effects of Aging and Dual Task Demands on Vocal Function

Objective: This study sought to determine the effects of aging and dual task demands on computational measures of vocal function. Furthermore, the effects of speech task and reaction time on the secondary tasks were examined.

Methods: Seven young (26 ± 2.06 yrs) and six older females (64 ± 3.54 yrs), native speakers of American English who passed hearing, cognitive, and depression screenings were recruited for the study. All participants performed two speech tasks (story narration and monologue), with and without an accompanying cognitive task. Speech recordings were made using a head-worn microphone (ATM 73a) connected to a digital voice recorder (TASCAM DR-40) in a sound booth. The cognitive task varied in two levels of difficulty - simple 'attention' task and complex 'color stroop' task. These tasks were presented on a laptop using E-Prime software and responses were logged using a key press. Computational measures such as pitch (Hz), pitch strength (PS), cepstral peak prominence (CPP) were analyzed for the speech tasks while reaction time (ms) was analyzed for the cognitive tasks.

Results: Multiple analyses of variance (ANOVAs) using dual-task costs of the computational measures were performed with age as the between-subject factor; cognitive difficulty (simple vs. complex), and speech task (story vs. monologue) as within-subject factors. Pitch strength was significantly different between the two cognitive conditions and CPP was significantly different between the two speech tasks. Effects of age, cognitive difficulty, and speech task on reaction time were also examined. Older adults demonstrated longer reaction times at both cognitive difficulty levels for both speech tasks.

Conclusions: Healthy young and old adults show changes in a subset of measures of vocal function in connected speech under different cognitive loads, demonstrating an interaction between the two systems. Future work will extend this research to people with neurodegenerative disorders (e.g., Parkinson disease).

Supraja Anand, PhD, Assistant Professor, Dept. of Communication Sciences and Disorders, University of South Florida, Tampa, FL, (813) 974-3213, suprajaanand@usf.edu

Understanding Cortical Activation Associated with Corollary Discharge during Speech Production: The Role of Active and Passive Listening

Objective: The corollary discharge (CD) is defined as the attenuation of a cortical response elicited by the sensory feedback of one's own actions. CD is believed to be one of the main mechanisms involved in the control of speech production. In this study, we explored the context-dependent cortical processing of acoustic stimuli, as a first step toward understanding the neural bases of the CD during voice production.

Methods: We analyzed the CD in normal hearing volunteers (N=10). In a training session preceding the electrophysiological study, beeps were presented binaurally to every participant at a constant rate of 0.6 Hz. Following, participants were requested to reproduce the pace of the beep presentation by pressing a button (button-press-for-sound task). Event-related-potentials (ERP) were recorded from 64 scalp-electrodes while (i) participants underwent the aforementioned button-press-for-sound task, without any feedback of their performance, (ii) they listened a playback of the sound pattern generated during the behavioral task, and (iii) a control motor task, in which they pressed at the same pace but without beep being generated. The subtraction between conditions (i) and (iii) was defined as active listening and the corollary discharge was defined as the amplitude difference of the N1-P2 complex between the passive and active listening conditions.

Results and Conclusions: CD was evident as a decrease in the amplitude of both the N1 and P2 components of the ERP. During the active listening, global field power increased in the frontal electrodes while that computed from temporal electrodes decreased. Different activations of the frontal and temporal cortical regions were observed between conditions when source localization analyses (LORETA) were performed. Results suggest that fronto-temporal connections modulate the activation of hearing and language areas in the temporal lobe elicited by the auditory feedback of one's own actions.

Pavel Prado, PhD, Research Fellow, Advanced Center for Electrical and Electronic Engineering, Universidad Técnica Federico Santa María, Matta 222, Valparaíso, Chile, pavel.prado@usm.cl

Álvaro Cavieres, MD, Professor, Medicine School, University of Valparaíso, Subida Leopoldo Carvallo 200, Valparaíso, Chile, cavieres.alvaro@gmail.com

Lucia Zepeda, SLP, Research Assistant, Advanced Center for Electrical and Electronic Engineering, Universidad Técnica Federico Santa María, Matta 222, Valparaíso, Chile, luciaa.z.r@gmail.com

Alejandro Weinstein, PhD, Professor, Biomedical Engineering School, Universidad de Valparaíso, Gral Cruz 222, Valparaíso, Chile, alejandro.weinstein@uv.cl

Matías Zañartu, PhD, Professor, Department of Electronic Engineering, Universidad Técnica Federico Santa María, Av. España 1680, Valparaíso, Chile, matias.zanartu@usm.cl

Sonja Kotz, PhD, Professor, Sectie Neuropsychologie, Neuropsychology & Psychopharmacology, Departments, Faculty of Psychology and Neuroscience, Maastricht University, Minderbroedersberg 4-6 6211 LK Maastricht, The Netherlands, sonja.kotz@maastrichtuniversity.nl

Wael El-Deredy, PhD, Professor, Biomedical Engineering School, Universidad de Valparaíso, Gral Cruz 222, Valparaíso, Chile, wael.el-deredy@uv.cl

Classification Performance of Paired Subjects with Vocal Hyperfunction in the Presence of Subglottal Inverse Filtering Uncertainties: Pilot Study under Laboratory Conditions

Objective: Estimation of glottal airflow using an accelerometer mounted to the neck-skin is a practical approach for clinicians to assess vocal pathologies in a non-stationary (or ambulatory) setting. The Impedance-Based Inverse Filtering (IBIF) allows for estimating the glottal airflow from a neck-skin acceleration signal during running speech. Since it is a subject-specific filter, parameters based on neck-skin properties (referred as Q parameters) are needed for this purpose. The natural uncertainty of the parameter estimation process may have an impact upon the differentiation and/or classification task between control and pathological groups. In this study, we investigate how the uncertainties of neck-skin properties have an impact on various classification scores.

Methods: Acceleration signals from 8 subjects (4 with phonotraumatic vocal hyperfunction and 4 healthy controls) were recorded reading a phonetically balanced paragraph in Spanish. Q parameters were obtained from stable (in pitch and loudness) and time-varying speech segments using a Particle Swarm Optimization scheme. In addition, probability density functions were estimated to obtain multiple glottal airflow waveforms from Monte Carlo simulations. Frame-based features (e.g. peak-to-peak flow, maximum flow declination rate) were obtained and processed through a L1-Logistic Regression classifier to determine the best classification of patients vs. controls. Classification scores (AUC, Accuracy, F-Scores) were calculated.

Results and Conclusions: We observed differences in the performance of the classification models based on the probabilistic scheme of Q-parameter uncertainties. These results are aligned with prior results from our group in a running speech scenario. Current results show that Q uncertainties from /ae/ gestures range between 10% to 20% approximately, and classification results are slightly affected. This imply that the estimated glottal waveform is robust to small perturbations from the Q parameters.

Juan Pablo Cortés, MS Electrical Engineering, PhD Candidate , Universidad Técnica Federico Santa María, +56 9-5121-9266, juan.cortes.5@sansanso.usm.cl

Víctor M. Espinoza, PhD Elect Eng, BSc Acoustical Eng, Assistant Professor, Universidad de Chile, +56 22 978 1338, vespinoza@uchile.cl

Christian Castro Toro, SLP, BS ,Assistant Professor, Universidad de Valparaíso, +56 9 87759926, christian.castro@uv.cl

Rodrigo Manríquez Peralta, MS Electronic Engineering, Technical Assistant, Universidad Técnica Federico Santa María, +56 9 44366500, rodrigo.manriquezp@alumnos.usm.cl

Alba Testart Tobar, BS SLP, Assistant Professor ENT, Universidad de Playa Ancha de Ciencias de la Educación, +56 9 93242416, albatest@yahoo.fr

Matías Zañartu, PhD Electrical and Computer Engineering, Associate Professor, Universidad Técnica Federico Santa María, +56 32 2652612, matias.zanartu@usm.cl

Modeling Modal, Breathy, and Pressed Voice Qualities: The Role of Intrinsic Laryngeal Muscle Activation

Introduction: Intrinsic laryngeal muscle activation controls both prephonatory posturing and vocal fold tissue properties, thus leading to multiple dynamics and various resulting voice qualities. However, the underlying biomechanical aspects involved in various voice qualities are not yet fully understood.

Objectives: This study aims to delve into the study of intrinsic laryngeal muscular control of a physiologically-inspired voice production model to further understand key biomechanical aspects of modal, breathy, and pressed voice qualities.

Methods: A triangular body-cover model (Galindo et al., 2017) that takes into account gradual anterior-posterior glottal closure and a posterior glottal gap was used to simulate modal, breathy, and pressed voice qualities. The prephonatory posturing scheme proposed by Titze and Hunter (2007) for the five intrinsic muscles was combined with an extended version of the physiological rules for low order models by Titze and Story (2002) to obtain the vocal fold model parameters. Glottal airflow, sound transmission, and acoustic coupling were also included.

Results: Preliminary results suggest that the proposed muscle activation scheme is suitable for mimicking distinct modal, breathy and pressed qualities. Muscle activation maps are presented for selected acoustical features and muscle pairs. The acoustical parameters corresponding to the simulated voice qualities are in general agreement with those reported *in vivo* in prior studies.

Conclusions: Physiologically-based voice production models with comprehensive descriptions of intrinsic laryngeal muscle activation can help to better relate muscle behavior to acoustical, aerodynamic, and kinematic features. Future efforts will be directed to study muscle activation under pathological phonation.

Gabriel A. Alzamendi, PhD, Universidad Técnica Federico Santa María, Chile, +56 9 94866076,
gabriel.alzamendi@usm.cl

Christian Castro Toro, SLP, BS, Assistant Professor, Universidad de Valparaíso, +56 9 87759926,
christian.castro@uv.cl

Sean D. Peterson, PhD, University of Waterloo, Canada, (519) 888-4567 X38722
peterson@uwaterloo.ca

Byron D. Erath, PhD, Clarkson University, USA, (315) 268-6584, berath@clarkson.edu

Matías Zañartu, PhD Electrical and Computer Engineering, Associate Professor, Universidad Técnica Federico Santa María, +56 32 2652612, matias.zanartu@usm.cl

Analysis and Training of Feedback Mechanisms for Phonation and Speech in patients with Muscle Tension Dysphonia (MTD)

Introduction: The analysis of the processes underlying auditory feedback during phonation and speech can be investigated by the pitch-shift reflex (PSR). The PSR is the adjustment of the pitch during phonation/speech in response to a spontaneous pitch change of the auditory feedback. In former studies we analyzed the PSR in normal voices during phonation and speech. With this study we determined the auditory as well as kinesthetic feedback mechanisms of patients with MTD during phonation and speech via the acoustic-, Elektroencephalography (EEG)- and High-Speed Video (HSE) signal.

Methods: 20 subjects with normal voices and 20 subjects with MTD underwent transnasal HSE (8000fps) during sustained phonation [a] and articulation of the disyllabic word ['mama]. While phonating or articulating, the auditory feedback was pitched up for 700 cents, lasting 300ms. Voice response pitch changes, event-related potentials and voice onset parameters from the video signal were determined and analyzed. Statistical analyses were applied to compare feedback mechanisms during pitched and un-pitched condition of the phonation paradigm and speech paradigm within/between both groups.

Results and conclusion: The results do not show any differences between both groups regarding the latency of the pitch perception (latency of the N100 (EEG), MMN (EEG)) and the latency of the voice response. However, the magnitude of the voice response was significantly different during phonation and speech in comparison with the normal voices ($p=.046$). A shorter prephonatory process was obvious but without statistical significance. Due to the results, the first version of a training of the auditory and kinesthetic feedback process will be developed and presented.

Anke Ziethe, PhD, Research assistant, Department of Phoniatics and Pediatric Audiology at the, Department of Otorhinolaryngology Head & Neck surgery, Universitätsklinikum Erlangen, Waldstr. 1, 91054 Erlangen, Germany, +4991318533810, anke.ziethe@uk-erlangen.de

Ulrich Hoppe, PhD, Professor, CICERO - Cochlear Implant Centrum, Department of Otorhinolaryngology – Head and Neck Surgery, Universitätsklinikum Erlangen, Waldstr. 1, 91054 Erlangen, Germany, u.hoppe@uk-erlangen.de

Christopher Bohr, MD, Professor, Department of Otorhinolaryngology Head & Neck surgery, Universitätsklinikum Regensburg, Franz-Josef-Strauß-Allee 11, 93053 Regensburg, christopher.bohr@ukr.de

Michael Döllinger, PhD, Professor, Department of Phoniatics and Pediatric Audiology, Department of Otorhinolaryngology Head & Neck surgery, Universitätsklinikum Erlangen, Waldstr.1, 91054 Erlangen, Germany, +4991318533814, michael.doellinger@uk-erlangen.de

Risk Factors for Voice Disorders Among Emergency Call Center Personnel

Background: There is published data looking at voice disorders amongst teachers and, more closely related, call center personnel and telemarketers. Call center agents have been shown to be at high risk for voice disorders because of increased vocal load secondary to increased vocal demand and protracted speaking times. Emergency communications personnel are voice professionals for whom little literature exists. There are approximately 240 million 9-1-1 calls in the U.S. annually. So, by volume alone, these public safety answering points (PSAP) workers are professional voice users. Unlike call center workers and telemarketers, however, the ability for the caller to clearly understand and emergency communications worker is critical. Because callers call primarily in emergency situations, it is of significantly greater importance that PSAP communication workers have clear, understandable voices.

Objective:

The purpose of this preliminary study is to assess the impact of voice disorders on emergency communications personnel (ECP). We would like to assess sources of risks for voice disorders among this group of professional voice users so that risks and consequent voice disorders can be reduced. Our hypothesis is that ECP have higher risks for voice problems than the general public.

Methods:

Questionnaire/survey inquiring about average length of shift, average number of breaks, confounding factors (smoking, LPR/GERD). Screening Index for Voice Disorders (SIVD) and the Voice Handicap Index (VHI)

Results:

Total of 23 respondents at two Chicago suburban locations (Aurora and Rockford, IL) 20F:3M 17 W, 1 B, 1 Biracial, 4 who declined to answer. Mostly non-smokers, 3 smoked ½ pack per day or less. Most had been working for more than two years. No direct associations between VHI score and SIVD, trends show female predominance, mostly non-smokers, most people use some form of amplification, most have a single, cumulative break rather than interval periods of voice rest.

Conclusions:

Larger sample and further investigation would likely be helpful. We need to determine number to evaluate difference and need to structure how to power the study, but the initial inquiry is of value because of the recognition of a unique category of professional voice users. We plan to expand upon this data to develop more complete hypotheses regarding timing of breaks and the benefit of professional specific education about vocal hygiene.

H. Steven Sims, MD, Director, Chicago Institute for Voice Care, hssims@uic.edu

Jan Potter Reed, MS, CCC-SLP, Voice Specialist, Chicago Institute for Voice Care, jreed26@uic.edu

Changes in Laryngeal Endotracheal Tube-Induced Pressure Secondary to Increased Acuity of the Hypopharyngeal-Laryngeal Angle as seen in the Anterior-Based Larynx

Objective: Posterior glottic stenosis is a potentially devastating complication of oro-tracheal intubation. Canine studies have shown that increasing endotracheal tube diameter leads to increased pressure on the posterior glottis. Prior studies have not accounted for the potential contribution of anatomic variation to these pressure changes, namely the relative anterior position of the larynx to the hypopharynx. We hypothesize that a relatively anterior-based larynx, with a smaller hypopharyngeal-laryngeal angle, would cause the endotracheal tube to rest at a more acute position subsequently exerting an increased amount of pressure on the posterior larynx. The objective of this pilot study was to create a model to simulate this relationship and measure pressure changes associated with alterations to this angle.

Methods/Design: In order to simulate the change in the hypopharyngeal-laryngeal angle as seen with an anterior larynx, a double platform model was created such that relative platform height could be altered to increase angle acuity. Plastic tubing was used to simulate the airway lumen. A flexible pressure sensor was applied to a standard size 6.0 endotracheal tube at the region of assumed laryngeal contact and the endotracheal tube was placed into the tubing, simulating intubation. The model was adjusted to varying relative platform heights and pressure change at the point of “laryngeal contact” was measured.

Results: Voltage signals generated by the flexible pressure sensor were recorded at varying platform heights, specifically 6 cm, 7.6 cm and 8.8 cm. Recorded voltage signals at these heights corresponded to respective pressure measurements of 243 Pa, 493 Pa and 843 Pa.

Conclusions: These results demonstrate increased relative pressure measurements with increase in platform height, which simulates increased acuteness of the hypopharyngeal-laryngeal angle. This study demonstrates the potential impact of altering this angle and validates the use of a simulation model to further assess this relationship.

Kinneri Mehta, MD, Resident Physician, University of Connecticut Health Center – Department of Otolaryngology-Head and Neck Surgery, Farmington, CT, (860) 679-6522, kmehta@uchc.edu

Eli Curry, BS, Graduate Student, University of Connecticut Institute of Materials Science – Department of Mechanical Engineering, Department of Biomedical Engineering, Storrs, CT, (860) 486-2415, eli.curry@uconn.edu

Thanh Duc Nguyen, PhD, Assistant Professor, University of Connecticut Institute of Materials Science – Department of Mechanical Engineering, Department of Biomedical Engineering, Storrs, CT, (860) 486-2415, nguyentd@engr.uconn.edu

Denis Lafreniere, MD, Professor of Surgery, Chief, Division of Otolaryngology, University of Connecticut – Department of Otolaryngology-Head and Neck Surgery, Farmington, CT, (860) 679-6522, lafreniere@uchc.edu

Vocal Fold and Arytenoid Cartilage Motion During Inspiration and Phonation After Three-Dimensional Reconstruction of Dynamic CT

Dynamic CT was used to quantify vocal fold motion characteristics, including cartilage movement and soft tissue changes during inspiration and phonation. Dynamic CT scans were performed on five subjects who had verified normal voices by a trained voice doctor. CT scans were taken of the subjects' larynx during the inspiratory and phonation /i:/ process to obtain 10 time phases during a 5 second scan.

Cartilage and soft tissue laryngeal 3D models were segmented and reconstructed for each of the 10 time phases using Materialise Mimics software. The cartilage 3D models and the vocal fold 3D models were divided into the inspiratory phase and the phonatory phase after the reconstruction, in which the rotation angles of the arytenoid cartilage on the cricoid cartilage, the anterior and posterior displacement of the arytenoid cartilage, and the length of the vocal fold were measured. Rotation about the longitudinal axis, sagittal axis, and horizontal axis were defined as roll, pitch, and yaw respectively.

The results show that the yaw angle of the arytenoid cartilage is statistically significant between the inspiratory phase and the phonation phase, although there was no statistical significance for roll and pitch angles. Furthermore, there was no significant difference in the distance between the upper margin of the cricoid cartilage and arytenoid cartilage muscular process or in the distance between the upper margin of the cricoid cartilage and arytenoid cartilage muscular process, between the inspiratory and the phonation phases. However, there was significant difference in the length of the vocal folds between the inspiratory phase and the phonation phase. Dynamic CT with three-dimensional reconstruction has proven to be a successful method for noninvasively visualizing and quantifying a variety of dynamic characteristics of vocal fold motion.

Parameters that were able to be quantified from this method including, angle of rotation of the arytenoid cartilage, displacement of the anterior and posterior of the arytenoid cartilage, and the length of the vocal folds, have significance for quantifying normal vocal fold motion changes, objectively analyzing vocal fold motion, and may be applied to the diagnosis of patients with vocal fold motion lesions.

Huijing Bao, MD, MS, Student, baohuijingzb@126.com

David Piotrowski, PhD Student

Zheyi Zhang, MD, Assistant professor

Xinlin Xu, MD, MS, Assistant Professor, xinlin66544566@163.com

Jinan Wang, MD, Associate Professor

Peiyun Zhuang, MD, MS, Professor, Dept. of Otolaryngology, Xiamen University, Zhongshan Hospital, No 201, Hubin South Road, Fujian, P.R. China, +861300398989, peiyun_zhuang@yahoo.com

Jack Jiang, MD, PhD, Professor, University of Wisconsin, Madison Dept. of Surgery, Division of Otolaryngology, Head and Neck Surgery, (608) 265-9854, jjjiang@wisc.edu

Using RSI and RFS Scores to Differentiate between Reflux-related and other Types of Chronic Laryngitis

Introduction: Chronic laryngitis may be caused by inflammatory, infectious, allergic or traumatic events. Reflux laryngitis and allergic laryngitis are both highly prevalent and may be associated. Clinical diagnosis is challenging.

Objectives: To try to differentiate between allergic and reflux-related laryngitis based on the Reflux Symptom Index and the Reflux Finding Score.

Methods: The RSI and RFS scores of ninety-seven adults with chronic laryngitis were compared based on a history of allergies alone (Group I), laryngopharyngeal reflux alone (Group II) or both (Group III). Patients were paired by age and gender. Statistical analysis was carried out with a significance level at $p \geq 0.05$.

Results: There was no statistically significant difference between RSI and/or RFS scores between groups, although a trend towards higher scores was observed in patients that presented an association between allergic laryngitis associated with LPR. Another interesting association was observed between LPR and obstructive sleep apnea.

Discussion: Symptoms and inflammatory signs found in chronic laryngitis are common to a number of etiologies. Instruments such as the RSI and the RFS should not be used as the sole means of establishing an association with GERD and LPR.

Conclusions: The RSI and RFS scores were not able to differentiate between patients with reflux and non-reflux related causes of chronic laryngitis.

Claudia Eckley, MD, PhD, Flaury Medicina e Saude, Av. Vereador Jose 'Diniz', 3457 CJ. 501, Sao Paulo, Brazil, +55 11 983856024, claudia.eckley@grupofleury.com.br

Rodrigo Tangerina, MD, Attending Physician, Brazil, rodrigo.tangerina @grupofleury.com.br

Adriana Chaves, MD, Attending Physician, Brazil, adriana.chaves@grupofleury.com.br

Karen Lopes, MD, PhD, Attending Physician, Brazil, karen.lopes@grupofleury.com.br

Sensitivity and Specificity of the Brazilian Version of the Reflux Symptom Index

Introduction: The diagnosis of Laryngopharyngeal Reflux (LPR) is controversial and mostly clinical. The Reflux Symptom Index (RSI), is the most widely used questionnaire in clinical practice for diagnosis and outcome monitoring, and has been translated to over 7 languages, including Brazilian Portuguese.

Objective: To study the sensitivity and specificity of the Brazilian Portuguese version of the RSI (Índice de Sintomas de Refluxo – ISR).

Methods: The ISR of 80 patients with chronic laryngitis associated with GERD was compared to that of 80 healthy controls matched by gender and age.

Results: A significantly higher mean ISR was found in patients when compared to controls ($P<0,001$). Sensitivity was 0.95 and specificity was 1.0 for an ISR cutoff of 13.

Conclusion: The Brazilian version of the Reflux Symptom Index, the “Índice de Sintomas de Refluxo”, proved to be a reliable, sensitive and valid instrument for diagnosis of LPR.

Claudia Eckley, MD, PhD, Flaury Medicina e Saude, Av. Vereador Jose ‘Diniz , 3457 CJ. 501, Sao Paulo, Brazil, +55 11 983856024, claudia.eckley@grupofleury.com.br

Rodrigo Tangerina, MD, Attending Physician, Brazil, [rodrigo.tangerina @grupofleury.com.br](mailto:rodrigo.tangerina@grupofleury.com.br)

Adriana Chaves, MD, Attending Physician, Brazil, adriana.chaves@grupofleury.com.br

Karen Lopes, MD, PhD, Attending Physician, Brazil, karen.lopes@grupofleury.com.br

Pathogenic Role of Reinke's Edema in Snoring and Obstructive Sleep Apnea

Objective: To investigate the association between vocal fold reinke's edema, snoring and obstructive sleep apnea.

Design/Methods: Twenty five patients diagnosed with reinke's edema and 25 patients with normal laryngeal examination, matched according to age, gender and body mass index were recruited for this prospective study. Demographic data included age, gender, and body mass index (BMI). All patients filled the Berlin Questionnaire, STOP-BANG Questionnaire, and the Epworth Sleepiness Questionnaire.

Results: Out of 25 patients with reinke's edema, 36% had OSA as evidenced by having 2 or more positive categories in the Berlin Questionnaire. In the control group, only 1 out of 25 subjects had OSA. The difference between the two groups was statistically significant ($p\text{-value}=0.005$). With respect to Epworth Sleepiness Scale and the Stop Bang Apnea Questionnaire ($p\text{-value} > 0.05$), there was no statistically significant difference between the two groups.

Conclusion: This investigation revealed higher prevalence of snoring and obstructive sleep apnea in patients with reinke's edema as evidenced by the Berlin Questionnaire. The caring physician should be alert to symptoms of airway obstruction for possible early intervention.

Elie Khalifee, MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, ek30@aub.edu.lb

Abdul-Latif Hamdan, MD, EMBA, MPH, FACS, Professor, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, ah77@aub.edu.lb

Pierre Abi Akl . MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, pa18@aub.edu.lb

Anthony Ghanem MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, ag60@aub.edu.lb

Aya El Hage MPH, Research Assistant, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, aah63@mail.aub.edu.

Application of Thulium Laser as Office-Based Procedure in Patients with Benign Vocal Fold Lesions

Objective: To report the treatment outcome of office-based thulium laser in the management of benign vocal fold lesions.

Methods/Study Design: This is a retrospective chart review of all patients who underwent thulium laser treatment for benign vocal fold lesions as an office-based procedure under local anesthesia. Demographic data included age, gender, diagnosis and smoking history. Outcome measures used included: Voice Handicap Index-10, perceptual evaluation using the GRBAS grading system and extent of regression of the lesions as seen on laryngeal endoscopic examination.

Results: A total of 35 patients were enrolled in this study. These consisted of 25 males and 10 females with a mean age of the total group of 53.71 ± 14.44 years. The total number of vocal fold lesions was 42. The most common pathology observed was vocal fold polyp (n=24 patients), followed by Reinke's edema (n=7 patients). Review of available endoscopic recordings post-treatment (28 subjects with 32 vocal fold lesions) revealed complete regression of the disease in 26 out of 32 lesions, and partial regression in 6. There was a significant decrease in the mean VHI-10 (p-value< 0.001) and in the mean of all the perceptual parameters, namely GRBAS (p-value< 0.001) before and after treatment.

Conclusion: Thulium laser treatment under local anesthesia as an office based procedure is a safe and effective mode of treatment for benign vocal fold lesions.

Elie Khalifee, MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, ek30@aub.edu.lb

Abdul-Latif Hamdan, MD, EMBA, MPH, FACS, Professor, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, ah77@aub.edu.lb

Hussein Jaffal, MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, drhusseinjaffal@gmail.com

Anthony Ghanem MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, ag60@aub.edu.lb

Pierre Abi Akl, MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, pa18@aub.edu.lb

Aya El Hage MPH, Research Assistant, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, aah63@mail.aub.edu.

The Prevalence of Dysphonia and Dysphagia in Patients with Vitamin D Deficiency

Objective: To investigate the prevalence of phonatory and swallowing symptoms in patients with hypovitaminosis D.

Methods/Design: All patients presenting to the endocrinology clinic and investigated for vitamin D deficiency between January 2018 and April 2018 were asked to participate in this study. Demographic data included age, gender, allergy, and history of smoking. Patients filled Voice handicap Index (VHI-10) and Eating Assessment Tool (EAT-10).

Results: A total of 136 consecutive subjects presenting to the endocrinology clinic for vitamin D testing were included: 60 with hypovitaminosis D and 76 with no hypovitaminosis D. The mean vitamin D level in the study group and controls was 13.25ng/ml and 31.91ng/ml, respectively. There was no significant difference in the mean score of VHI-10, nor in the mean score of EAT-10 in patients with hypovitaminosis D vs. those with no hypovitaminosis D (p value >0.05).

Conclusion: There was no significant difference in the prevalence of phonatory and dysphagia symptoms using VHI-10 and EAT-10 questionnaires between subjects with hypovitaminosis D and those with normal serum vitamin D levels.

Elie Khalifee, MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, ek30@aub.edu.lb

Abdul-Latif Hamdan, MD, EMBA, MPH, FACS, Professor, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, ah77@aub.edu.lb

Nader El Souky, MD, Research fellow, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, naa84@mail.aub.edu

Pierre Abi Akl . MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, pa18@aub.edu.lb

Anthony Ghanem MD, Resident, Department of Otolaryngology – Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, ag60@aub.edu.lb

Sami Azar, MD, Professor, Department of Internal Medicine, American University of Beirut Medical Center, Beirut, Lebanon, 009611350000, sazar@aub.edu.lb

Safety and Efficacy of Apneic or Intermittent Apneic Anesthesia for Vocal Fold Injection Medialization

Objective: The objective of this study was to assess apneic and intermittent apneic anesthesia for vocal fold injection medialization cases

Design: Prospective, observational study

Methods: In a prospective study, 16 adults over the age of 18 underwent apneic or intermittent apneic anesthesia for laryngoscopy with vocal fold injection medialization from June 2018 to date at a tertiary referral institution. Correlations between Anesthetic agents, BMI, ASA Class, operating time, and complications within thirty days of surgery were examined.

Results: At this time there are 16 patients enrolled in the study, recruitment will end on February 1, 2019. The study will be concluded March 1, 2019. Preliminary data yields that intermittent apneic anesthesia is safe for vocal fold injection in patients with BMI ranging from 19 to 40, ASA classes 2 to 4. Operating times range from 1 minute to 10 minutes with the threshold for ventilation being oxygen desaturations to 89%. Most common intra-operative events observed have been tachycardia/arrhythmia and hypertension.

Conclusions: The use of apneic or intermittent apneic anesthesia for vocal fold injection is safe and effective for operating times less than 10 minutes.

Mausumi Syamal, MD, Voice & Airway Surgeon, Lehigh Valley Health Network, 3701 Corriere Road-Suite 26. Easton, PA 18045, (484) 591-7150, Mausumi_N.Syamal@lvhn.org

Jill Hanisak, CRNA, Nurse Anesthetist, Lehigh Valley Health Network, Cedar Crest Hospital, 1200 South Cedar Crest, Allentown, PA 18103, (610) 402-1374, jill.hanisak@lvhn.org

Use of Corticoids in Phonotrauma: a Prospective Comparative Analysis

Objective: Phonotrauma represents a situation of excessive or inadequate voice use, under improper, unusual or unexpected conditions. Clinically the patient complains of dysphonia, and may present with acute laryngitis, with formation of exudate and erythema in the laryngeal mucosa. Although it is a common finding in clinical practice, its treatment is not well defined in literature. Corticosteroid therapy has been widely used to treat acute phonotraumatic laryngitis. However, despite its indiscriminate use in clinical practice, there are few experimental studies on the use of steroids in humans for the treatment of this condition. The present study has the objective of evaluating the effect of oral steroids in the treatment of dysphonia caused by acute phonotrauma.

Methods: Twenty-three young adults complaining of dysphonia after vocal abuse associated with 3–10 day exposure to intense cheering in University sports events were randomly assigned to either treatment with a five-day course of oral steroids (40 mg prednisone once daily) or placebo. Subjects were evaluated prior to attending the events, 24–72 hours after returning, and after completion of treatment through videolaryngostroboscopy (VLS), perceptual analysis, and acoustic measures.

Results: There was no significant difference in time to improved dysphonia between the two groups, with a mean time to voice return of 4.1 days for the control group and 4.1 days for the prednisone group ($p = 0.959$). There was no significant difference between the groups in improvement of clinical parameters as measured by VLS, perceptual analysis, and acoustic measures ($p > 0.05$).

Conclusions: There was no difference in treatment efficacy between the control and prednisone groups.

Renata Santos Bittencourt Silva, MSc, MD, Assistant Doctor, Hospital da Santa Casa de Misericórdia de São Paulo, Department of Otorhinolaryngology, São Paulo, Brazil, +5511999991098, renatasbsilv@gmail.com

André de Campos Duprat, PhD, Professor, Hospital da Santa Casa de Misericórdia de São Paulo, Department of Otorhinolaryngology, São Paulo, Brazil, + 551121767235, adcduprat@gmail.com

Adriana Passos Bueno, Medical Student, Faculdade de Ciências Médicas da Santa Casa de São Paulo, São Paulo, Brazil, +551121767235, apbueno05@hotmail.com

Giovana Zucchini Rondini, Medical Student, Faculdade de Ciências Médicas da Santa Casa de São Paulo, São Paulo, Brazil, +551121767235, Giovana.zucchini@gmail.com

Vocal Characteristics after Thyroidectomy

Objective. The purpose of this study was to determine the long-term impact (i.e. 10 years postoperative) of a thyroidectomy without laryngeal nerve injury, on the vocal characteristics.

Design/Methods. Forty-four subjects who underwent a thyroidectomy between September 2006 and May 2007, and who participated in our previous study (Van Lierde et al., 2010), were contacted to participate in this follow-up research. Eighteen subjects (12 women and 6 men, mean age 54 yrs., range 28-76 yrs.) agreed to participate and received a multidimensional voice assessment consisting of objective (aerodynamic assessment, maximum phonation time, acoustic analysis, voice range, Dysphonia Severity Index) and subjective (auditory-perceptual evaluation, subject's self-report, videolaryngostroboscopy) vocal outcomes. These long-term results were compared with the preoperative and short-term postoperative (1 week and 6 weeks) results of the previous study (Van Lierde et al., 2010).

Results. No differences were found between the current long-term follow-up results and the previous pre- and post-operative results, except for the auditory-perceptual grade and the shimmer. The general grade of hoarseness was rated lower at long-term follow-up compared with the first post-operative result (1 week). The shimmer was higher at long-term follow-up compared with the pre- and post-operative results.

Conclusions. Results suggest that thyroidectomy does not cause permanent changes in vocal characteristics. Ten years postoperative, subjects have a normal objective and perceptual vocal quality and experience no psychosocial limitations. Only the shimmer increased compared with the previous assessments.

Kristiane Van Lierde, PhD, Professor, Professor, Head of the master program Logopaedic and Audiological Sciences, Chair FCIGG, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University; Department of Speech-Language Pathology and Audiology, University of Pretoria, Pretoria, South Africa, +32 9 332 23 91, kristiane.vanlierde@ugent.be

Huvenne Wouter, MD, PhD, Professor, Head and neck surgeon, Department of Head, Neck & Maxillofacial Surgery, Ghent University, wouter.huvenne@uzgent.be

Lena Servayge, MSc, Logopaedic and Audiological Sciences, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University

Orphee Versavel, MSc, Logopaedic and Audiological Sciences, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University

Iris Meerschman, PhD, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University, +32 9 332 94 73, iris.meerschman@ugent.be

Sofie Claeys, MD, PhD, Professor, ENT doctor, Department of Otorhinolaryngology, Ghent University, Belgium, sem.claeys@ugent.be, sofie.claeys@uzgent.be

Evelien D'haeseleer, PhD, Professor, Speech-language Pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University, +32 9 332 24 67, evelien.dhaeseleer@ugent.be

The Compensatory Movement on Contralateral Vocal Cord of the Patients with Unilateral Vocal cord Paralysis

Objective: Some studies showed that patients with unilateral vocal cord paralysis in PET-CT examination often produce false positive results in the contralateral cricoarytenoid, where the metabolism may be higher, and this place may be the performance of the contralateral compensatory of these patients. In this paper, by comparing the video frames of the contralateral vocal cords of the patients with unilateral paralysis vocal fold and vocal cords in normal subjects in stroboscopic laryngoscope. The study was to explore the contralateral compensatory movement on the vocal cords of the patients with unilateral vocal cord paralysis.

Methods: We collected 14 patients with unilateral vocal cord paralysis and 14 cases of normal subjects stroboscopic laryngoscope, these subjects were divided into vocal cord paralysis group and normal group, analyzing excessive adduction of the contralateral vocal cords of vocal cord paralysis group, vocal cords adduction video frames feature in stroboscopic laryngoscope video. The independent sample t-test was used to compare analysis between the two groups of data. We also analyzed PET-CT images of 4 patients with unilateral vocal cord paralysis.

Results: 4 patients with unilateral vocal cord paralysis of the contralateral cricoarytenoid joints had a higher metabolic phenomenon; 50% the contralateral adduction of the vocal cords of the patients with unilateral vocal cord paralysis were over the midline; the contralateral adduction of the vocal cords in patients with vocal cord paralysis had a shorter video frames, much smaller than the normal group, the difference was statistically significant ($P < 0.01$); vocal cord abduction video frames in vocal cord health side of patients with unilateral vocal fold paralysis were less than the normal group, there was no statistically significant difference ($P > 0.05$).

Conclusion: patients with unilateral vocal cord paralysis existed faster adduction compensation in the contralateral vocal cords adduction performance, the contralateral cricoarytenoid joints metabolism in patients with unilateral vocal cord paralysis was higher.

Key words: vocal cord paralysis, vocal cord compensatory movement

Xinlin Xu, MD, Doctor, Xiamen University Zhongshan Hospital,
+8618250867320, xinlin66544566@163.com

Peiyun Zhuang, MD, Doctor, Xiamen University Zhongshan Hospital, +8613003989899,
peiyun_zhuang@yahoo.com

Pain Perception during Injection of Botulinum Toxin for Spasmodic Dysphonia

OBJECTIVE: There has been recent interest in level of pain perception during interventions. For example, one study looked into pain perception during injections into the vocal fold under local anesthesia¹. Botulinum toxin injections are performed into the larynx with no anesthesia, and we are unaware of any research looking into discomfort during these type of injections. Our research question is, 'how painful are botulinum toxin injections into the larynx without local anesthesia?'

METHODS/DESIGN: This is an observational audit undertaken on 18 patients in a single center by the same surgeon. The injection material is dysport (botulinum toxin) through a hollow- bore Teflon- coated needle, with EMG guidance to identify the appropriate muscle (in this instance the thyroarytenoid was the chosen muscle). Outcome measures included: Short Form McGill Pain Questionnaire (SF-MPQ); Visual Analogue Scale; Heart rate (HR) including maximal HR during procedure; Systolic and Diastolic Blood Pressure (BP). SF-MPQ, HR and BP were performed pre, immediately post and 20 minutes post injection

RESULTS: 2 patients were excluded due to past medical history leaving an N of 16. Amount of Dysport injected (per side) ranged from 1-3.75 units, 13 patients had unilateral injections, 3 had bilateral injections.

VAS (1-100, mean SD) Pre score 0.94, post score 9.31, $p=0.024$

SBP (mm HG) Pre 136.71, post 140.23, $p=0.314$

DBP (mm Hg) Pre 68.79, Post 78.33, $p=0.006$

HR (bpm) Pre 79.19, Post 75.75, $p=0.139$

McGill Pre (Median, IR) 0(0), Post 0.5 (1.5) Median difference 0.5 (0to1) $p=0.016$

Conclusion: There were some statistically significant findings (mildly raised VAS, DBP, McGill). That said, clinically, only a few patients reported mild pain and the injections were well tolerated. Further studies with larger n are indicated.

¹Crawley BK et al. *Perception and duration of pain after office-based vocal fold injection augmentation*. Laryngoscope 2018 128(4): 929-934

John S Rubin MD FACS FRCS, Royal National Throat Nose and Ear Hospital, University College London NHS Trust, 330 Grays Inn Road London WC1X 8DA ENGLAND, +44 207 232 1653, john.rubin@nhs.net

Henry Zhang MB BS, Specialist Registrar, UCLH, +44 7921265304, henry.zhang@nhs.net

Development of a New Clinical Applicable High-Speed Videoendoscopy System

Objective: High-speed videoendoscopy (HSV) is outperforming classical videostroboscopy for vocal fold examination. However, a current limitation is the usability of the system in a clinical setting in both means, hardware and software-wise. Current systems are bulky, complex to operate from examination to analysis, and the whole process is very time consuming. Further, currently clinical used cameras are out-dated and followed by much more powerful and compact systems. The goal of the project is to develop a new state-of-the-art HSV system including a clinical useable software tool for data analysis.

Methods: We use commercially available high speed cameras with a very small footprint directly attached to the endoscope. Further, we plan to integrate a highly efficient LED light source sufficient to illuminate the vocal folds in a decent quality. Optimizing the optics between endoscope and camera will improve the coverage of the region of interest, i.e. the vocal folds, on the camera chip.

Using a custom-written interface to the camera we can stream the video after acquisition to a computer for further postprocessing and clinical analysis. We will utilize deep learning algorithms to segment the glottis automatically and objectively. An optimized user interface will allow the examiner to easily determine important clinical parameters and their position relative to the parameters' distribution to healthy control subjects.

Results/Conclusions: Recent advances in camera sensors and design will allow us to build a light-weight HSV system capable of imaging vocal folds in a full field of view with desired 8,000 fps with at least one megapixel resolution. The presentation will discuss the process and ideas of the HSV system development and gives an overview on state-of-the-art technologies.

Andreas Kist, MSc, PhD student, University Hospital Erlangen, Medical School, Department of Otorhinolaryngology – HNS, Department of Phoniatics and Pediatric Audiology, Waldstr. 1, 91054 Erlangen, +49 9131 85-32618, andreas.kist@uk-erlangen.de

Ingolf Franke, Manager, WEVOSYS medical technology GmbH, Am Ellersgraben 24, 96148 Baunach, www.wevosys.com, +49 9544 985880, i.franke@wevosys.com

Aline Schollbach, Development Engineer, WEVOSYS medical technology GmbH, Am Ellersgraben 24, 96148 Baunach, www.wevosys.com, +49 9544 985880, a.schollbach@wevosys.com

Michael Döllinger, PhD, Professor, University Hospital Erlangen, Medical School, Dept. of Otorhinolaryngology – HNS, Dept. of Phoniatics and Pediatric Audiology, Waldstr. 1, 91054 Erlangen, +49 9131 85-33814, michael.doellinger@uk-erlangen.de

What is the Contact Granuloma Telling You?

OBJECTIVE:

Vocal process granulomas are benign laryngeal lesions with controversial treatment and a tendency to recur. According to the recent literature the most common management options include voice therapy and antireflux pharmacotherapy, intralesional steroid injections, botulinum toxin injections, and surgical excision. The aims of this article are to focus on experiences of the own treatment strategies for primary lesions and recurrences and the outcome in the daily office.

BACKGROUND:

We reviewed the medical records of 111 patients with a diagnosis of contact granuloma or vocal process granuloma between January 1997 and October 2018 and included 53 patients, who had follow-up data available for review. All patients had to complete the RSI and VHI questionnaires and were treated with twice-daily proton pump inhibitors step down, dietary advices, life style change with anti-stress management and semioccluded vocal tract therapy (SOVT). The oropharyngeal Ph-Measurement by Restech System was necessary at 13 Patients to clarify the underlining reflux disease and the life style habit.

CONCLUSION:

The contact granuloma tells us following answer:

In our experience the mainstay treatment for the reduction, and/or complete resolution of contact granuloma in the daily inoffice situation is necessary:

- Antireflux medication when combined with lifestyle changes,
- Dietary advices and to correct vocally abusive behavior with SOVT
- Anti-Stress Management

KEYWORDS:

antireflux treatment; benign; gastroesophageal reflux; larynx; proton pump inhibitors; semioccluded vocal tract therapy; life style, dietary advices, vocal process granulomas vocally abusive behavior, anti-stress management

Josef Schlömlcher-Thier, MD, ENT and Occupational Medicine, Austrian Voice Institute, Salzburgerstrasse 7, A-5202 Neumarkt, Austria, +4362164030, Fax: +436216403020, austrianvoice@sbg.at, hno-schloemicher@sbg.at

İlter Denizoglu, MD, MSc, PhD candidate, MedicalPark Health Center, Department of Otorhinolaryngology – HNS, Unit of Clinical Vocology, Izmir, Turkey, +905424140231, ilterdenizoglu@yahoo.com

Hyperkinetic Vocal Fold Paresis: A Definite Clinical Entity

Objective: The diagnosis of paresis is challenging based on endoscopy alone. Image analysis of abduction and adduction may yield useful information regarding dynamic timing and speed of vocal function.

Study design: Image analysis of videostroboscopy motion.

Methods: Twenty patients with suspected paresis were studied. Video montage of adduction and abduction was assembled with 10 video frames each with 66 milliseconds between each frame. The line corresponding to each membranous vocal fold was captured for motion analysis. Glottis angle, vocal fold length and rate of angular change for each gesture were analyzed.

Results: Seven of 20 patients were felt to have hyperkinetic vocal fold paresis. This is based on greater than 5 degree angular change on the paretic side compared to the normal side. In 43% of patients, laryngeal electromyography (LEMG) confirmed the side of paresis. Other clinical findings on stroboscopy, such as a more lateral vocal fold and atrophy, suggested the paretic side despite greater motion. The remaining patients did not have LEMG.

Conclusion: There is a subset of patients with suspected vocal fold paresis in whom objective measures show greater abduction or adduction than the normal side. This has been confirmed with LEMG. We coin this hyperkinetic vocal fold paresis. Other factors, such as configuration and atrophy can factor in the diagnosis of paresis, but LEMG for confirmation secures the diagnosis. This is the first report of this interesting clinical entity.

Benjamin Rubinstein, MD, Fellow, Laryngology, Department of Otolaryngology – HNS, Icahn School of Medicine at Mount Sinai, New York, NY, 212-241-8331, drbenrubinstein@gmail.com

Benjamin Woo, MD, Professor, Laryngology, Department of Otolaryngology – HNS, Icahn School of Medicine at Mount Sinai, New York, NY, 212-580-1004, peakwoo@peakwoo.com

Food Allergies in Voice Pathology

Introduction

Food can give late allergical reactions, these can produce increase in peptic acid and changes in the bowel. Intolerance, hyperreactivity and food allergy are pathologies that can cause reflux. Gastritis and colitis help also to have reflux. Fast eating and limited chewing avoid the correct lower esophageal sphincter closure. A good digestive transit influences the extraesophageal symptoms and signs. The combination of respiratory and food allergies increases the irritation of larynx and pharynx due to reflux. The slow digestive processing for some food favours the reflux pathologies.

To examine the different respiratory and food allergies of the most frequent food eaten by each patient is important.

Method

In our group of 401 voice patients the most frequent food allergies are analyzed.

Food allergy in serum Rast test was examined.

Results

The highest products that cause allergic reactions in our group are milk and milky products.

Beef, eggs and apple showed very strong allergy in both genders.

Discussion

Food allergy has to be known in detail to avoid late response of the gastric mucosa that originates more possibilities for reflux.

If we have to use our voice late in the evening, for a conference, acting or performance on stage, it is an advice to eat carbohydrates and proteins at least two hours before and only a light dinner after performance.

Scheduling at least five meals in a day helps preventing reflux.

Conclusions

Food allergy is important to be examined in patients with voice pathology. Rotatory diet and desensitization treatment and immunoregulators help to avoid symptoms that increase reflux. Voice hygiene program must have food advice in order to prevent food allergies. Overload in the immune system has to be diminished.

R. Eugenia Chávez Calderón MD, PhD, Director of Centro de Foniatría y Audiología, President of Collegium Medicorum Theatri 2018-2020, Centro de Foniatría y Audiología, + 52-55-56632073, eugeniachavez@hotmail.com

Injection Augmentation with Autologous Fat for Glottic Insufficiency: Outcomes, Complications and Lessons Learned

Introduction:

Autologous fat has a long and successful track record as a deep vocal fold injection augmentation material for improving both paralytic and non-paralytic glottic insufficiency. Autologous fat can be used and prepared in a fashion that allows it to be a temporary injectable as well as a permanent graft. Its effectiveness compared to other medialization materials has been studied. Prior reports regarding the effectiveness of autologous fat injection augmentation have limited subject numbers but demonstrate effectiveness in acoustic, aerodynamic measures as well as improved quality of life. This study intends to evaluate and add to the literature the largest single institution cohort to date of patients who received only deep, autologous fat injection augmentation for glottic incompetence of varying etiologies.

Method:

A retrospective chart review was performed to identify all patients who had received an injection augmentation using autologous fat for glottic insufficiency. The primary etiology for the glottic insufficiency was noted in addition to any concomitant laryngeal pathologies. Primary outcome measures were change in Voice Handicap Index 10 (VHI-10) from initial presentation to 3 months post augmentation, blinded pre-/post- audio perceptual ratings and frame by frame analysis of phase closure during vibration from laryngovideostroboscopy. Pre-/Post- treatment VHI-10 scores were analyzed with paired comparison T-test.

Results:

A total of 57 patients met criteria over the 4 year period investigated. The most common etiologies for subtle glottic insufficiency were unilateral paresis (23) and true vocal fold atrophy (28). Unilateral true vocal fold paralysis (9) was less commonly treated with autologous fat augmentation. The majority of patients underwent diagnostic vocal fold augmentation before permanent autologous fat augmentation and this will be discussed. A wide variety of concomitant diagnoses were identified which included subepithelial lesions, scar/sulcus, vocal process granuloma, Reinke's edema essential vocal tremor, adductor spasmodic dysphonia and Parkinson's disease. Of the 57 patients, 2 were taken back to the OR for debulking of the fat graft due to overaugmentation. The average initial VHI-10 was 24.80 and average post-augmentation VHI-10 after 3 or more months was 16.44. The average improvement in VHI-10 was 8.36. Post-treatment VHI-10 scores were significantly lower than pre-treatment VHI-10 ($p=0.00008$). Audio-perceptual ratings and frame by frame analysis of open vs. closed phase are being collected at the time of abstract submission and will be reported.

Conclusion:

Deep injection augmentation using autologous fat remains an effective method of improving glottic insufficiency. VHI-10 demonstrated improvement in the cohort. Further conclusions will be reported including audio perceptual ratings and frame by frame analysis of glottic closure.

Christie DeLuca, MS, CCC-SLP, Voice Pathologist, Brigham and Women's Hospital,
cdeluca1@bwh.harvard.edu

Thomas L Carroll, MD, Director, Brigham and Women's Voice Program, Brigham and Women's Hospital, Division of Otolaryngology, 45 Francis Street, Boston, MA 02115, Harvard Medical School, (617) 525-3000, Fax: (617) 525-6544, tcarroll1@partners.org

Douglas F. Roth, MM, MA, CCC-SLP, Associate Director, Voice and Swallowing Center, Assistant Professor, Tufts University, School of Medicine, Speech Language Pathology and Audiology, 800, Washington St #823, Boston, MA 02111, Droth@tuftsmedicalcenter.org

Phonetically Informed Smoothed Cepstrum Calculations on Connected Speech to Objectively Measure Dysphonia

Objective: Voice disorders are common: the NIDCD reports that at least 7.5 million people in the United States have vocal problems. To address this issue, voice scientists have developed objective vocal health measurements. To study those measurements further, vocal health practitioners have collected and organized speech databases. One standard for perceptual evaluation of the voice is the GRBAS Scale. This scale achieves strong perceptual agreement among medical professionals with respect to a speaker's vocal health. In broad terms, dysphonia represents difficulty in producing phonation. As such, traditional voicing detection algorithms can fail on dysphonic voices.

Methods: Recordings of the voiced sentence, "Marvin Williams is only nine," were undertaken for 277 speakers. The center point of each lexically stressed vowel in the words, "Marvin," "Williams", "only," and "nine" was hand-labeled to create four targeted neighborhoods. The specific locations offered an opportunity to perform phonetically informed analyses, as opposed to global calculations over the whole utterance.

Results and Conclusions: An objective measurement called the Smoothed Cepstrum (CPPS) was applied to each utterance to obtain 87% sensitivity/90% specificity when evaluated with respect to the GRBAS perceptual rating of "Grade." Table 1 displays a near replication in Row 1. Row 2 displays results from the average of the four CPPS values. Row 3 displays results from the concatenation of the four vowels. The presentation will explain these results and provide implications for the automation of the methods.

Description	Sensitivity	Specificity	Pospredict	Negpredict
Nearly replicated results	87%	91%	54%	78%
Mean CPPs of four stressed vowels	94%	90%	84%	82%
CPPS of four concatenated stressed vowels	91%	92%	86%	82%

Table 1. Connected Speech Results, 277 Samples

Kathleen M. Murray, MSE, Instructor, Department of Otolaryngology–Head & Neck Surgery, Drexel University College of Medicine, 219 N. Broad St. 10th Floor Philadelphia, PA 19107 U.S.A. , (215) 762-5530, kathleen.murray@drexel.edu

Robert Thayer Sataloff, MD, DMA, FACS, Professor and Chairman Department of Otolaryngology–Head & Neck Surgery, Drexel University College of Medicine, Senior Associate Dean for Clinical Academic Specialties, Drexel University College of Medicine. Faculty, The Academy of Vocal Arts, Chairman, Board of Directors of the Voice Foundation. Chairman, American Institute for Voice and Ear Research, 219 N. Broad St. 10th Floor Philadelphia, PA 19107 U.S.A. , (215) 762-5530, rtsataloff@phillyent.com

Yolanda D. Heman-Ackah, MD, MS, Clinical Professor, Philadelphia Voice Center, Drexel University, College of Medicine Dept. of Otolaryngology - Head and Neck Surgery, 219 N. Broad St. 10th Floor Philadelphia, PA 19107 U.S.A. , (484) 270-8095, ydhemanackah@phillyvoicemd.com

Vocal Outcomes of Common Procedures in Otolaryngology: A Systematic Review and Meta-Analysis

Objective: To systematically review the literature regarding subjective and objective vocal outcomes for the most common procedures in otolaryngology

Methods: A systematic literature review was conducted using the PRISMA guidelines. Eligibility criteria included intervention performed (tonsillectomy, septoplasty, or endoscopic sinus surgery), patient characteristics, publication type, and reported outcomes. Meta-analysis was performed for outcomes with sufficient homogeneity. Additionally, these data were used to edit acoustic recordings in order to demonstrate potential vocal changes.

Results: 12 studies ultimately met inclusion criteria. There was substantial heterogeneity between studies. Studies of endonasal surgery report small increases in nasalance in the early postoperative period that resolve within 90 days. Subjective outcomes following tonsillectomy were generally good in both singers and non-singers. Meta-analysis revealed significant changes in acoustic measures including F0, Jitter, and Shimmer.

Conclusions: The current literature suggests that tonsillectomy, septoplasty, and sinus surgery may lead to measurable differences in voice in the early post-operative period. The literature in this area is limited, especially regarding outcomes in high level voice users.

David L. Young, MD, Resident Physician, Department of Otolaryngology – Head & Neck Surgery, Vanderbilt University Medical Center. 843-460-2704. David.young@vumc.org

Telemedicine in Occupational Voice Disorders

Introduction

There are occupational activities where the voice is the most important tool like teachers, call centers, sellers, political or religious leaders, actors and singers. The voice professionals have an overload in the vocal function. Telemedicine can give education in voice production, hygiene, exercises and follow-up control. An analysis from different factors that have great importance for a correct voice production is made. An important factor is the fluid intake to maintain a proper hydration and cooling effect on the vocal folds. Several environment and pollution factors that increase occupational voice pathologies like humidity, temperature, wind, air quality in particles and gases, noise and acoustical conditions of working places are studied. It is important to know how large the groups are for example in teachers. Industrial aspects, overload situations for artistic voices and others. Examination of ideal situation of voice professions students is performed in some countries mainly for actors, singers and teachers. There are several labor loss in the workers and negative development for example in the pupils.

Method

With help of telesystems in 2 pilot groups(20) this telemedicine program made one hour conference about voice production and hygiene talking about biological conditions like : Fluid intake, anatomical and physiological conditions for vocal occupations and other pathologies that can affect the voice. A complete explanation was made about environment and pollution was performed. A questionnaire about daily voice occupations and VHI was also made.

Results

In both groups of 20 voice professionals there was interest in all the subjects. They practiced the different exercises and answered weekly the results.

Discussion

Prevention Strategies for education, training and treatment are important to avoid voice pathologies. This telemedicine program was satisfactory for everybody and because its simplicity was easy to follow up. Creation of instruments for longitudinal international and regional research studies are necessary.

Conclusion

The education, prevention and early voice pathologies detection are transcendental for voice professionals.

This kind of short program using telemedicine are important and the cost is very low.

R. Eugenia Chávez Calderón MD, PhD, Director of Centro de Foniatría y Audiología, President of Collegium Medicorum Theatri 2018-2020, Centro de Foniatría y Audiología, + 52-55-56632073, eugeniachavez@hotmail.com

Comparative Study Acoustic Analysis, Electroglographic and Aerodynamic Measures of Voice in the Vocal Tesitures of Classical and Non-Classical Singers

Objective: Establish normal acoustic, electroglotologic and aerodynamic values in tenors and sopranos of classical and non-classic singers. Establish differences in acoustic, electroglotologic and aerodynamic values in tenors and sopranos (classical singers, non-classical singers, singers with tension muscle dysphonia and non-singers).

Methods: Observational, cross-sectional, descriptive and comparative study. Normalized study through the composition of four groups: classical singers, non-classical singers, singers with muscle tension dysphonia and non-singers. Singers from 22 to 50 years old and vocal training of at least five years. Analyze voice samples with the voice analysis program -Multidimensional Voice Program (MDVP), KayPentax computerized speech laboratory (model CSL 4500), EGG Kay Pentax Electrophotograph (model 6103) and Kay Pentax Aerodynamic Phonatory System.

Results: Preliminary findings suggest:

Tenors: Fundamental frequency average: 150 Hz, Jitter average: 0.4%, Shitter average: 4%, Harmonic-to-noise ratio: 0.15%, Center prominence peak average: 10 dB, Long-term spectrum: 10 dB, Average contact ratio: 40%, Average laryngeal resistance: 35.33 cm H₂O xs / ml, Average intraoral pressure: 6 cm H₂O, Average translaryngeal flow: 120 ml / s.

Sopranos: Fundamental frequency average: 200 Hz, Jitter average: 0.3%, Shitter average: 3%, Average harmonic-to-noise ratio: 0.10%, Central prominence peak average: 13 dB, Long-term spectrum: 12 dB, Average contact ratio: 30%, Average laryngeal resistance: 40.33 cm H₂O xs / ml, Average intraoral pressure: 7 cm H₂O, Average translaryngeal flow: 125 ml / s.

Additional data collection and analyses are ongoing.

Conclusions:

So far with the data collected; the acoustic, electroglotologic and aerodynamic values in classical singers are different from popular singers because of their vocal technique.

Carlos Manzano, MD, Phoniatician, MSc Student, Hospital Médica Sur, Hospital Centro médico ABC, Col. Polanco, CP. 11550, México City.

María de la Luz Arenas, MD, Instituto Nacional de Rehabilitación, Ciudad de México

Rafael Alarcón, PhD, Instituto Nacional de Antropología e Historia, Ciudad de México

Antonio Ysuzna, MD, Phoniatician, PhD, Oakland University William Beaumont School of Medicine, Detroit, Michigan

Advantages of Indirect Endoscopic Phonosurgery

Introduction

Indirect laryngeal phonosurgery has been improved with different rigid endoscopes, recordings systems, stroboscopes and instruments. In indirect procedure the most important advantage is to view the function under stroboscopy during the surgery. This possibility helps for a better functional result. The enlargement of the images allows greater precision. Reinke's oedema, benign and malignant tumors, injection, supraglottal pathology are the cases that have advantage of this procedure.

Method

The patient is prepared by blood tests. An anesthesiologist performs intravenous sedation and the phonosurgeon applies local anesthesia in the tongue, pharynx and larynx. The use of 90 and 70 degrees endoscopes, stroboscopic light, recording system, HD camera is used in all phonosurgeries. The patient is awake, in a sitting position.

Results

in a group of 3,000 patients this procedure was performed.

75% cases with benign tumors

15% cases malignant tumors

15% cases injection

40% Reinke's oedema

Some cases had two different lesions

Discussion

The indications of indirect phonosurgery are for patients with heart or pulmonary alterations, risks for general anesthesia metabolic disorders, maxillofacial and pharyngo-oral difficulties such as mouth opening, teeth malformations, shortness of the neck, limitation for head hyperextension, thickness of the tongue, or narrow pharynx. In degenerative lesions like papillomatosis or cancer, the mucosal wave movement during surgery permits a stroboscopic control in all registers. Biopsies from a supraglottal lesions can be obtained. The indication of respecting free edge is easier to control with this indirect approach. Under stroboscopic light the phonosurgeon can decide different manoeuvres as planned, with freedom in the larynx and functioning vocal folds.

Conclusion

Every patient can be operated by this technique.

There are cases that have all the advantages with indirect endoscopic procedure to perform a correct phonosurgery.

The phonosurgeon can have functional information during the procedure.

Every phonosurgeon must have some experience on this technique.

The cost advantages and less general anesthesia risks are important factors.

R. Eugenia Chávez Calderón M.D. Prof., Centro de Foniología y Audiología, Minerva 104-501 Col. Florida, México 01030, +52 55 56 63 2073

Disease-Specific and General Patient-Reported Outcome Measures of Laryngopharyngeal Reflux

Objective: To examine the relationship between disease-specific and general health status in patients diagnosed with laryngopharyngeal reflux (LPR), as determined by objective pH-probe testing.

Methods/Design: Adults presenting to a tertiary care academic center with a primary voice complaint completed the Reflux Symptom Index (RSI) and the Patient-Reported Outcomes Measurement Information System 10-item global health instrument (PROMIS). An RSI score ≥ 13 was considered abnormal. Objective testing for LPR was performed using hypopharyngeal-esophageal MII catheter with dual pH (HEMII-pH) testing; a positive test was defined as more than 1 pharyngeal impedance events over 24 hours. The sensitivity and specificity of the RSI to detect HEMII-pH findings were determined, and Spearman rho analyses were applied.

Results: 104 patients underwent HEMII-pH testing. Mean scores were 16.7 (SD 8.3) for RSI, and 12.4 (95% confidence interval [CI] 11.9-12.9), 13.4 (95% CI 12.9-13.9), 3.8 (95% CI 3.6-4.1), and 3.5 (95% CI 3.4-3.7) for PROMIS physical and mental health domain scores, and the social and global items, respectively. Sixty-three (60%) patients were diagnosed with LPR by HEMII-pH testing. Average number of pharyngeal impedance events was 8.7 (SD 13.2). The RSI has a sensitivity and specificity of 66.7% and 31.7%, respectively, for picking up pH-proven pharyngeal events. RSI scores were moderately correlated with PROMIS physical (Spearman rho 0.49, $p < 0.0001$), social (Spearman rho 0.33, $p < 0.0001$) and mental health (Spearman rho 0.32, $p < 0.0001$) scores.

Conclusions: There is moderate sensitivity and lack of specificity of the RSI for detecting true LPR events. Reflux-specific and general health status instruments are correlated, and may assess issues relevant to patients with LPR. Further investigation may assess the ability of health status instruments to detect clinically meaningful change in this population of patients.

Elliana Kirsh, BM, BS, Medical Student, Department of Otolaryngology, Harvard Medical School, 25 Shattuck St, Boston, Massachusetts 02115, (513) 515-6781, Elliana_kirsh@hms.harvard.edu

Jennifer J. Shin, MD, SM, Associate Professor of Otolaryngology, Department of Otolaryngology, Harvard Medical School, Division of Otolaryngology, Brigham and Women's Hospital, 45 Francis Street, Boston, MA 02115, (617) 732-4829, Jennifer_Shin@meei.harvard.edu

Thomas L. Carroll, MD, Assistant Professor, Department of Otolaryngology, Harvard Medical School, Director, Brigham and Women's Voice Program, Brigham and Women's Hospital, 45 Francis Street, Boston, MA 02115, (617) 732-4829, tcarroll@BWH.Harvard.edu

Long-term Outcomes of Lateral Vocal Fold Injection of Autogenous Fat for Glottic Insufficiency

Objective: To investigate the long-term efficacy and influence factors of the lateral vocal fold injection of autogenous fat for glottic insufficiency.

Methods: One hundred and forty patients with glottic insufficiency caused by unilateral vocal fold immobility were treated in our department with fat injection. Deep lateral vocal fold injection was performed through direct laryngoscope under general anesthesia. Fat was injected into the lateral aspect of the vocal fold (paraglottic space) using a Brünning injector. The voice assessment including GRBAS scale, maximum phonation time (MPT), voice handicap index (VHI) and video laryngostroboscopy were evaluated before and after operation.

Results: All patients were followed up for 6 to 120 months (average: 36.43 ± 19.73 months). The average age of patients was 32.45 ± 12.82 years old (9~73 years old), with 61 males and 79 females. Before the surgery, all patients underwent moderate to severe hoarseness (G2.5R1.5B2.5A2S0). The MPT was 8.34 ± 4.87 s, and VHI score was 78.32 ± 23.85 . Under the laryngostroboscopy, the vocal folds were fixed in the paramedian or external position with obvious glottic incompetence. After the surgery, 119 patients (85%) had normal phonation (G0R0B0A0S0, $P < 0.01$), 15 patients (10.7%) had improved voice (G1R1B1A1S0, $P < 0.01$). The postoperative MPT was 16.67 ± 8.25 s, and VHI score was 13.45 ± 6.67 . Both were significantly improved versus preoperative ($P < 0.01$). Laryngostroboscopy showed obvious improvement of the glottic closure. The amplitude of vocal fold vibration and excursion of the mucosal wave were excellent.

Conclusions: Lateral vocal fold injection of autogenous fat is a useful and safe procedure for surgical correction of glottal incompetence due to vocal fold immobility. The Long-term efficacy (2~10 years) is extremely satisfied, which related to the injected amount of fat, the degree of recurrent laryngeal nerve injury, and the cause of glottic insufficiency.

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Rong Hu, MD, Department of Otorhinolaryngology–Head and Neck Surgery, Beijing Tongren Hospital, Capital Medical University, Beijing, China, +86-18611987192, hurong_ronghu@126.com

Wen Xu, MD, PhD, Department of Otorhinolaryngology–Head and Neck Surgery, Beijing Tongren Hospital, Capital Medical University, Beijing, China, +86-13501387856, xuwendoc@126.com

Qingwen Yang, MM, Department of Otolaryngology Head and Neck Surgery Beijing Tongren Hospital, Capital Medical University, Beijing, China, +86-13701367356, yangqingwen@sohu.com

Respiratory Allergies and Environmental Influence in the Artistic Voice

Introduction

The respiratory airways immunological response to air allergens provoke different symptoms in artistic voice like slight or severe dysphonia, phonasthenia, dryness, lack of vocal flexibility, lack of brilliance, throat cleaning, neurovegetative disorders, nasal resonance, posterior nasal drip, cough, changes in pitch quality, sore throat during acting or singing, irregular messa di voce irregular and no pianissimo.

Environment has different ecological systems, the biological one include the human being functions. The human voice is a function that can be affected by the environment.

Method

The artistic voice patients were examined with laryngeal endoscopy and stroboscopy, acoustical analysis, VHI, nose and ear endoscopy and the allergological tests include some skin end titration system or quantitative blood radioallergisorbent test with IgE measurements. The test included 60 to 65 allergens.

Results

494 artistic voice professionals patients with allergological symptoms and signs in a group of 875 phoniatic patients are presented. Statistical analysis of the most frequent respiratory allergies is made. The different artistic voice pathologies are presented. Statistical analysis is made to understand the relation among respiratory allergies, environment and artistic voice complaints. Allergological treatment with desensitization vaccines was done to the patients.

Discussion

Respiratory structures react due to their individual sensitivity to aeroallergens and also to the air pollutants. Special situation are the artistic voice users with respiratory allergic conditions. Epigenetic studies show in different cellular and biochemical levels the non-genetic changes due to the environment. The respiratory allergic hyperreactivity can be worse due to environmental factors. As known the harmful effects of the environment can increase respiratory mucosa dryness, irritation and changes in the secretions. Both affections can change vocal endurance and can cause more laryngeal pathologies in the allergic patients. The house and work environment are influenced by the local but also by general universe conditions. Prevention of these effects is discussed.

Conclusions .-

Respiratory allergies alone or in combination environmental influence affect the respiratory mucosa and disturbs the artistic voice production.

Improvement of the immunological system and the personal environment help to avoid more damage in artistic voice production.

R. Eugenia Chávez Calderón MD, PhD, Phoniatician specialist in artistic voice and Medical Audiologist, President of Collegium Medicorum Theatri, Director of Centro de Foniatría y Audiología México City, eugeniachavez@hotmail.com

Use of Postoperative Antibiotics in Patients Undergoing Type I Thyroplasty With Gore-Tex® Implant

Type I Thyroplasty is a common laryngological procedure in which an implant is used to approximate the vocal folds to improve phonation. The purpose of this study is to determine the need for postoperative antibiotic administration in these patients using evidence-based data. Medical records of patients from a quaternary care laryngology practice who underwent type I thyroplasty for glottic insufficiency using Gore Tex® implant between the years 2007 and 2019 were reviewed retrospectively. Subjects were divided into two groups determined by who did or did not receive routine postoperative antibiotics. All patients received two grams of cefazolin (for the standard 70-kilogram patient), and dexamethasone as a one-time dose given at least ten minutes prior to incision except for patients allergic to cefazoline who receive a single dose of 600 mg of clindamycin. All subjects were seen in the office at least three times after the procedure: one day, one week, and approximately 6 weeks after the procedure. There was no significant difference in infection rate or complications between groups. Routine use of antibiotics following type I thyroplasty appears unnecessary.

Key words: Thyroplasty, Gore Tex® implant, postoperative antibiotic, complications.

Ghiath Alnouri, MD, Drexel University, galnouri@phillyent.com

Dylan Vance, Medical student, Drexel University, dgv23@drexel.edu

William Valentino, Medical student, Drexel University, billvalentino90@gmail.com

Robert Thayer Sataloff, MD, DMA, FACS, Professor and Chairman Department of Otolaryngology–Head & Neck Surgery, Drexel University College of Medicine, Senior Associate Dean for Clinical Academic Specialties, Drexel University College of Medicine. Faculty, The Academy of Vocal Arts, Chairman, Board of Directors of the Voice Foundation. Chairman, American Institute for Voice and Ear Research, 219 N. Broad St. 10th Floor Philadelphia, PA 19107 U.S.A. , (215) 762-5530, rtsataloff@phillyent.com

Difficulty Producing High-Pitched Sounds in Singing: Correlations with Laryngostroboscopy and Electromyographic Findings

OBJECTIVE:

Difficulties or limitations in producing high-pitched sounds while singing may be due to the vocal technique used or organic factor. The observation of such difficulty or limitation by singing teachers is one of the main reasons affected individuals are referred to otolaryngologists. The purpose of the present study was to evaluate the laryngostroboscopic and electromyographic changes in the cricothyroid muscles of singers with difficulties or limitations producing high-pitched sounds.

STUDY DESIGN:

Cross-sectional.

METHODS:

Ten singers with difficulty producing high-pitched sounds underwent voice, laryngostroboscopic, and electromyographic evaluations.

RESULTS:

None of the evaluated singers presented signs of impairment of the superior laryngeal nerve on laryngostroboscopy. The electromyographic findings for the cricothyroid muscle were normal for all singers. Six singers presented vocal fold lesions, seven had signs suggestive of laryngopharyngeal reflux, and two presented vascular changes.

CONCLUSION

No signs suggestive of superior laryngeal nerve paresis or paralysis were observed on laryngostroboscopy and electromyography of the cricothyroid muscle in singers with difficulties or limitations producing high-pitched sounds. The presence of vocal fold lesions should be investigated in this population.

Gustavo Korn, MD, PhD, SLP, Universidade Federal de São Paulo, Rua Pedro de Toledo, 947, São Paulo, Brazil, +5511987946882, gustavokorn@uol.com.br

Renata Azevedo, SLP, renata.r.azevedo@uol.com.br

Juliana Monteiro, SLP, fono@julianaceglio.com.br, Denise Pinheiro, MD, PhD

Sung Park, MD

Noemi De Biase, MD, PhD

Relationship between Reinke's Edema and Minor Structural Alterations

Introduction: Reinke's edema is a benign laryngeal lesion related to smoking. Minor structural alterations of larynx (MSA) are histological derangements found in superficial layer of lamina propria of vocal folds which may concur with Reinke's edema.

Objectives: Verify prevalence of minor structural alterations in patients with Reinke's edema and examine if they may change the edema's form of presentation.

Methods: A retrospective review of clinical data (medical charts, laryngoscopy and surgical videos) of patients diagnosed with Reinke's edema referred to surgical treatment from January 2015 to August 2017 in Laryngology and Voice division of UNIFESP.

Results: Minor structural alterations were present in 30% of patients. The most prevalent alteration was sulcus vocalis. MSA were more common in patients with asymmetrical or unilateral edemas, being present mostly on vocal cords in which the grade of edema was smaller. There was a statistical significant correlation between their presence and an asymmetrical or unilateral Reinke's edema.

Conclusions: This data suggest that the presence of MAS may influence the shape of presentation of Reinke's edema.

Karine Gonçalves Oliveira, MD, Clinical Fellowship, University Federal of São Paulo, Department of Otolaryngology and Head and Neck surgery, Division of Laryngology and Voice, Sao Paulo, Brazil, +5531993579722, karinevgo@gmail.com

Cristiana Vanderlei de Melo, MD

Isabela Tavares Ribeiro, MD

Welber Chaves Mororo, MD

Grazzia Guglielmino, MD

Jose Caporrino Neto, MD, PhD, jose.capo.neto@gmail.com

Noemi Grigoletto de Biase, MD, PhD, Adjunct Professor, ngdebiase@gmail.com

Temporary Threshold Shift in Singers: A Pilot Study

Objectives: The cumulative time spent practising identifies rehearsal as the dominant source of noise exposure in performers. Temporary threshold shift (TTS), also known as ‘temporary noise-induced hearing loss’ has been demonstrated following exposure to music. There are no studies on TTS in singers despite the influence of healthy hearing on voice. This study aims to establish baseline hearing function in a group of professional choir singers, monitor the effect of routine rehearsal noise on singers’ hearing, and establish if a period of rest from noise exposure is sufficient to recover from TTS.

Methods

Cohort study of 18 professional choir singers, with institutional ethical committee approval. Pure-tone Audiometry (PTA) hearing threshold comparisons were made at three time-points: before rehearsal, immediately after rehearsal and before the next rehearsal. Routine rehearsal noise during scheduled rehearsal times was considered the source of noise exposure.

Results

Average duration of exposure was 114 minutes \pm 19 minutes with intensity range of 47.4–107dB SPL. 12 singers had normal baseline PTA. This study did not reveal any statistically significant TTS following rehearsal noise exposure, but individualised inspection of PTA results revealed TTS in 11 participants across several frequencies. Nine of these singers had normal baseline PTA, and two had hearing impairment, or permanent threshold shift (PTS). TTS at low frequencies was demonstrated in eight singers. TTS was not influenced by repertoire, type of singer, position in the choir, gender, age or the presence of baseline hearing impairment.

Conclusion

Visual inspection of PTAs suggests TTS following rehearsal noise exposure among some singers, mainly affecting low frequencies. While this is not statistically significant, a further study designed to adjust to the ever-changing setting of rehearsal, using objective measurements with more participants may yield significant results.

Finola M Ryan, BMBS, MA (Performance), MSc student, University College London, Department of Surgery and Interventional Sciences, UK, +4475 3266 8568, finolaryan@gmail.com

John Rubin, MD, Consultant ENT Surgeon, Royal National Throat, Nose and Ear Hospital, London, UK, +4420 7915 1313, john.rubin@nhs.net

Doris-Eva Bamiou, MD, Consultant in Audiovestibular Medicine, National Hospital for Neurology and Neurosurgery, London, UK, +4420 3448 3135, d.bamiou@ucl.ac.uk

Thanos Bibas, MD, Associate Professor in Otolaryngology, the 1st Department of Otorhinolaryngology – Head & Neck Surgery, National and Kapodistrian University of Athens, Greece, thanosbibas67@gmail.com

Katerina Vardonikolaki, MD, Consultant ENT Surgeon, the 1st Department of Otorhinolaryngology – Head & Neck Surgery, National and Kapodistrian University of Athens, Greece, catvard@yahoo.com

Severe Inflammatory Reaction to Injection Laryngoplasty with Hyaluronic Acid Filler

Objective: To describe the clinical course and management of a patient who underwent injection laryngoplasty with hyaluronic acid filler and subsequently developed a local inflammatory reaction.

Methods/Design: Case report.

Results: A 72 year-old male presented with dysphonia secondary to poorly differentiated carcinoma within the left upper lobe of the lung. Associated symptoms included dysphagia and cough after drinking liquids. He was currently receiving treatment for his cancer. Rigid videostroboscopy revealed left true vocal fold immobility with resultant large glottic gap and absent mucosal wave propagation. He elected to proceed with in-office injection augmentation laryngoplasty using hyaluronic acid. This procedure was routine without any immediate complications noted. The day following the procedure, the patient reported dyspnea, mild pharyngodynia, and dysphagia. His symptoms worsened the following day and he was admitted to the intensive care unit for airway narrowing due to severe edema of the injected vocal fold. He was treated with racemic epinephrine and intravenous dexamethasone with improvement of his stridor and was discharged 3 days after admission. Nearly three months after the procedure he presented for routine follow-up; his dysphonia was markedly improved and his stridor had completely resolved. His Voice Related Quality of Life Score improved to 10/50 (initially 50/50 preoperatively). Repeat videostroboscopy demonstrated complete glottic closure with normal mucosal wave propagation.

Conclusions: Within the past several years, increased awareness regarding similar inflammatory reactions in the context of injection laryngoplasty has begun to emerge. Rarely, this reaction may precipitate respiratory symptoms as described in this report. We present an additional case that was successfully managed with close observation and corticosteroid administration.

Alhasan Elghouche, MD, MS, Resident, Department of Otolaryngology – Head & Neck Surgery, Indiana, University School of Medicine, (317) 278-1258, aelghouc@iupui.edu

Benjamin Anthony, MD, Assistant Professor, Department of Otolaryngology – Head & Neck Surgery, Indiana University School of Medicine, (317) 278-1258, bpanthon@iu.edu

Relationships Among Self-Reported Vocal and Laryngeal Health and Performance Career Success in Professional Wind Instrumentalists.

Objective: to compare and contrast the degree to which college wind instrumental music majors and professional, older wind instrumentalists experience symptoms related to Velopharyngeal insufficiency, LPR, Voice and Throat discomfort, vocal training and singing health. Current data collected suggest that in younger students, these problems may affect their ability to pursue a career as a wind instrument performer, since the older performers have not reported these problems.

Methods/Design: The data were obtained using a 74-Item questionnaire including established and validated questionnaires: the Voice Handicap Index (VHI), the Reflux Symptom Index (RSI), Singing Voice Health Index (SVHI-10) and additional questions concerning experiences with velopharyngeal insufficiency. Additional data include age, gender, instrument, and level of playing. Statistical analysis to uncover relationships among the variables will be applied to the data, which will be collected through SurveyMonkey. The questionnaire will be shared for distribution with professional organizations, colleges and universities, and professional ensembles. The IRB approval has been obtained.

Results/Conclusions: Current preliminary data collected (N = 227 so far) suggest that in younger students, these problems may affect ability to pursue a career as a wind instrument performer on particular instruments, since the older performers have not reported these problems. The survey is open for additional wind instrumentalists to participate, since it was closed to all except trumpet, French horn, clarinet, oboe and bassoon. A possible conclusion is that vocal and laryngeal health in young instrumentalists may need to be monitored better and considered when children-through-college students report problems. This issue appears to be under-reported and under-investigated at this time.

Valerie L. Trollinger, MM, DME, Professor of Music, Kutztown University of Pennsylvania,
Professor of Clinical Otolaryngology (Adjunct), Drexel University College of Medicine, KU College
of Visual and Performing Arts, Kutztown, PA 19530, (610)683-1588,
Valerie.trollinger@kutztown.edu

Coexistence of Minor Structural Alterations in Patients with Vocal Fold Polyps

Introduction: Vocal fold polyps are benign, usually unilateral laryngeal lesions. Their etiology is still unclear, however phonotrauma seems to play an important role. Minor structural alterations (MSA) are histological derangements of Reinke's space, which may result in altered vibration of vocal folds.

Objectives: Verify presence of MSA in patients diagnosed with vocal fold polyps, and examine the most common location of those lesions.

Methods: Retrospective review of clinical data (medical charts, laryngoscopy and surgical vídeos) of patients diagnosed with vocal fold polyps referred to surgical treatment from August 2010 to March 2017 in Laryngology and Voice division of UNIFESP.

Results: Eighty patients were included in this study. Polyps were significantly more frequent in the middle third of vocal folds in women and in the anterior third in men. MSA were present in 57% of patients with vocal polyps.

Conclusions: This study suggests that MSA occur more frequently in patients with vocal fold polyps. MSA, associated with other factors, such as phonotrauma, may contribute to vocal polyps occurrence.

Karine Goncalves Oliveira, MD, Clinical Fellowship, University Federal of São Paulo, Department of Otolaryngology and Head and Neck surgery, Division of Laryngology and Voice, 947 Pedro de Toledo St, Sao Paulo, Brazil, +5531993579722, karinevgo@gmail.com

Cristiana Vanderlei de Melo, MD

Welber Chaves Mororo, MD, welbercm@hotmail.com

Isabela Tavares Ribeiro, MD, itavaresr@gmail.com

Beatriz Santos Botelho, MD

Jose Caporrino Neto, MD, PhD, jose.capo.neto@gmail.com

Noemi Grigoletto de Biase, MD, PhD, Adjunct Professor, ngdebiase@gmail.com

Thermography Protocol Proposal for Larynx Extrinsic Muscles Evaluation during Phonation

Objective: Develop a protocol of surface thermographic evaluation of the extrinsic muscles of the larynx during phonation.

Methods / design: This is a propositional study of development and creation of a superficial thermal evaluation protocol of the extrinsic muscles of the larynx during phonation. procedures involving control of environmental variables will be proposed, control of individual variables, individual positioning, procedures in capturing the thermogram, voice quality analysis and appropriate method of analysis of the images.

Results: To establish the protocol must first be carried out control of environmental variables with temperature and relative humidity record of the air that should be between 22 °C and 24°C and 40 and 60%, respectively. The patient should be instructed to remove beard on assessed region 48h before, avoid physical activities 1h before the exam, do not drink alcohol, coffee or have large meals 30min before the test and do not make use of makeup, moisturizers or accessories in the anterior neck. During the examination the patient should be sitting with the head in a natural position, hair up and cap. After the patient thermoregulation the camera must be positioned in front of the individual with an approximate distance of 30 cm on a tripod with leveling angle of 30° and up. The thermographic record should also be held in video associated with voice recording for later analysis of vocal quality. The analysis of the video is performed after the examination in the software Flir Tools to evaluate the average temperature of the supra-hyoid region, left and right infra-hyoid.

Conclusion: The establishment of a superficial thermography protocol of the anterior neck region may help to understand the relationship between of the larynx extrinsic muscular condition and vocal function.

Aline Natallia Simões de Almeida, Master Student in Human Health Communication, Speech-Language and Hearing Sciences Department, Federal University of Pernambuco, +55 081 998699877, alinenatallia@gmail.com

Daniele Andrade da Cunha, PhD in Nutrition, Speech-Language and Hearing Sciences Department Professor, Federal University of Pernambuco, +55 081 996356525, dhanyfono@hotmail.com

Patricia Maria Mendes Balata, PhD in Neuropsychiatry and Behavioral Sciences, Federal University of Pernambuco, speech therapist at the Hospital of the Servidores of Pernambuco, +55 081 999644200, pbalata@uol.com.br

Maria Carolina Netto de Mendonça Paes, Master of Anatomy, Federal University of Pernambuco, speech therapist at the Hospital of the Servidores of Pernambuco, +55 081 999755558, carolpaesfono@gmail.com

Beatriz Freitas Duarte Specialization in Voice Student, Voice Studies Center - CEV, +55 081 998884038, fonobiaduarte@gmail.com

Hilton Justino da Silva, Doctor in Nutrition, Professor, Speech-Language and Hearing Sciences Department, Federal University of Pernambuco, +55 081 999732857, hiltonfono@hotmail.com

Variations on Vocal Doses among Occupational Voice Users: A Meta-Analysis

DESCRIPTION: The vocal load of occupational voice users can be quantified through instruments like voice dosimeters. Occupational voice users present different vocal loads depending their daily activities during a working day. **OBJECTIVE:** To compare measures of vocal dose among different occupational voice users through a meta-analysis. **METHODS:** A meta-analysis was conducted after a systematic review of literature. At first, a total of 242 potential articles were found. After exclusion by reading of titles and abstracts, 36 papers were included in the meta-analysis (+ 4 papers from secondary references). The time dose, distance dose, cycle doses, fundamental frequency and vocal intensity were extracted from occupational voice users for this analysis. **RESULTS AND CONCLUSION:** Previous research has reported a higher prevalence of voice disorders among teachers. One of the most important factors associated with voice complaints among teachers is the vocal load. A good measure to quantify vocal load is the time dose percentage. In the present study, we found variations in the measurements for the cycle dose and distance dose which can be associated with the increased vocal demand of teaching. Further research on vocal dosimetry in different occupational voice users is required as a study of vocal overload.

Àngela Patricia Atarà Piraquive, SLP, Master student, Universidad Nacional de Colombia, +57 3208907328, apatarap@unal.edu.co

Lady Catherine Cantor Cutiva, SLP, MSc, PhD, Professor, Universidad Nacional de Colombia, +57 3004864136, lccantor@unal.edu.co

The Influence of the Voice Sample Length in Perceived Overall Voice Quality Analysis and in the Acoustic Voice Quality Index (AVQI) in the Brazilian-Portuguese Language

Objective: To analyze the variations that different voice sample length (VSL) has on the perceived degree of voice quality deviation and on the AVQI accuracy.

Methods: Voices of 71 subjects (53 dysphonic; 18 vocally healthy) were recorded: vowel/a/+numbers 1 to 20 (42 syllables). Three different VSL were edited: VSL1, 1 to 20+ 3s vowel/a/; VSL2, customized length, so the voiced-segments of the continuous speech had the same length of the vowel (mean=18.73 syllables corresponding to 3s of only-voiced segments) + 3s vowel/a/; VSL3, 1 to 10 (15 syllables) + 3s vowel/a/. Three voice specialists perceptually judged the overall voice quality (G); three sessions were performed to evaluate each VSL variant. AVQI's precision and concurrent validity were assessed.

Results: The intra-rater reliability was "almost perfect" ($\kappa > 0.826$) for all evaluators in VSL3; "substantial" (0.684) and "almost perfect" (0.897) in VSL2 and "fair" (0.447) to "almost perfect" (1.000) in VSL1. The inter-rater reliability was "moderate" (0.554) for VSL1, "substantial" (0.622 and 0.618) for VSL2 and VSL3. The Gmean and AVQI mean were perceived as more severe for VSL1 (1.39 and 1.40) and as less severe for VSL3 (1.18 and 1.94). Considering the AVQI, VSL3 ($r = 0.665$) presented the higher concurrent validity. VSL2 presented the best area under the ROC curve (0.821). VSL1 and VSL2 specificity was 100%, VSL3 specificity was 75%; higher sensitivity was observed for VSL3 (74%).

Conclusion: The voice quality outcomes change for different VSLs. Longer VSLs seem to be perceived as more deviated, shorter VSLs seem to be more reliable and have better correlation with the acoustic analysis. The AVQI best accuracy was found at a customized length. Thus, to increase the voice analysis reliability, standardized procedure must be followed, including a precise speech material control allowing comparison among clinics and voice-centers.

Marina Englert, PhD Candidate, Speech Language Pathologist, Unifesp – "Universidade Federal de São Paulo" and CEV – "Centro de Estudos da Voz", +55 11 9 83669794 / +32 493 02 86 57, marinaenglert@gmail.com

Lívia Lima, PhD, Speech Language Pathologist, UVV – "Universidade Vila Velha" and CEV – "Centro de Estudos da Voz", +55 27 999014605, livialima.r@ig.com.br

Ben Barsties v. Latoszek, PhD, Doctor of Medical Sciences, University of Antwerp, +32 3 265 26 39, ben.barsties@t-online.de

Mara Behlau, PhD, Speech Language Pathologist, Unifesp – "Universidade Federal de São Paulo" and CEV – "Centro de Estudos da Voz", +55 11 5575171, mbehlau@uol.com.br

Acoustic Voice Quality Index (AVQI) and Acoustic Breathiness Index (ABI): Analysis with different speech material in the Brazilian Portuguese

Objective: To analyze the Acoustic Voice Quality Index (AVQI) and the Acoustic Breathiness Index (ABI) concurrent validity and diagnostic accuracy with different speech materials.

Method: Voices of 53 subjects (40 dysphonic; 13 vocally healthy) were recorded: vowel /a/ + numbers 1 to 20 (42 syllables) + reading of a text (138 syllables). The numbers and text were edited in order to achieve 3s of only-voiced segments; there was an average of 18.81 and 32.49 syllables and a confidence interval of 1.87 and 2.30. Thus, the audio files were edited to have 17 syllables for numbers and 32 for text; the middle portion of the vowel was edited to achieve 3s. Three voice specialist perceptually judge the overall voice quality (G) and the breathiness (B); two sessions were performed to evaluate each speech material + vowel /a/. AVQI's and ABI's precision and concurrent validity were assessed for each speech material.

Results: The intra and inter-rater reliability were high. Text presented higher concurrent validity (r) than number (AVQI_Number=0.815; AVQI_Text=0.899; ABI_Number=0.809; ABI_Text=0.870). Text presented an Excellent area under the ROC Curve (AROC) for AVQI (0.963) and ABI (0.929). Numbers presented a Good AROC for the AVQI (0.870) and Excellent for ABI (0.924). Numbers had higher sensitivity for ABI (95.2%) and text had higher specificity for both indexes (AVQI=100%; ABI=90.90%). Text presented higher AVQI and ABI scores than numbers, therefore, text seem to reveal more vocal deviations, although this deviation was not perceived in the perceptual analysis; no difference between Gmean and Bmean for numbers and text.

Conclusion: Different speech materials may impact acoustic outcomes and certain voice characteristics may not be evident. The reading of a text offers a higher diagnostic accuracy when compared to an automatic speech, such as, counting numbers.

Marina Englert, PhD Candidate, Speech Language Pathologist, Unifesp – “Universidade Federal de São Paulo” and CEV – “Centro de Estudos da Voz”, +55 11 9 83669794 / +32 493 02 86 57, marinaenglert@gmail.com

Lívia Lima, PhD, Speech Language Pathologist, UVV – “Universidade Vila Velha” and CEV – “Centro de Estudos da Voz”, +55 27 999014605, livialima.r@ig.com.br

Mara Behlau, PhD, Speech Language Pathologist, Unifesp – “Universidade Federal de São Paulo” and CEV – “Centro de Estudos da Voz”, +55 11 5575171, mbehlau@uol.com.br

Differences on Voice Acoustic Parameters of Occupational Voice Users

Aim: To identify differences in voice acoustic parameters between two groups of occupational voice users (college professors and call-center workers) in Bogotá-Colombia. **Methods:** This is a longitudinal study with one month of follow-up. Participants will fill out a questionnaire and record a standardized speech sample before and after occupational voice use. Six voice acoustic parameters will be analyzed: fundamental frequency, standard deviation of sound pressure level, Jitter, Shimmer, Harmonics-to-noise ratio, and Cepstral Peak Prominence smooth. **Results:** From preliminary data, we expect to find an increase in fundamental frequency after the occupational voice use. Higher harmonics-to-noise ratio is expected to be found among broadcasters compared with college professors. **Conclusion:** Although college professors and call-center workers are within the category of occupational voice users, differences on voice acoustic parameters are justify on differences on occupational voice use.

Keywords: occupational voice users, acoustic voice parameters

Karen Dayana Guevara Pedraza, SLP, Universidad Manuela Beltrán, Bogotá, Colombia, +57 3154281945, karenguevara299@gmail.com

Ivon Dayany Mateus Hernández, SLP, Universidad Manuela Beltrán, Bogotá, Colombia, +57 3214683369, ivoncilla@hotmail.es

Lady Catherine Cantor Cutiva, SLP, MSc, PhD, Professor, Universidad Nacional de Colombia – Universidad Manuela Beltrán, Bogotá, Colombia, +57 3004864136, lccantor@unal.edu.co; leidy.cantor@docentes.umb.edu.co

What Helps Speech-Language Pathology Students to Become Competent Clinicians in the Field of Voice? An Investigation of Students' Perceptions

Objective: Although not all Speech-Language Pathology (SLP) students will work with clients with voice disorders after graduation, all must achieve entry-level competency in this area of practice. The attainment of competency is influenced not only by the development of skills and knowledge, but also personal attitudes, values and abilities. Presently, there is limited research on the holistic factors influencing students' development of competency in voice. This study aimed to identify factors, perceived by students themselves, that help or hinder development of competency in voice.

Methods: Focus groups interviews were conducted with a convenience sample of 14 speech pathology students (93% female, mean age 22 years). Interviews were transcribed verbatim and analyzed using template analysis.

Results: Students' perceptions of influencing factors were grouped into two major themes: (1) personal factors, and (2) educational factors. A key finding was that many participants perceived a student's own voice to be a major factor impacting their development and attainment of clinical competency in voice, and that mindsets towards the (un)changeability of students' own voices varied across participants. Students with a performance background were considered to be at an advantage in terms of performing vocal tasks and suitability to work with specific populations. Key educational factors included access to and experience of demonstrations (face-to-face and video), additional training workshops, peer learning, and simulation.

Conclusion: This study identified a number of personal and educational factors that students perceive to impact the development of competency in voice. Consideration of these holistic factors may assist SLP educators to deliver optimally effective voice-related curricula.

Anna Rumbach, PhD, GCHEd, MSpPathSt BSc, Senior Lecturer in Speech Pathology, School of Health and Rehabilitation Sciences, The University of Queensland, +61 7 3365 3080, a.rumbach@uq.edu.au

Katherine Dallaston, BSpPath (Hons), Speech Pathologist, School of Health and Rehabilitation Sciences, The University of Queensland, +61 7 3365 3080, katherine.dallaston@uqconnect.edu.au

Anne Hill, PhD, BSpThy, Senior Lecturer in Speech Pathology, School of Health and Rehabilitation Sciences, The University of Queensland, +61 7 3365 1461, ae.hill@uq.edu.au

Speech Pathology Students' Perceptions of a Standardized Patient Clinic for Assessment and Management of Voice Disorders

Objective: Simulation is an appropriate and accessible learning method for students to gain skills in place of traditional practice, especially in clinical caseloads that are not able to be accessed by a majority of students. The study aimed to explore change in students' perceptions of knowledge, confidence, anxiety and clinical readiness for assessment and management of an adult with a voice disorder after participation in simulation.

Methods: Students enrolled in mandatory courses dedicated to the voice range of practice area participated (N = 113). Students completed 32 hours of academic coursework and two, 30-minute simulation experiences with a simulated patient playing the role of an adult with a voice disorder. The impact of the simulation learning activities on student perceptions of knowledge, confidence, anxiety and clinical readiness across time were measured using three surveys: (1) pre-lectures, (2) post lectures, but pre-simulation, and (3) post-simulation. Change across time was analysed using repeated measures analysis of variance. Post-hoc analysis involved planned contrasts (Bonferroni adjustment).

Results: All students perceived significant ($p \leq .001$) positive changes in knowledge and confidence across all activities, across all time points, with the exception of writing an assessment report. Anxiety related to the management of a client with a voice disorder fluctuated significantly ($p \leq .001$) throughout the program. Overall, the majority (>90%) of students agreed or strongly agreed that the simulation experience helped develop clinical skills, apply content taught in lectures, enhance confidence and interest, and was a useful learning experience.

Conclusion: This study supports the benefits of incorporating simulation as part of student's clinical preparation for the assessment and management of voice disorders.

Anna Rumbach, PhD, GCHEd, MSpPathSt BSc, Senior Lecturer in Speech Pathology, School of Health and Rehabilitation Sciences, The University of Queensland, +61 7 3365 3080, a.rumbach@uq.edu.au

Danielle Aldridge, BSpPath, Speech Pathologist, School of Health and Rehabilitation Sciences, The University of Queensland, +61 7 3365 3080, d.aldrige@uq.edu.au

Anne Hill, PhD, BSpThy, Senior Lecturer in Speech Pathology, School of Health and Rehabilitation Sciences, The University of Queensland, +61 7 3365 1461, ae.hill@uq.edu.au

Lingering Effects of Straw Phonation Exercises on Aerodynamic, Electroglottographic, and Acoustic Parameters

Objective. This study aimed to investigate the duration of straw phonation effects using aerodynamic, electroglottographic, and acoustic metrics.

Methods. Twenty-four participants were recruited to perform both a 5-minute and a 10-minute straw phonation exercise. Upon completion of the exercises, phonation threshold pressure (PTP), mean airflow, contact quotient, fundamental frequency, jitter, shimmer, and noise-to-harmonics ratio were measured over a 20-minute time frame. Parameters were measured before the intervention (baseline), immediately after the intervention (m0), 5 minutes (m5), 10 minutes (m10), 15 minutes (m15), and 20 minutes (m20) after the intervention.

Results. PTP significantly decreased immediately after 5 minutes of straw phonation and returned to initial state within 5 minutes. PTP remained decreased over 5 minutes after 10 minutes of straw phonation. Mean airflow increased immediately after both 5 minutes and 10 minutes of straw phonations and remained improved for 20 minutes. No significant changes were obtained for contact quotient and acoustic parameters over the intervention period.

Conclusions. The results extended our knowledge of proper clinical application of straw phonation regarding the duration of exercise. This study confirmed that 10 minutes of straw phonation lead to optimal and relatively continuous effects in PTP and mean airflow. Although straw phonation did show lingering effects in aerodynamics, repeated practices were recommended to obtain optimum and therapeutic effects.

Note: This paper has been accepted by the Journal of Voice.

Jing Kang, MD, PhD Student, Department of Otolaryngology-Head and Neck Surgery, EENT Hospital of Fudan University, 83 Fenyang Road, 200030, Shanghai, China , +86 18321462142, 229272620@qq.com

Jack Jiang, MD, PhD, Professor, University of Wisconsin, Madison Dept. of Surgery, Division of Otolaryngology , Head and Neck Surgery, Department of Otolaryngology-Head and Neck Surgery, EENT Hospital of Fudan University, Shanghai, China, (608) 265-9854, jjjiang@wisc.edu, jjjiang@fudan.edu.cn

Pharyngoesophageal Pressures Related to Phonation at the Light of High Resolution Manometry

Background: Since air pressure provides energy for vocal fold vibration, the course of this pressure through the vocal tract is relevant to the study of vocal function. High-resolution manometry (HRM), a technology developed to measure esophageal intraluminal pressure using a catheter with a series of closely spaced sensors, represents a potential tool for measuring pharyngoesophageal phonation pressures.

Methods: with HRM transnasal catheter in place, 12 (6 males, mean age 27) professional singers were asked to produce 4 different vocal tasks at low, medium and high vocal loudness: vowel /ae/, ascending 5 note scale, word /hey/ and word /go/. Pressures were measured at pharynx, upper esophageal sphincter (UES) and thorax.

Results: Thoracic pressures are higher during vocalization than at rest and as the vocal loudness increases, so does the pressure. Pressures at the UES do not increase significantly during vocalization, but muscle bundle recruitment differs according to vocal loudness. The pharynx does not present a linear pressure increment following an increase in vocal loudness. Pharyngoesophageal pressure magnitude does not change significantly among different vocal tasks.

Conclusions: HRM is a valuable tool for measuring pharyngoesophageal pressures during phonation. Different from the UES and pharynx, thoracic pressures are higher during phonation than at rest and tend to increase with vocal loudness increment. The phonatory task nature does not significantly interfere with the pressure magnitude of the pharyngoesophageal segment. The topographic plot provides additional data about the physiology of phonation, especially at the UES region.

Thays Vaiano, MD, Speech Pathologist, CEV, UNIFESP, + 55 11 5575-1710, tvaiano@uol.com.br

Fernando Herbella, MD, Gastric surgeon, UNIFESP, + 55 11 5575-1710, herbella.dcir@epm.br

Mara Behlau, PhD, Speech Language Pathologist, Unifesp – “Universidade Federal de São Paulo” and CEV – “Centro de Estudos da Voz”, +55 11 5575171, mbehlau@uol.com.br

Development of a Voice Quality of Life Scale using a Mixed Methods Approach

Objective: To develop a valid and reliable QOL assessment for older adults with voice disorders using the lived experiences of treatment seeking individuals following a four-step, mixed methods design. Changes in voice can impact quality of life (QOL) across multiple domains. Measuring the QOL impact of a voice disorder provides clinicians with valuable information useful for functional goal setting and patient engagement.

Methods/Design: Following guidelines from the Scientific Advisory Committee of the Medical Outcome Trust and the Food and Drug Administrations by Branski et al (2010), a four-part study to create a voice quality of life scale for older adults was designed. Briefly, Step 1: Complete semi-structured qualitative interviews to acquire a rich, thick descriptions of the impact of a voice disorder on quality of life organized by themes; Step 2: Verification check of the themes; Step 3: Develop the preliminary scale and complete readability checks and item reduction; Step 4: Pilot testing of the Aging Voice Index (AVI) for reliability and validity.

Results: Pilot testing of the AVI with 92 older adults identified an intraclass correlation for test-retest reliability of 0.952 and was found to be highly correlated to the VRQOL ($p < 0.0001$). Additionally, the AVI score was found to distinguish between self-rated voice quality ($p < 0.0001$) and diagnostic voice categories ($p < 0.0001$). No significant differences were identified for sex or race.

Conclusions: The Aging Voice Index is a valid and reliable quality of life assessment for older adults with voice disorders. It was developed following guidelines for patient-reported outcome measures (PROM) beginning not with expert opinion, but with the lived experiences of the population of interest. This presentation will discuss our multiphase, multicenter, mixed methods approach to scale development.

Nicole M. Etter, Ph.D., CCC-SLP, Assistant Professor, Pennsylvania State University, Department of Communication Sciences & Disorders, 814-863-2021, nme2@psu.edu

Edie R. Hapner, Ph.D., CCC-SLP, Professor, Caruso Department of Otolaryngology and Director of Speech Language Pathology, the USC Voice Center, 323-442-5790, Edie.Hapner@med.usc.edu

Julie M. Barkmeier-Kraemer, PhD, CCC-SLP, Professor, Department of Surgery, Division of Otolaryngology, Voice Disorders Center Clinic Director, University of Utah, (801) 585-7143, JulieB.Kraemer@hsc.utah.edu

Jackie L. Gartner-Schmidt, PhD, CCC-SLP, Professor, Co-Director of the University of Pittsburgh Voice Center, Professor of Otolaryngology and Director of Speech-Language Pathology-Voice Division at the University of Pittsburgh Medical Center, (412) 647-2100, gartnerschmidtjl@upmc.edu

Emily V. Dressler, PhD, Associate Professor, Wake Forest School of Medicine, Department of Biostatistical Sciences, (336) 716-0917, edressler@wakehealth.edu

Joseph C. Stemple, PhD, CCC-SLP, Professor, University of Kentucky Division of Communication Sciences and Disorders, (859) 218-0556, jcstem2@uky.edu

Effect of Voice Therapy Using Semi-Occluded Vocal Tract Comparing Singers and Non-Singers

Objectives: Voice therapy with a semi-occluded vocal tract (SOVT) has a long history. These exercises have been used for many years for dysphonia singers and dysphonia non-singer. SOVT with increased vocal tract impedance leads to increased vocal efficiency and economy. Although there is a growing number of research about the physiological impact of SOVT, and growing clinical sentiment about the therapeutic benefits, empirical data are lacking describing how it works for singers and non-singers. The objective of the current study is to evaluate vocal tract function and the voice quality in singers and non-singers with dysphonia, after undergoing SOVT.

Methods: The patients who were diagnosed as vocal fold nodules, functional dysphonia and aged atrophy were assessed (singers: n=7, non-singers: n=8). Stroboscopic examination, aerodynamic assessment, acoustic analysis, formant frequency and VHI 10 were obtained before and after performing SOVT.

Results: In singer's group, subglottic pressure, jitter, shimmer, singing voice handicap index-10 and voice handicap index (VHI)-10 significantly improved after SOVT. Also, formant frequency (first, second, fourth) and Standard Deviation (SD) of first, second, third formant frequency significantly improved. In non-singer's group, subglottic pressure, jitter, shimmer and VHI-10 significantly improved after SOVT. However, no significant changes observed about formant frequency.

Conclusions: These results suggest that SOVT may be more effective to adjust the vocal tract for singers patients compared with non-singer patients.

Mami Kaneko, SLP, M.S., Department of Otolaryngology Head & Neck Surgery, Kyoto Prefectural University of Medicine, +81- 75-251-5603, mkaneko@koto.kpu-m.ac.jp

Shigeru Hirano, M.D., Ph.D, Professor, Department of Otolaryngology Head & Neck Surgery, Kyoto Prefectural University of Medicine, +81- 75-251-5603, hirano@koto.kpu-m.ac.jp

Is There an Effect of Quality Sleep on the Voice Functioning in College Professors?

Background: Work-related stress is a risk factor for serious health and mental issues, including voice and sleep disorders. Recovery from stress results extremely important to preserve health, wellbeing and work performance. Sleeping is the most critical stage in the psychological and somatic recovery process. Sleep deficiency can lead to changes in the breath pattern that might contribute to development of vocal disorders, it also can compromise the individual's communicative competence. There is a lack of studies about the relationship between sleep quality and voice functioning. Moreover, it is not clear which mechanisms may mediate the relationship between these two variables. **Purpose:** To define the relationship between sleep quality and voice functioning. **Methods:** Data will be collected from university professors ($N = 30$) over a 4-week follow-up period. Daily self-reports and objective recordings from the sleep quality, stress levels and voice functioning will be collected. A multilevel methodology will be applied evaluating a model in which end-of-work stress levels and sleep quality (measured in the next morning), influence voice functioning. **Results:** From preliminary data, we expect that sleep quality will be associated with voice functioning, and this interaction will be mediated by the perceived work stress level. **Conclusion:** In addition to the theoretical implications, the findings from this study could contribute to the improvement in the design of interventions focused to decrease the occurrence of voice disorders among occupational voice users.

Keywords: voice functioning, daily work stress, sleep quality, university professors.

Andrés Carrillo González, Psychologist, Universidad Nacional de Colombia, + 57 3188572270, acarrillog@unal.edu.co

Lady Catherine Cantor Cutiva, PhD, MSc, SLP, Professor, Universidad Nacional de Colombia, +57 3004864136, lccantor@unal.edu.co

The Relationship between Eating Disorder Symptoms and Voice Problems

Objective: There seems to be a common notion among clinical professionals that voice disorders and bulimia nervosa are related in some way, and bulimia nervosa has been identified as a risk factor for voice disorders. Proposed mechanisms include trauma to the larynx during the act of vomiting and acid reflux irritation secondary to lower and upper esophageal sphincter relaxation due to chronic emesis. However, to date no studies have documented an increase in voice disorders among those with eating disorders associated with vomiting. In addition, other mechanisms that might contribute to a predisposition for voice problems in this population have been understudied. The primary purpose of this study is to determine the prevalence of voice disorders in individuals with bulimia nervosa.

Methods/Design: This research is cross-sectional design of a clinical population with the purpose of determining the correlation between voice disorders and bulimia using epidemiological survey methods. Participants are individuals who have experienced an eating disorder, currently or in the past, and have completed a survey addressing eating disorder behaviors, voice behaviors, and voice disorder diagnosis and symptoms. Analysis includes the prevalence of voice symptoms and disorders in this population, the relationship between vomiting behaviors and voice complaints, and the relative time course of the eating disorders and voice problems to determine if vomiting is a predictor of current or future voice problems or if another, mutual underlying cause may mediate this assumed relationship.

Results and Conclusions: Preliminary results are too early to completely analyze. However, results will conclude if there is a relationship and direct clinicians to the potential underlying cause of this relationship.

Taylor Lawrence, BS, Graduate Student, School of Communication Sciences and Disorders, The University of Memphis, 4055 North Park Loop, Memphis, TN 38152, (901) 678-5800, tlawrnce@memphis.edu

Miriam van Mersbergen, PhD, CCC-SLP, Assistant Professor, School of Communication Sciences and Disorders, The University of Memphis, 4055 North Park Loop, Memphis, TN 38152, (901) 678-4474, mrvmrsb@memphis.edu

High Resolution Manometry as a Biofeedback Tool for Vertical Laryngeal Positioning

Background: larynx positioning is the starting point for any voice training. Low vertical larynx results in reduced musculoskeletal tension and easier vocal fold vibration what is critical not only for professional voice users, but also for those with dysphonia. Biofeedback has proved to be an interesting tool for laryngeal positioning training resulting in less laryngeal tension and/or a better voice quality than conventional approaches. High-resolution manometry (HRM), a technology developed to measure esophageal pressures, provides real time UES positioning. As the cricopharyngeus muscle is attached to the lateral arch of the cricoid cartilage they are obligated to move together and so, HRM may represent a valuable tool for laryngeal excursion biofeedback.

Methods: with HRM transnasal catheter in place, 10 (50% males, mean age 28) professional singers were asked to sustain the vowel /ae/ singing at a comfortable larynx positioning, at the lowermost larynx location, and at the highest larynx location. The tasks were repeated after the computer screen was positioned at the visual field of the participant that was instructed on how to self-evaluate laryngeal positioning based on the UES color plot and the variations with real time images.

Results: downward laryngeal excursion was 2.0 cm without biofeedback and 3.1 cm after biofeedback ($p=0.03$). Upward Laryngeal excursion was 0.2 without biofeedback and 0.5 after biofeedback ($p=0.4$).

Conclusions: singers can improve laryngeal vertical movements, especially the lowering of the larynx, when biofeedback is provided. HRM biofeedback allows singers to visualize the larynx position while singing facilitating real-time vocal tract position modification and may serve as an efficient tool for singing training.

Thays Vaiano, MD, Speech Pathologist, CEV, UNIFESP, + 55 11 5575-1710, tvaiano@uol.com.br

Fernando Herbella, MD, Gastric surgeon, UNIFESP, + 55 11 5575-1710, herbella.dcir@epm.br

Mara Behlau, PhD, Speech Language Pathologist, Unifesp – “Universidade Federal de São Paulo” and CEV – “Centro de Estudos da Voz”, +55 11 5575171, mbehlau@uol.com.br

Factors Affecting Initiation of Voice Therapy for Paradoxical Vocal Fold Motion Disorder

Objectives: To investigate patient-level predictors of initiation of voice therapy for paradoxical vocal fold motion disorder (PVFM).

Methods: Patients consented to the University of Wisconsin Voice and Swallow Clinics Outcomes Database between March 2010 and November 2016 who were diagnosed with PVFM and recommended for voice therapy were eligible. Patients who attended at least one voice therapy session were considered to have initiated therapy. Analyzed variables included age, gender, distance to the clinic, insurance status, socioeconomic factors, comorbidity score, spirometry results, presence of asthma and/or dysphonia diagnoses, length of evaluation, evaluation model, and patient scores on the Voice Handicap Index (VHI) and Generalized Anxiety Disorder 7-item scale (GAD-7).

Results: One-hundred seventy-eight patients met inclusion criteria. Of these, 118 initiated voice therapy as recommended (66.29%). The majority of patients were female ($n = 127$; 71.35%). Age was the only factor significantly associated with therapy initiation in both univariate ($p = 0.0359$) and multivariable ($p = 0.0295$) analyses, with patients aged 30-39 least likely to attend compared with other age groups. Multivariable analysis also showed that patients evaluated by a speech-language pathologist (SLP) alone were an estimated three times as likely to initiate therapy compared to patients evaluated by SLP and otolaryngologist (ENT) together ($p = 0.0407$). Other variables were not statistically significant for prediction of therapy initiation.

Conclusions: This study suggests that age group and evaluation model are associated with initiation of voice therapy for PVFM. Further study is needed to investigate social-cognitive and quality of life factors in predicting therapy initiation.

Kevin Pasternak, MS, CCC-SLP, Clinical Speech Pathologist, University of Wisconsin Voice and Swallow Clinic, University of Wisconsin Medical Foundation, 600 Highland Ave., G3/2 Clinical Science Center, Madison, Wisconsin 53792, (608) 263-3979, pasternak@surgery.wisc.edu

Susan L. Thibeault, PhD, CCC-SLP, Professor, Division of Otolaryngology, Head and Neck Surgery, Department of Surgery, University of Wisconsin-Madison, 1111 Highland Ave., Madison, Wisconsin 53705-2275, (608) 263-0121, thibeault@surgery.wisc.edu

Innovative Service Delivery Models for Voice Therapy: The Patient's Opinion

Objective. The purpose of this study was to investigate and compare the voice patient's opinion regarding three different service delivery models for voice therapy: a short-term intensive voice therapy with individual sessions (IVT-I), a short-term intensive voice therapy with group sessions (IVT-G), or a long-term traditional voice therapy with individual sessions (TVT).

Design/Methods. Forty-six voice patients (44 females, 2 males, mean age 23.2 years) who followed one of the three therapy programs (IVT-I, IVT-G or TVT) at Ghent University Hospital between October 2014 and January 2017 were asked to participate in this study. They were contacted by email with the request to fill in an online questionnaire that reviews their opinion about the received therapy. The following items were scored by means of a visual-analogue scale from 0 to 100 using a slider: degree of general satisfaction with the therapy, degree of vocal quality improvement after therapy, degree to which the voice disorder was solved after therapy, opinion on the duration of one session, opinion on the total therapy duration, opinion on the frequency of therapy, degree of transfer, and the need for further therapy. At last, participants were asked if they actually continued voice therapy elsewhere after the treatment at Ghent University Hospital.

Results. The response rate of the survey was 87% (40/46). There were no significant differences between the three groups regarding the patients' perception of vocal quality improvement, degree to which the voice disorder was solved, duration of one session, total therapy duration, degree of transfer, and actual continuation of voice therapy. The IVT-G group was significantly less satisfied with the treatment compared with the IVT-I and TVT groups. The IVT-I group rated the therapy as significantly more intensive than the TVT group who rated the frequency as optimal. The TVT group felt a significantly higher need for further therapy than the IVT-G group. *Conclusions.* Results of this study suggest that patients are equally satisfied and perceive a similar progress after short-term intensive voice therapy and long-term traditional voice therapy. This finding creates flexibility in selecting particular time-related variables depending on the specific case and situation. Patients seem to prefer individual sessions over group sessions. Future larger-scale investigation is needed to confirm these results.

Iris Meerschman, PhD, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University, +32 9 332 94 73, iris.meerschman@ugent.be

Evelien D'haeseleer, PhD, Professor, Speech-language Pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University, +32 9 332 24 67, evelien.dhaeseleer@ugent.be

Sofie Claeys, MD, PhD, Professor, ENT doctor, Department of Otorhinolaryngology, Ghent University, Belgium, sem.claeys@ugent.be, sofie.claeys@uzgent.be

Van Lierde Kristiane, PhD, Professor, Professor, Head of the master program Logopaedic and Audiological Sciences, Chair FCIGG, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University; Department of Speech-Language Pathology and Audiology, University of Pretoria, Pretoria, South Africa, +32 9 332 23 91, kristiane.vanlierde@ugent.be

Acoustic and Perceptual Effects of Articulation Exercises in Transwomen

Background. Differences in formant frequencies contribute to gender perception and are therefore targeted in speech therapy for transgender persons. The vowel chart area (/a/, /i/, /u/) in Dutch is larger in female speakers. Articulation exercises using a cork between the front teeth enlarges articulation movements and hypothetically results in a larger vowel chart area. Articulation exercises for lip spreading hypothetically result in changes in the vowel formants.

Objective. The purpose of this study is to measure the impact of articulation exercises using a cork and articulation exercises for lip spreading on the formant frequencies of vowels and listeners perceptions of femininity in transwomen.

Design/Methods. Samples of continuous speech during reading are recorded before and after the cork articulation exercises and before and after exercises for lip spreading. Speech samples are analyzed using PRAAT. In the study, transwomen (n=20) will be included. Data collection of the study will continue until January 2019 and results will be analyzed in February-March 2019. For each speech sample, the vowel formant frequencies (F1, F2, F3) and the vowel chart area will be determined. Secondly, a listeners experiment will be organized using naive female and male listeners rating the audio samples of continuous speech. For the listening experiment a combination of masculinity/femininity ratings (using a VAS) and gender identification (male voice versus female voice) will be used.

Results. The preliminary results of 4 included transwomen show an increase of F2 (in Hz) of /a/ and /i/ and an increased F2 contrast /i-u/ in all participants indicating more frontal-dorsal tongue placement after the cork exercise. The results of the total group and the results of the listeners experiment will be analyzed and presented in June 2019.

Evelien D'haeseleer, PhD, Professor, Speech-language Pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University , +32 9 332 24 67, evelien.dhaeseleer@ugent.be

Paul Corthals, PhD, Professor, Speech-language Pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University

Marjan Cosyns, PhD, Speech-language Pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University

Kristiane Van Lierde, PhD, Professor, Professor, Head of the master program Logopaedic and Audiological Sciences, Chair FCIGG, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University; Department of Speech-Language Pathology and Audiology, University of Pretoria, Pretoria, South Africa, +32 9 332 23 91, kristiane.vanlierde@ugent.be

Iris Meerschman, PhD, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University, +32 9 332 94 73, iris.meerschman@ugent.be

Kim Bettens, PhD, Doctor Assistant, Speech-Language Pathologist, Dept. of Speech, Language and Hearing Sciences, Ghent University, De Pintelaan 185, 2P1, 9000 Gent, Belgium, +32 9 332 9426, kim.bettens@ugent.be

Predictive Factor of Listeners' Attitudes Related to Dysphonic Voices

Introduction: Deviant voices can cause negative reactions in the listener and impact on the communicative effectiveness of dysphonic individuals.

Objective: to identify the predictive factors listeners' attitudes related to dysphonic voices.

Method: were used sample of CAPE-V sentences produced from 44 subjects of both gender with different overall severity (OS) of vocal deviation (health, mild, moderate and intense) and different degrees of roughness (GR), breathiness (GB) and strain (GS). The samples were presented to 152 listeners of both gender who performed the judgment of 12 attitudes inserted in a semantic differential scale previously validated for this study. Logistic Regression Model were used.

Results: There was no association between the gender of the listeners and the judgment of attitudes. In the general model for female and male voices, only the GB and OS were predictors of the attitudes of the listeners. The increase in GB and OS reduces the chance of a voice being evaluated positively in 16 and 20%, respectively. GB and GS were predictors of the listeners attitudes of the female voices, while the OS and GR were predictors of the attitudes for male voices. The increase in GB and GS reduces the chance of a female voice being evaluated positively in 36 and 19%, respectively. The OS reduces the chance of a voice being evaluated positively by 46%, while GR increases by 62% the chance of a male voice being judged positively.

Conclusion: GB and OS are general predictors of listeners' attitudes. GB and GS are predictors for the judgment of the attitudes of female voice listeners, whereas OS and GR are predictors for attributing attitudes to male voices.

Keywords: Voice; Voice disorder; Vocal quality; Attitude

Deyverson Evangelista, MS, Speech Language Pathologist, PhD candidate of UFPB – Federal University of Paraíba, +55 83 3216-7831, deyverson_evangelista@hotmail.com

Leonardo Lopes, PhD, Speech Language Pathologist, Permanent Professor of UFPB – Federal University of Paraíba, +55 83 3216-7831, lwlopes@hotmail.com

Perceived Age, Voice Quality, and Acoustic Metrics: Two Case Studies of Prominent Individuals

Introduction: Age-related changes occur in speech that are associated with structural, physiological and immunological processes involving head, neck and thorax anatomical structures. Additionally, prolonged speaking and voicing has been shown to increase vocal effort needed to speak and may lead to other voice issues. From a listener's perspective, speech changes can be used to give insight into the vocal health and the vocal age of a talker.

Objectives: To look at the relationship between rated vocal quality, estimated age, and acoustic metrics in two elderly individuals. Understanding these relationships is important to both general speech perception as well as in caring for an aging population.

Methods: Speech samples were used from two individuals. The first person (F, 78 y/old) was a public figure who was recorded speaking continuously for 8 hours. The second person (M, 49-98 y/old), spoke regularly over nearly 50 years in the latter half of life. Short speech samples from the first individual were taken at 20 minute intervals over the duration of the 8 hours. Short samples from the second individuals were taken at about 3 year increments over 49 years of recordings. These samples were studied in three ways: 1) using normal-hearing subjects, the short samples were age estimated; 2) trained listeners rated the samples voice quality using the GRBAS; and 3) acoustic analysis of the samples was performed.

Results: As would be expected, actual age and estimated age were related for the longitudinal sample. Additionally, voice quality and acoustic characteristics (e.g. vocal fundamental frequency) do change with age and duration of the prolonged speaking. Unexpectedly, preliminary analyses of estimated vocal age with prolonged vocal speaking showed a negative relationship (younger estimated age after hours of speaking). This result was supported by improving voice quality ratings and acoustic metrics.

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Keywords:

Aging voice, vocal quality.

Eric Hunter, PhD, Dept. of Communicative Sciences & Disorders, Michigan State University, East Lansing, Michigan, USA, ejhunter@msu.edu

Sarah Hargus Ferguson, PhD, Associate Professor, Dept. of Communication Sciences & Disorders, University of Utah, Salt Lake City, Utah, USA, sarah.ferguson@hsc.utah.edu

Lady Catherine Cantor-Cutiva, Lady Catherine, PhD, SLP, Professor, Universidad Nacional de Colombia, Universidad Manuela Beltrán, lccantor@unal.edu.co

Characterization of the Laryngeal Condition during the Humming-Crescendo Task as Hypothetical Hygienic Loud Voice Phonation

Objectives: This study aimed to assess whether or not humming can help increase vocal intensity with only a slight increase in laryngeal resistance.

Methods/design: Seventeen healthy nondysphonic speakers were asked to perform two phonatory tasks in order: gradually increasing vocal intensity (crescendo) during phonation of a vowel or production of a hum (vowel- or humming-crescendo task: VCT or HCT, respectively), while the sound pressure level (SPL), electroglottographic (EGG) signals and high-speed laryngeal movies were simultaneously recorded. The perturbation and glottal contact parameters of the EGG signals and glottal opening and laryngeal outlet (LO) parameters on the laryngeal movies were calculated.

Results and Conclusion: 7 (41%) and 1 (6%) of the 17 participants respectively failed a VCT and HCT due to an abrupt SPL increase with a significant difference ($P=0.011$). With a gradual SPL increase during both tasks, most of the participants showed a progressive decrease in the LO parameter, but no discernible change in the EGG glottal contact parameter. In comparisons between tasks, the HCT produced a significantly lower SPL and greater LO parameter value than the VCT. The failed VCTs showed a significantly higher EGG contact parameter value than the successful VCTs. These results demonstrate that during a gradual increase in vocal loudness, humming suppresses the enhancement of supraglottic resistance and avoid an abrupt SPL increase associated with increased glottal contact.

Makoto Ogawa, M.D., Ph.D., Associate Professor, Department of Otorhinolaryngology – Head and Neck Surgery, Osaka University Graduate School of Medicine, Suita, Japan,
mogawa@ent.med.osaka-u.ac.jp

Tom de Hoop, M.D., Physician, Deventer Hospital, Deventer, Netherlands,
tom_dehoop@hotmail.com

Toshihiko Iwahashi, M.D., Ph.D., Department of Otorhinolaryngology, Toyonaka city Hospital, Toyonaka, Japan, tiwahashi@ent.med.osaka-u.ac.jp

Masanori Umatani, M.D., Ph.D. student, Department of Otorhinolaryngology – Head and Neck Surgery, Osaka University Graduate School of Medicine, Suita, Japan,
mumatani@ent.med.osaka-u.ac.jp

Kiyohito Hosokawa, M.D., Ph.D., Laryngologist, Department of Otorhinolaryngology, JCHO Osaka Hospital, Osaka, Japan, khosokawa@wg8.so-net.ne.jp

Hidehiko Inohara, M.D., Ph.D., Professor, Department of Otorhinolaryngology – Head and Neck Surgery, Osaka University Graduate School of Medicine, Suita, Japan, hinohara@ent.med.osaka-u.ac.jp

Cepstral Peak Prominence (CPP) and Smoothened Cepstral Peak Prominence (CPPs) in Individuals with Vocal Fatigue

Objective: Cepstral measures are sensitive to slightest deviance in voice quality. Vocal fatigue being an initial symptom of a voice disorder, this study aims at documenting the cepstral measures in individuals with vocal fatigue.

Study design: Cross-sectional

Method: A total of 100 subjects participated in the study i.e. 50 with vocal fatigue and 50 without vocal fatigue. Vocal fatigue index (VFI) in Tamil was administered to identify the presence of fatigue. Voice samples (sustained vowel & conversational speech) was recorded using Computerized Speech Lab (Model 4150). Recorded samples were calibrated for SPL@30cm using method 3A as specified by Svec & Granquist (Svec, 2018). Extraction of Cepstral peak prominence (CPP) and smoothened cepstral peak prominence (CPPs) for vowel (v) and connected speech (cs) was done using Praat software (version 6.0.39). Steps and parameters of extraction was followed as mentioned by Phatke (2018). T-test and Pearson correlation was used.

Results: Cepstral values for individuals without fatigue for CPPv CPPcs, CPPs vowel and CPPs connected speech were 25.93 (3.07), 19.93(1.39), 14.64 (2.45) and 9.63(1.14) respectively. Mean and SD of CPPv, CPPcs, CPPs vowel and CPPs connected speech in individuals with vocal fatigue were 21.70 (3.73), 16.52 (1.16), 12.10 (3.36) and 7.50 (1.41) respectively. Individuals with vocal fatigue showed a significantly lower cepstral measures compared to individuals without vocal fatigue. However, there was no significant correlation between the cepstral measures and factors of VFI except in factor II. Factor II (tiredness of voice) had a moderate negative correlation ($r = -0.42$; $p=0.00$) with CPPs connected speech i.e. higher the scores of VFI, lower the values of CPPs.

Conclusion: Deviation in CPPs for connected speech could possibly indicate presence of vocal fatigue related symptom in individuals with voice problem.

Shenbagavalli Mahalingam MASLP, Assistant Professor, Dept. of Speech Language and Hearing Sciences, Sri Ramachandra Institute of Higher Education and Research, Chennai, India,
shenbagavalli.mahalingam@sriramachandra.edu.in

Sreya Srinivas M.Sc (ASLP), Speech Language Pathologist, Chennai, sreya.srinivas1195@gmail.com

Prakash Boominathan PhD, Professor, Dept. of Speech Language and Hearing Sciences, Sri Ramachandra Institute of Higher Education and Research, Chennai, India,
prakash_boominathan@sriramachandra.edu.in

Intelligibility of Dysphonic Speech in Laboratory and Classroom Settings: A Comparative Study

Objective: Previously, a laboratory-based study has shown that vowels in dysphonic speech are less identifiable than vowels in normal speech. The purpose of this study was to evaluate the generalizability of this data to a classroom setting.

Methods: The experiment took place in a university classroom. Listeners of the study were 82 undergraduate students with an average age of 20.41 years ($SD = 1.35$ years). All listeners were native speakers of American English and reported to have normal hearing. Speakers of the study were ten adult females with varying degrees of dysphonia and ten adult females with healthy voice. The speech materials used for the experiment were five vowels of American English in /h/-vowel-/d/ format (i.e., /i, æ, ɑ, o, u/), embedded in a carrier phrase, "I'm going to say ____." The recordings were presented to the listeners through 45BC KEMAR Head and Torso with Mouth Simulator, which was placed at the front of the classroom. Two intensity levels, 60 and 66 dBA, were chosen to simulate conversational and louder speech, respectively. Cafeteria noise was also played with these recordings through two loudspeakers placed at the front of the classroom. A signal-to-noise ratio (SNR) ranged from -10 to +10 dB, depending on the seating location of the listeners. The listeners were asked to indicate the word they heard in a forced-choice format.

Results: The preliminary analysis revealed the number of correctly identified vowels are significantly lower in speech at conversational level ($p < 0.01$). There was no significant difference between dysphonic and normal groups.

Conclusions: Results of the study indicate that the generalizability of the laboratory-based findings to a classroom setting is limited. The presentation will also discuss the effect of vowels and seating location.

Keiko Ishikawa, PhD, MM, CCC-SLP, Assistant Professor, University of Illinois at Urbana-Champaign, 901 South Sixth St., Champaign, IL 61820, (217) 300-7017, ishikak@illinois.edu

Searam Park, Undergraduate Research Assistant, spark191@illinois.edu

Pasquale Bottalico, Engineer, Assistant Professor, Department of Speech and Hearing Science, University of Illinois Urbana-Champaign, (217) 300-0327, pb81@illinois.edu

Low-Cost Electronic Device for Respiratory Training

Respiratory muscle exercise programs have the potential to improve functions of breathing, swallowing and speech. Several studies have demonstrated that respiratory training improve aerobic capacity, breathing pattern, muscle strength, and quality of life in patients with respiratory, swallow and/or voice problems. Different devices are used to perform inspiratory and expiratory exercises. Many of them are inexpensive and functional for adult patients, nevertheless they have low playful appeal for teenagers and children, who are not encouraged to use them.

This paper proposes a low-cost electronic device (joystick) for respiratory training that allows to perform blow and suctions exercises using any free internet games. With this device, patients will be able to control internet free games by different intensities of blow and suctions instead of typing on a keyboard.

The embedded system that characterizes the joystick proposed in this paper include a pressure sensor and a microcontroller connected to a computer (USB connection). The user can select the function – Blow or Suction – and, can also choose the intensity and duration of the exercise using a settings mode display. In addition to an easy practice and attractive interface, the operation of the device can be customized for each patient, according to the interest of the speech therapist and the physical condition of the patient.

The functional results were obtained by practical laboratory tests. Calibration function and intensity degrees for blow and suction were verified using different internet games. The system is easy to use and does not require any driver or software installed on the computer. The low-cost joystick system for respiratory exercises showed promising results in all the laboratory tests.

María Eugenia Dajer, PhD, Professor at Federal University of Technology – Paraná – Brazil,
+005543 996300369, medajer@utfpr.edu.br

André Sanches Fonseca Sobrinho, PhD, Professor at Federal University of Technology – Paraná
– Brazil, +005543 35204091, andresobrinho@utfpr.edu.br

Novel Application of Fully Convolutional Neural Networks (FCNN) in Auditory-Perceptual Analysis of Voice

Objective. Auditory-perceptual evaluation of voice quality is an essential component in the comprehensive evaluation of voice disorders, particularly in the assessment of change over the course of voice therapy. However, perceptual description of voice varies greatly among voice care providers. Deep learning (DL) is a promising platform for improving the reliability of perceptual voice evaluation. We present the first use of FCNN to create an automated, objective voice evaluation method that reliably sorts voice audio samples by predominant sound quality.

Methods/Design. Participants with healthy voices were recruited from the Columbia University Graduate Engineering Program to provide 25 samples each of sustained /a/ with normal, breathy, rough, and strained voice. Participants were trained using videos and coaching by a speech-language pathologist and medical student, both trained in auditory-perceptual evaluation of voice. These voice samples constituted the training, test, and validation sets of a FCNN, which harbors the advantage of being able to process inputs of variable durations. The model (a) ‘learned’ what a normal, breathy, rough, or strained voice sounds like during the training phase, and (b) classified previously unused voice samples by predominant voice sound quality during the testing phase.

Results. We are nearing completion of data collection. An interim analysis with one-third of the total projected data showed that the FCNN identified what the researchers had labeled as the predominant voice sound quality with an accuracy over 87%. We are expecting comparable or improved accuracy with the full data set.

Conclusions. This study indicates that DL can accurately identify different voice sound qualities. Future studies will use patient voice samples in the training, test, and validation sets. We believe DL models can provide a complementary objective measurement that strengthens the evaluation and treatment of voice disorders.

Kimberly Duncan, MA, CCC-SLP, Speech-Language Pathologist, The Voice and Swallowing Institute, Columbia University Medical Center, (847) 894-5324, kad2202@cumc.columbia.edu

Victoria Yu, BA Medical Student, Columbia University, (408) 207-3002, vxy2101@cumc.columbia.edu

Michael Pitman, MD, Chief, Division of Laryngology, The Voice and Swallowing Institute, Columbia University Medical Center, (212) 305-5289, mp3517@cumc.columbia.edu

Zoran Kostic, PhD, Associate Professor of Professional Practice, Columbia University, (212) 851-0269, zk2172@columbia.edu

Zixiao Zhang, MS in Electrical Engineering, Graduate Student, Columbia University, (212) 851-0269, zz2500@columbia.edu

Yilin Lyu, MS in Electrical Engineering, Graduate student, Columbia University, (212) 851-0269, yl3832@columbia.edu

Vocal Manifestations of Reported Past Trauma

Introduction: The human voice carries a wealth of information about a speaker's physical and emotional states, their personality, and perhaps even their past experiences. For many people, these experiences include the endurance of traumatic events, which can have a lasting effect on psychological, physical, and neurobiological development. In turn, one's past experiences of trauma might impact their vocal function and/or quality. The aims of the present study are (1) to identify whether a connection exists between an individual's past experiences and their vocal characteristics, and (2) to explore the extent to which so-called "laryngoresponders" display a unique set of acoustic features when compared to "non-laryngoresponders".

Methods: Data will be presented from 25 vocally healthy cisgender females between 18 and 65 years of age. Participants will complete self-report measures wherein they identify their body's habitual response to stress, i.e., their vulnerable body pathway(s), thus allowing them to be characterized either as laryngoresponders or non-laryngoresponders. Each participant will complete self-report measures of personality and past traumatic experiences, and they will also provide repeated samples of brief speech recordings for acoustic analysis. Descriptive statistics will be reported for all data obtained. Pearson's correlation coefficient will be performed to determine if acoustic measure change scores are related to scores obtained from the trauma questionnaires, and independent samples t-tests will be performed on acoustic measure change scores for self-reported laryngoresponders versus non-laryngoresponders. Appropriate substitutions will be made if assumptions are violated.

Results: Data collection is ongoing (data from n=10 participants obtained at the time of submission) and will be completed by the end of December 2018. Formal acoustic measures, as well as analyses of personality and trauma questionnaires will be presented in detail. Repeated measures of time- and spectral-based acoustics will be reported for all participants, and the relationship between these acoustic measures and the amount and type of past trauma will be characterized. Additionally, acoustic and experiential data will be compared between self-identified laryngoresponders and non-laryngoresponders to determine the extent to which these measures corroborate or relate to self-report of the vocal region as a vulnerable body pathway.

Conclusions: The present study serves as a novel and innovative exploration of the relationship between past traumatic experiences and current vocal function, quality, and body perception. Findings are expected to clarify relationships between voice and trauma, further explore the clinical presumption that the voice represents an underlying "vulnerable body pathway" to stress, and will serve to hone future research methods in this arena.

Diana Rose Becker, BM, MS Candidate (April 2019), Graduate Student Researcher, University of Pittsburgh, Communication Science & Disorders, (631) 848-8131, Drb79@pitt.edu

Elisa Monti, PhD Candidate, The New School for Social Research, (347) 400-2603, Monte991@newschool.edu

Harmony Sullivan, PsyD, Licensed Psychologist, Private Practice, (412) 596-6432, HSullivanPsyD@gmail.com

Leah B. Helou, PhD, CCC-SLP, Assistant Professor, University of Pittsburgh Department of Communication Science & Disorders, (412) 383-6541, Lbh7@pitt.edu

Comparison of Reported Vocal Habits of First-Year Undergraduate and Graduate Vocal Performance Majors

Objective: Vocal performance students at the collegiate level are faced with rigorous vocal training for which they are required to maintain optimal vocal quality and function. The purpose of this study is to compare the vocal habits and hygiene practices of incoming undergraduate bachelor's, graduate master's, and graduate doctoral/artist diploma vocal performance students at a prestigious music conservatory. To date, no study has compared the reported vocal habits of undergraduate and graduate vocal performance students at the same music conservatory.

Methods: Two-hundred and eighty six incoming vocal performance majors including undergraduate (n=79), graduate master's candidates (n=171), and graduate doctoral/artist diploma candidates (n=36) at the University of Cincinnati College–Conservatory of Music (CCM) over a period of 9 years (2008-2017) were asked to complete a questionnaire designed to gain information about their baseline vocal patterns and hygiene practices. The intake form included questions about daily liquid intake, past voice treatment, current adverse voice symptoms, warm-up and cool-down use, average time spent singing daily, and any harmful voice hygiene practices such as phonotraumatic behaviors (i.e. yelling, frequent throat clearing). This data was retrospectively analyzed for significant findings within groups and as a comparison between groups.

Results/Conclusions: Results from the questionnaires detailing the undergraduate voice performance participants' self-reported current and past vocal symptoms, current vocal health and hygiene practices, reported voice training habits, and other pertinent factors that may lead to potential voice problems in comparison to those same factors presented in the graduate master's and doctoral/artist diploma voice performance participants' questionnaires are provided. Data gained from the voice performance participants revealed that the potential for voice-related problems exists within all groups, as 45.5% of undergraduate students, 38.6% of graduate master's students, and 44.4% of graduate doctoral/artist diploma students stated at least one current voice issue or adverse symptom. The information provided in this study may be beneficial for those who are vocal performers as well as those involved in the training of collegiate-level vocal performance students.

Holly A. Reckers, BM, Student, University of Cincinnati/CCM, (513) 410-3163, reckerha@mail.uc.edu

Erin N. Donahue, MA, CCC-SLP, Voice Pathologist/Singing Voice Specialist, BBIVAR/ProVoice, (513) 632-5805, edonahue@soents.com

Wendy D. LeBorgne, PhD, CCC-SLP, Clinical Director/Voice Pathologist/Singing Voice Specialist, BBIVAR/ProVoice/CCM, (937) 496-2622, wleborgne@soents.com

Do Phonatory Aerodynamics in Connected Speech Differ Between Vocally-Normal Patients and those with Muscle Tension Dysphonia?

Objective: To compare phonatory aerodynamics in patients diagnosed with primary muscle tension dysphonia (MTD) to healthy control (HC) patients without voice complaints. Historically, MTD has been described as an uncoordinated respiratory-phonatory interaction resulting in patients using the vocal folds more as a valve to control exhalatory airflow, manifesting in a breath-holding pattern while speaking.

Methods/Design: Prospective-retrospective collection of n= 146 age, gender, and BMI-matched pairs (MTD to HC) with aerodynamics in connected speech data. All participants read a standardized passage using a software system that captured phonatory aerodynamics (number of breaths, duration of passage, phonation time, mean Sound Pressure Level (dB SPL), pitch range, mean phonatory airflow, inspiratory/expiratory airflow and volumes) and completed the Voice Handicap Index-10 (VHI-10). Paired t-tests were conducted to compare phonatory aerodynamics and VHI-10.

Results: The two groups differed significantly only in VHI-10 scores, mean SPL, and phonation time ($p < .05$). All other phonatory aerodynamic scores were not significantly different. VHI-10 scores were higher in patients with MTD. Mean SPL and phonation time were lower in patients with MTD. Ranges and standard deviations were greater for all aerodynamic measurements in patients with MTD.

Conclusion: This study further supports the findings of past work documenting large variability in

aerodynamic measurements in patients with primary MTD. Prior investigations have identified multiple profiles of phonatory airflow in people with MTD. Individual phonatory aerodynamic values should be considered when setting goals and treatment plans for patients with MTD.

Michael Belsky, BS, Medical Student, University of Pittsburgh School of Medicine, (724) 553-6333, mab536@pitt.edu

Ali Lewandowski, MSc. CCC-SLP, Speech-Language Pathologist, (412) 232-7464, ali.lewandowski2@upmc.edu

Scott Rothenberger, PhD, Assistant Professor, University of Pittsburgh, Center for Research, (412) 864-3014, rothenberger@pitt.edu

Amanda I. Gillespie, PhD, Assistant Professor of Otolaryngology, Emory University School of Medicine; Director, Speech Pathology; Co-Director, Emory Voice Center, Emory University, (404) 778-3381, amanda.i.gillespie@emory.edu

Diana Rose Becker, BM, MS Candidate (April 2019), Graduate Student Researcher, University of Pittsburgh, Communication Science & Disorders, (631) 848-8131, Drb79@pitt.edu

Jackie Gartner-Schmidt, PhD, Co-Director of the University of Pittsburgh Voice Center, Professor University of Pittsburgh Voice Center, (412) 232-8970, jgs@pitt.edu

Do Results from Voice Stimulability Probes Predict Voice Handicap-10 Change Scores?

Objective: To determine if baseline patient characteristics and patient's ability to manipulate voice using flow, resonance and clear speech stimulability probes predict Voice Handicap-10 (VHI-10) change scores after Conversation Training Therapy (CTT). Results compared outcomes from CTT with age/gender/diagnosis-matched historical controls having had physiologically-based eclectic voice therapy without stimulability probes prior to therapy.

Methods/Design: Prospective study of 57 participants diagnosed with primary Muscle Tension Dysphonia and vocal fold lesions who underwent 4 sessions of CTT. Historical controls had 4+ eclectic voice therapies. Participants in the CTT program underwent objective stimulability testing with flow phonation, resonant voice and clear speech and subjective patient self-assessment (*sound* and *feel* of voice in response to stimulability probe), as well as baseline perceived stress scores (PSS). Historical controls did not have any stimulability probes prior to therapy.

Results: All participants passing the standardized stimulability protocol demonstrated significant positive VHI-10 change decreasing from 20.8 to 8.3 at follow-up ($p < .001$). Participants who noted an immediate change in the *feel* of voice had better VHI-10 outcomes than those without such awareness. Participants with a moderate-severe baseline PSS (score > 14) achieved smaller change in VHI-10 score following therapy than patients with mild PSS scores at baseline. Magnitude of response to therapy was less for the historical controls than for the study group.

Conclusions: These data support the hypotheses that 1) positive change in flow phonation, resonant voice and clear speech stimulability trials may predict greater voice outcome (success) following voice therapy; 2) good candidates for voice therapy need proficient kinesthetic awareness of voice; 3) heightened perceived stress may limit the ability to attend to voice change.

Jackie Gartner-Schmidt, PhD, Co-Director of the University of Pittsburgh Voice Center, Professor
University of Pittsburgh Voice Center, (412) 232-8970, jgs@pitt.edu

Clark Rosen, MD, Professor, Director, University of California San Francisco Voice Center, (415) 885-7700, clark.rosen@ucsf.edu

Amanda I. Gillespie, PhD, Assistant Professor of Otolaryngology, Emory University School of Medicine; Director, Speech Pathology; Co-Director, Emory Voice Center, Emory University, (404) 778-3381, amanda.i.gillespie@emory.edu

Diana Rose Becker, BM, MS Candidate (April 2019), Graduate Student Researcher, University of Pittsburgh, Communication Science & Disorders, (631) 848-8131, Drb79@pitt.edu

Voice Therapy for Transgender Clients

Objective: The current work provides trans voice care from the perspective of the Global Voice Therapy Model (GVTM) involving interprofessional collaboration, including family and friends, to address all of the client's needs.

Method: Transgender clients at West Chester University Speech and Hearing Clinic receive voice therapy through the GVTM. The GVTM involves four components; stimulability testing, treatment hierarchy, "new" versus "other" or "old" voice, and additional methods that augment and support the target voice. Stimulability testing involves finding the best possible voice production technique that facilitates the "new" voice. That technique could be resonant voice, semi occluded vocal tract exercises, yawn sigh, stretch and flow, loud voice, Estill's Figures and Qualities, etc. The treatment hierarchy involves moving from smallest unit of utterance (words) with decreased cognitive load up to long utterances (conversational speech) with increased cognitive load. "New" versus "other" or "old" voice requires that the client produce the new voice achieved through voice therapy and contrast it with the "other" or "old" voice at each step of the treatment hierarchy. The "other" voice may be a voice that is the extreme female sounding voice with high larynx, elongated true vocal folds, retracted false vocal folds, thyroid tilt with slightly narrow epilarynx. The "other" voice may change depending upon the needs of the client and the goals in voice therapy. The "old" voice is the voice that the client wants to change. By contrasting these voices in therapy, the client can determine what is the best "new" voice that will be used in and out of the therapy room. The team explores this fundamental question - What voice is the most functional that will meet all of the client's needs? Additional methods that augment and support the new voice could involve counseling, posture work, respiratory training, stress reduction, interprofessional collaboration, family/friends/caregiver involvement, etc. The GVTM will be discussed with video examples from clinicians, trans clients, family members, and other professionals demonstrating the model.

Results: Comparing pre to post data, there are significant differences for the acoustic measures of fundamental frequency (F_0) and standard deviation (STD) of F_0 and for the perceptual measure of the Transsexual Voice Questionnaire (TVQ). For clients transitioning from male to female, the F_0 and STD of F_0 increased at post as compared to pre. The TVQ decreased at post as compared to pre.

Conclusions: The GVTM facilitates a "new" voice that meets the client's needs as demonstrated by significant changes from pre to post across acoustic and perceptual measures. Involving other professionals (e.g., licensed social worker) and the client's family and friends in the GVTM may improve treatment outcomes and facilitate generalization and maintenance of the "new" voice.

Elizabeth U. Grillo, PhD, CCC-SLP, EFP, Professor, West Chester University, (610) 436-2132
egrillo@wcupa.edu

Cassidy Quick, MA Candidate, Graduate Student, West Chester University, (610) 436-2132, CQ899720@wcupa.edu

Emily Catinella, MA Candidate, Graduate Student, West Chester University, (610) 436-2132, EC899605@wcupa.edu

Kay Bogunovich, MA Candidate, Graduate Student, West Chester University, (610) 436-2132, KB810019@wcupa.edu

Lena Queen, MSW, MEd, LCSW, Clinical Social Worker/Therapist, Journey Wellness, (302) 721-5449,
LenaQ@journeywellnessdelaware.com

Interface to Characterization of Voice Signals to determine Vocal Fatigue Levels in College Professors in Bogotá-Colombia

Objective: Determine vocal fatigue levels among college professors in Bogotá-Colombia. **Methods:** The process of detection of vocal fatigue levels was done by detecting changes in the analog waves identified with an interface that characterizes voice signals by means of algorithms. The first step was to identify variables that allow to determine variations in the voice signals obtained through digital signal processing protocols. The second step is to quantify variations in the selected variables to obtain vocal fatigue degree. The last step was to define the relation between the selected variables and vocal fatigue control variables (self-report, standard deviation of the fundamental frequency and standard deviation of the level of vocal sound pressure). For this study, technological resources will be used to characterize and identify the signals obtained. Therefore, differentiate the changes or visible variations in the waves. In order to do this, we will recruit college professors from a private university in Bogota, Colombia. The signals will be obtained at the beginning of the academic day and at the end of the day, this will show changes that take place during a work day and may allow us to detect short-term vocal fatigue. **Expected Results and Conclusions:** At the end of this project, an interface to quantify vocal fatigue will be developed. This interface will quantify vocal fatigue through digital signal processing.

Keywords: professors, work-related factors, life-style habits.

Diego Alejandro Morales Gil, Biomedical Engiener, Universidad Manuela Beltrán,
cristar2002@hotmail.com

Stephanie Cuellar Guamán , Biomedical Engineer, Universidad Manuela Beltrán,
tefa.cuellar@outlook.com

Emilio Alejandro Sanchez Pinzón, Biomedical Engineer, Universidad Manuela Beltrán,
emilio.sanchez.ing@gmail.com

Hédrick Yoseft Robles Vega, Biomedical Engineer, Universidad Manuela Beltrán,
hedrick.robles@docentes.umb.edu.co

Lady Catherine Cantor-Cutiva, SLP, MsC, PhD, Professor, Universidad Manuela Beltrán,
lccantorc@unal.edu.co

Work-Related Factors and Life-Style Habits Related with Self-Report Voice Symptoms among College Professors: A Case Study of Chilean and American College Professors

Background: College professors are considered professionals of the non-artistic voice. There is interest in obtaining a better understanding of vocal health and voice use, which added to the infrastructure of the classrooms, hours of teaching and poor vocal hygiene, can lead to vocal problems. **Purposes:** (1) Determine differences in work-related factors and lifestyle habits associated with voice function, (2) Define the effect of history of voice problems in smoking, alcohol consumption and caffeine consumption among college professors. **Methods:** An online survey was sent to a random sample of Chilean and American college professors. The survey included questions on socio-demographics, life-style habits (smoking, alcohol consumption, caffeine consumption, non-occupational singing, spicy food consumption), work-related factors (having teaching assistants, years of experience, hours of teaching per week, among others), and history and current occurrence of voice disorders. **Results:** In total, 53 American college professors and 81 Chilean college professors filled in the online questionnaire. Fewer American professors reported history of vocal training and voice disorders. They also reported lower consumption of alcohol and caffeine beverages than their Chilean colleagues. Chilean professors reported higher prevalence of self-reported voice symptoms compared with their American colleagues (33% vs. 19%). Chilean professors reported, in average, more hours per week of teaching (16 vs. 7 hours), but smaller groups compared with American professors (25 vs. 49 students). Teachers who reported smoking sometimes reported more often history of voice disorders ($B=2.3$, $SE=1.08$; $p\text{-value}=0.03$). **Conclusion:** The elevated report of voice disorders and voice training in the Chilean professors may be due to higher work-related voice use (e.g. more hours per week of teaching) but also higher presence of lifestyle habits, such as smoking. Both groups reported occupational elements that have been tied to voice disorders, though different aspects of the loads (larger classes vs longer teaching hours). In conclusion, many of the same risk factors exist for both sets of professors, however there are some differences which could likely be attributed to general cultural differences as well as institutional cultural differences.

Keywords: professors, work-related factors, life-style habits.

Lady Catherine Cantor-Cutiva, SLP, MsC, PhD, Professor, Universidad Manuela Beltrán,
lccantor@unal.edu.co

Celina Malebran, SLP, Associate Professor, Universidad Santo Tomás sede Viña del Mar,
mariamalebranbe@santotomas.cl

Eric J. Hunter, PhD, Professor, Dept. of Comm Sciences & Disorders, Michigan State University,
ejhunter@msu.edu

Effects of High-Intensity Group Singing Training on Vocal Function in Patients with Parkinson Disease

Objective: There is a large body of evidence that intense vocal training, specifically Lee Silverman Voice Training (LSVT), improves speech and communication for people with Parkinson Disease (PD). Although effective, LSVT places high demands on clinical and patient resources. Alternatives to this protocol have shown promise, such as reducing the number of visits, extending the duration, or offering training in a group setting. There is emerging evidence that Choral Singing Therapy is one group approach that can benefit people with PD across a range of modalities, including speech, respiration, and quality of life (QOL). The goal of this study was to examine the effects of group singing training plus daily home practice on the voice of patients with PD and capture potential transference to swallowing function.

Methods/Design: This was a prospective cohort study with within-subject pre/post-treatment comparisons using a mixed model repeated measures design. A total of 16 patients with PD completed an 8-week singing training program, with one session per week. Pre/post evaluations included vocal function (acoustic and aerodynamic), swallowing function (FEES), quality of life questionnaires, and self-perception of vocal improvement. Amount of daily home practice was measured via both self-report and audio recordings.

Results: Outcome measures were highly variable with no clear improvement or change in any objective acoustic or aerodynamic measurement except for an increase in subglottal pressure. No change was observed on FEES. Quality of life measurements also remained unchanged, despite 9/16 participants reporting self-perceived improvements in voice. The amount of self-reported and recorded home practice was highly related ($R^2 = 0.87$), with a wide range of values from 0-300 minutes per week.

Conclusions: There was no measureable group improvement in voice or swallowing after 8 weeks of group singing training. These negative findings may be explained by the variable engagement in home practice between group singing sessions.

Aaron M. Johnson, PhD, MM, CCC-SLP, Assistant Professor, New York University School of Medicine, (646) 754-1207, aaron.johnson@nyulangone.org

Sonja Molfenter, PhD, CCC-SLP, Assistant Professor, New York University, (212) 992 7694, smm16@nyu.edu

A Novel Time-Frequency Approach to Discriminate Healthy, Rough, Breathy, and Strained Voices

Objective: Time-frequency analysis plays a significant role in voice quality assessment and vocal monitoring. Empirical mode decomposition is a nonlinear and nonstationary tool that decomposes a signal into a sum of oscillatory components namely the intrinsic mode functions (IMFs), with guaranteed positive and smoothly varying instantaneous frequencies via Hilbert transform. This study aims to analyze the accuracy of temporal and spectral features extracted from the IMFs of the voice signals in the classification of voice disorders.

Methods: A total of 116 recorded samples of sustained vowel /ε/ were employed, being 30 from normal individuals and 86 from subjects with vocal disorders (29 roughness, 28 breathiness and 29 strain). All voice signals were decomposed in ten IMFs. Five features, including temporal and spectral ones, were extracted from each IMF. A statistical analysis was performed to identify the most relevant features. The selected ones were classified individually and combined using a multilayer perceptron (MLP) neural network to discriminate between healthy and disordered voices.

Results: Concerning individual measure performance, the deviation of instantaneous power spectral density (PSD) measure, extracted in the fifth intrinsic mode decomposition, showed the best classification potential to discriminate between healthy and disturbed voices, with accuracy rate of 92.67 ± 4.52 %. A gain was obtained in the classification when the measures were combined, reaching an accuracy of 100%, for discriminating both between healthy and breathy and between healthy and rough voices. In the first case, the second intrinsic mode had higher discrimination power in classification, while in the second one there was the fifth intrinsic mode. Smaller IMFs provide information of the high frequencies of the signals.

Conclusions: Measures extracted from the IMFs of the voice signals were promising in differentiating healthy, rough, breathy, and strained voices. Isolated or combined measures present performance above 90% in this discrimination.

Samuel Ribeiro de Abreu, Master's Student in Electrical Engineering, Federal Institute of Paraíba (IFPB), Brazil, +55 (83) 98640-2863, abreu.s.ribeiro@gmail.com.

Suzete Élidea Nóbrega Correia, PhD, Electrical Engineer/Professor, Federal Institute of Paraíba (IFPB), Brazil, +55 (83) 98709-9849, suzete@ifpb.edu.br

Silvana Luciene do Nascimento Cunha Costa, PhD, Electrical Engineer/Professor, Federal Institute of Paraíba (IFPB), Brazil, +55 (83) 98757-1968, silvana@ifpb.edu.br

Leonardo Wanderley Lopes, PhD, Speech Therapist/Professor, Speech and Language Pathologist Dept., Federal University of Paraíba (UFPB), Brazil, +55 (83) 99985-5871, lwlopes@hotmail.com

Vinícius Jefferson Dias Vieira, PhD, Technologist in Telecommunications/Professor, Speech and Language Pathologist Dept., Federal University of Paraíba (UFPB), Brazil, +55 (83) 99802-6281, viniciusjdv@gmail.com

Vocal and Respiratory Conditioning Program for Professional Choral Singers

Objective: Professional singers can benefit from conditioning programs. The purpose of this study is to evaluate benefits of a vocal and respiratory conditioning program - VRCP.

Methods: 22 vocally healthy adults participated; active professional members of the Metropolitan Civil Guard choir. Four evaluations were carried out: A1. baseline condition, 30 days before the beginning of the VRCP; A2. VRCP day 1; A3. VRCP final day; A4. One-year follow up after A3. The VRCP consisted of: one group session per week, 8 consecutive weeks, 60 min duration. The content of the program included: semi-occluded vocal tract exercises and incentive spirometries with progressive overload. Exercises were repeated daily, with supervision. Acoustic (F_0 and phonatory deviation diagram) aerodynamic (MPT of /ae/, /s/, /z/; forced vital capacity) clinical parameters and self-assessment questionnaires (VHI-10 and VoiSS) were extracted. At A3 the participants were asked to report perceived benefits and to indicate the 3 best exercises; at A4 they were asked on the maintenance of the perceived benefits.

Results: Data set showed a large dispersion; the only statistical difference was found at the /z/ maximum time. Self-perception indicated better respiratory control and/or vocal conditioning; the best exercises were considered: the incentive spirometry, straw and finger-kazoo. After 1-y, at A4, participants still perceived the VRCP gains. Clearly, the participants perception did not match the results on the objective parameters; interaction between the trainers and the choir members could have produced the positive results; moreover, the selected parameters could not have been sensitive to the possible changes. A clinical battery to be easily applied for detection of positive changes in normal voices submitted to a long-term program has to be developed.

Conclusion: The VRCP performed with the professional choral singers resulted in self-reported perception of improvement in voice and/or respiration, with long time maintenance results.

Flavia Badaró, SLP, BSc Associate Professor at Centro de Estudos da Voz (CEV, São Paulo (SP), Brazil, +55 11 55751710, flabadaro@uol.com.br

Thays Vaiano, SLP, MS Associate Professor at Centro de Estudos da Voz (CEV, São Paulo (SP), Brazil, +55 11 5575-1710, tvaiano@uol.com.br

Mara Behlau, SLP, PhD, Director at Centro de Estudos da Voz, (CEV, São Paulo (SP), Brazil

The Influence of Auditory Feedback and Vocal Rehabilitation on Prelingual Hearing-Impaired Individuals Post Cochlear Implant

Objective: To verify changes in the perceptual and acoustic vocal parameters in prelingual hearing-impaired adults with cochlear implants (CI) after vocal rehabilitation. **Methods/Design:** Study prospective and pre-post. Twenty literate adults, age 17 to 48, with profound prelingual bilateral sensorineural hearing loss participated in the study; individuals were implanted late and were fluent users of oral language. All individuals presented normal results in laryngoscopy and hearing thresholds with CI better than 40 dBHL. Individuals were randomly distributed into two groups: G1 (treatment) and G2 (control), both with ten patients, matching mean age and hearing deprivation time. Patients from G1 underwent a protocol of vocal and speech therapy including 12 individual sessions with the same clinician, comprising vocal exercises and plosive consonants production training with spectrogram. G2 only underwent vocal recordings. The recording sessions used the CAPE-V protocol and reading of carrier phrases with the six plosive consonants of the Brazilian Portuguese language. Auditory-perceptual evaluation of voices was performed by three judges, and the acoustical analysis used the PRAAT program. **Results:** Statistically significant reductions in the overall vocal degree ($p=0.005$), vocal instability ($p=0.028$) and degree of resonance ($p=0.005$) were observed in G1. Statistically, individuals from G1 did not differ in regard to the modification of voice acoustic parameters. G1 presented statistically significant improvement in the production of [b] ($p=0.008$) and [d] ($p=0.01$). G2 did not present significant changes in any of the analyzed parameters. **Conclusions:** The cochlear implanted adults submitted to vocal rehabilitation presented changes in the auditory-perceptual parameters, with reduction of the overall voice severity, vocal instability, degree of resonance and improvement in the production of consonants [b] and [d]. Voice and speech rehabilitation should begin as soon as possible, helping to maintain correct functioning of the larynx.

Maysa Tibério Ubrig, PhD, Speech Language Pathologist, Department of Otolaryngology, University of São Paulo. Av. Dr. Eneas de Carvalho Aguiar, 255 – Cerqueira César – 04559-001 - São Paulo, Brazil, maysaubrig@gmail.com

Robinson Koji Tsuji, MD, PhD, Department of Otolaryngology, University of São Paulo. Av. Dr. Eneas de Carvalho Aguiar, 255 – Cerqueira César – 04559-001 - São Paulo, Brazil, rktsuji@gmail.com

Márcia H. Moreira Menezes, PhD, Speech Language Pathologist. Plenavox, Rua Dr. Diogo de Faria, 1087 - Vila Clementino - 04037-004 - São Paulo, Brazil, marciamenezes@plenavox.com.br

Viviane M. O. Barrichelo, MS, Speech Language Pathologist. Vocalis – Voz & Expressão. Rua Itacolomi, 601 cj 13 – Higienópolis – 01239-020 – São Paulo, Brazil, viviane@vocalis.com.br

Maria Gabriela B. da Cunha, MS, Speech Language Pathologist. Parola Consultoria em Comunicação. Rua Dr. João Pinheiro, 619 – Jardim Paulista – 01429-001 – São Paulo, Brazil, gabicunha74@gmail.com

Domingos H. Tsuji, MD, Professor, PhD, Department of Otolaryngology, University of São Paulo. Av. Dr. Eneas de Carvalho Aguiar, 255 – Cerqueira César – 04559-001 - São Paulo, Brazil, domingostsuji@terra.com.br

Maria Valéria S. Goffi-Gomez, PhD, Speech Language Pathologist, Department of Otolaryngology, University of São Paulo. Av. Dr. Eneas de Carvalho Aguiar, 255 – Cerqueira César – 04559-001 - São Paulo, Brazil, goffigomez@uol.com.br

Acoustic Characteristics of Different Intentional Vocal Distortions Produced by Rock Singers

Objective: Intentional vocal distortions create different rough qualities in voice that are used as an expressiveness resource in several musical genres, especially in rock. Studies were made with the objective of understanding the production of these distortions, but few investigated their acoustic variations. This study aims to analyze through acoustics the differences and similarities between intentional vocal distortions in rock singers.

Methods: In this exploratory study different distortions were recorded in two ways: music sections and sustained sounds, by eight singers, six men and two women, with a mean age of 36 years old. Acoustic analysis were performed in which were observed: fundamental frequency, number of sub-harmonics, vowels used, spectrographic trace and harmonic component range. The data of the distortions were compared, and the spectrographic tracings classified according to the degree of presence of harmonics and noise.

Results: 47 types of distortions were collected, 38 presented a small variation when comparing music and sustained samples. The types of tracings characterized by the presence of regular harmonics and noise were 37 in music and 39 in the sustained ones. Five sustained vocal adjustments presented only noise and three presented biphonation. In the music section there were seven with noise and three with biphonation. The most used vowels were those of intermediate opening (32) and anterior (34) and there were zero to eight sub-harmonics observed.

Conclusions: The distortions were differentiated acoustically by the varied degree of harmonic component and noise, by the presence of noise alone or by biphonation. Factors such as the vowel chosen, and the fundamental frequency sung influenced the accuracy of the distorted emission. The distorted vocalizations performed in the sustained samples were similar to the ones used during music.

Mauro Barro Fiuza, MM, MSc, SLP, Teacher of Singing, Student at Pontifícia Universidade Católica de São Paulo PUC-SP, +55 11 98384 5317, mauro.bf@gmail.com

Marta Assumpção de Andrada e Silva, PhD, Coordinator, Speech Language Pathologist
Postgraduate Program, Pontifícia Universidade Católica de São Paulo PUC-SP, +55 11 99957 6530, m.andradaesilva@gmail.com

Nasal Resistance (NR) Technique: An Approach to Increase Glottal Adduction

Objective:

Hypofunctional voice disorders that can range between functional dysphonia and Parkinson's disease have one common feature, lower levels of glottal contact. Several techniques have been practiced in the field of voice therapy to increase glottal adduction. Semi-occluded Vocal Tract Exercises (SOVTE) have shown to bring in a positive increase in glottal contact as reflected by Closed Quotients (CQ) measured using waveforms recorded via electroglottograph. This study explored the effect of manually induced nasal resistance on voice production. Nasal resistance (NR) technique is a typical humming exercise with the nares partially blocked with the subject's fingers. Preliminary data indicate an increase in CQ using NR.

The goal of this study is to analyze the effect of NR technique on electroglottographic measures and compare CQ across most commonly used SOVTE reported in literature.

Methods:

Subjects: Two groups of participants were recruited for this study, phononormal and hypophonic patients.

Protocol:

Instrumentation: Subjects were seated comfortably. Electrode placements were performed with care to obtain authentic EGG waveforms. A condenser microphone was used to record acoustic signals. The two signals were recorded simultaneously using an A-D converter. Subjects were instructed to perform tasks including (a) steady phonation, (b) straw phonation, (c) humming, and (d) NR technique.

Analysis: Electroglottographic waveforms from steady segments of each stimuli were analyzed using EFXHIST, freeware written by Mark Huckvale, University College of London. CQ measures and jitter% were recorded for each stimuli.

Results and conclusions:

Preliminary results indicate an increase in CQ during performance of NR technique. Comparison across stimuli and between subjects will be reported during presentation. The efficacy of NR technique will be highlighted based on the results obtained from this study in progress.

Nandhu Radhakrishnan, PhD, CCC-SLP, Associate Professor, Director of Voice Lab and Vocology Clinic, Dept. of Speech and Hearing Sciences, Lamar University, Beaumont, Texas, (409) 880-7591, nandhu@lamar.edu

Common Voice Quality Terms Create Difficulty for Raters and Singers

Objective: This study aims to explain the acoustic and aerodynamic qualities of the voice quality terms *front*, *back*, *dark*, and *light*, as well as to understand the ability of voice professionals to consistently rate acoustic samples using these terms.

Methods: In Phase 1, 19 members of University singing groups were recorded singing /a, ε, i, o, u/ and a phrase from the UVA alumni song in *front*, *back*, *light*, and *dark* voices using Multidimensional Voice Protocol (MDVP) and Phonatory Aerodynamic System (PAS) with electroglottalgram (EGG). Statistical analysis using ANOVA with post-hoc LSD was conducted to identify significant differences in acoustic and aerodynamic properties of voice qualities. In Phase 2, passage recordings from Phase 1 were compiled into a survey completed by 33 voice professionals from vocal pedagogues to SLPs. Listeners rated 36 samples (12 *front*, 12 *back*, 6 *dark*, and 6 *light*) on a sliding scale from *front* to *back*, and 36 samples (12 *light*, 12 *dark*, 6 *front*, and 6 *back*) on a sliding scale from *light* to *dark*. Ratings were categorized into three groups: 1-3 as *light* or *front*, 4 as *neutral*, and 5-7 as *dark* or *back*. Percent agreement was determined for each sample based on these categories. Voice professionals also qualitatively described *front*, *back*, *light*, and *dark*, and descriptions were sorted by theme for analysis.

Results and Conclusions: Light had significantly decreased loudness than dark ($p=.011$) and front ($p=.023$), significantly decreased sub-glottal pressure than dark ($p=.014$) and front ($p=.013$), significantly lower vocal efficiency than dark ($p=.004$), and significantly greater jitter % than front ($p=.001$) and back ($p=.004$). Inter-rater reliability was higher when listeners rated samples on a continuum from light to dark versus when they rated samples from front to back. 75% inter-rater reliability, however, was low for both voice quality pairings (44% for light/dark, 36% for front/back). At 50% inter-rater agreement, target light samples were most accurately identified, while target back samples least accurately identified.

When rating samples according to the opposite voice quality pairing, back was least frequently rated as dark, and front most frequently rated as light. This was quite the opposite of how raters qualitatively described the terms. The raters were most likely to compare dark to back and least likely to compare front to light. A wide variety of terms were also used to describe each voice quality, indicating a lack of consistent rater definitions of front, back, light, and dark.

Higher inter-rater reliability when rating light v. dark than when rating front v. back might be attributed to the significant differences in loudness, sub-glottal pressure, aerodynamic efficiency, and jitter in light compared to all other voice qualities. Low 75% inter-rater agreement for both voice quality pairings might be attributed to the lack of other significant acoustic and aerodynamic differences in the samples, or to the inconsistent internal representations of these terms among voice professionals. Qualitative descriptions indicate that dark may be associated with back, but listeners were more likely to rate front samples as light than back samples as dark. More research on the specific definitions of each of these terms is necessary before determining the extent to which front & light and back & dark are related.

A limitation of the study could be the use of the term light which was chosen due to its use in the literature. However, findings suggest that bright might have yielded different results. This study shows that voice professional across various disciplines have little agreement on categorization and definition of these voice qualities which may impact voice instruction, as well as evaluation and treatment of vocal performers with voice disorders.

Nicholas Barone PhD, CCC-SLP, Assistant Professor, Communication Sciences & Disorders, University of Virginia, (434) 243 0791, nbarone@virginia.edu

Melanie Turner, B.S.Ed in Speech Communication Disorders & Spanish (graduating May, 2019), University of Virginia, (203) 918 2540, mat2sd@virginia.edu

Phonovibratory Influences from Offset to Onset in Repeated Phonation: A Study of Sung Gestures Using High-Speed Digital Imaging

Objective: Phonation onset and offset are important aspects of singing and speech. Their execution requires control of timing and coordination of complex vocal fold kinematics, glottal configuration, laryngeal muscular adjustments, and respiration. The purpose of this study was to examine effects of timing and coordination of vocal fold adductory and abductory movements on vocal fold vibratory behavior from offset to onset in a series of repeated phonation gestures, using high-speed digital imaging. Of particular interest were differences in vocal fold adductory positioning for slower and faster tempi, patterns of oscillation during onset and offset for the different tempi, and effects of onset and offset timing events on subsequent vibratory patterns.

Methods: 11 subjects, all classically trained, experienced professional singers, were video-endoscopically recorded singing a series of repeated notes at two different tempi, using high-speed digital imaging. Vocal fold adductory positioning was measured in terms of relative glottal width during onset in slower and faster tempi. Vocal fold vibratory behavior was measured in timing of offset and onset “events,” number, spacing, and timing of PPOs and pSSOs.

Results and Conclusions: Relative glottal widths were significantly smaller for the faster tempo, supporting a hypothesis that vocal agility requires closer vocal fold approximation before onset. Significant differences were found in offset vs. onset timings and numbers of prephonatory and post-steady-state oscillations, supporting a theory of oscillation hysteresis.

Ena Freeman, MM, PhD/CCC-SLP, Speech-Language Pathologist, Singing Voice Specialist, Private Practice, New York, New York, (212) 316-4485, egf2114@tc.columbia.edu

John H. Saxman, PhD, Emeritus Professor, Communication Sciences and Disorders, Department of Biobehavioral Sciences, Teachers College, Columbia University, New York, New York, (212) 865-1490, jhs37@tc.columbia.edu

Peak Woo, MD, FACS, Clinical Professor of Otolaryngology, Department of Otolaryngology, The Mount Sinai Medical Center, The Icahn School of aMedicine at Mount Sinai, New York, New York, (212) 580-1004, peakwoo@peakwoo.com

Vocal Load and Benign Vocal Fold Lesions – Impact of a Vocal Loading Task on Voice Characteristics.

Background:

The use of controlled, high intensity tasks with healthy individuals is common in the medical world, and these loading tasks provide insight into function and can have diagnostic value. Vocal loading tasks are used to study how the larynx responds to stress, and are often considered a negative stressor aimed to compromise laryngeal function and result in observable fatigue. Researchers have used vocal loading tasks such as a prolonged period of loud reading to investigate the impact of sustained vocalisation on the laryngeal mechanism (Fujiki & Sivasankar, 2017). But is a heavy vocal load, or a vocal loading task always negative? There are several voice therapy programs that aim to load the larynx to produce improved function, and perhaps to induce change to muscle structure (Ziegler, Verdolini Abbott, Johns, Klein, & Hapner, 2014).

The impact of a loading task in patients with benign vocal fold lesions (BVFLs) has not been investigated. Many patients that present with BVFLs are required to continue to use their voice professionally or maintain a significant vocal load, and investigation of the impact of load on the lesion and vocal function is needed.

Methods:

30 participants with BVFLs have completed a 30-minute loading task at 75-85dB. We have obtained baseline and post vocal loading voice analysis for 30 participants including stroboscopic, aerodynamic, acoustic, and perceptual voice characteristics, in addition to participant perceived phonatory effort.

Results and Conclusion:

Baseline and post loading voice data will be analysed and presented to investigate the impact of loading on vocal function. Our results will be discussed and compared to current literature, and the clinical implications of our results explored.

Nicole Free, BSpPath, CPSP, CCC-SLP, PhD Student, Monash University, Department of Surgery, Faculty Medicine, Nursing and Health Sciences, 823-865 Centre Rd, Bentleigh East, VIC 3163, +61413421822, nicole.free@monash.edu.au.

Debra Phyland, PhD, FSPAA, CPSP, Clinical Research Coordinator, ENT Department, Monash Health, 823-865 Centre Rd, Bentleigh East, VIC 3163, Debra.Phyland@monash.edu

Julian Smith, MD, FACS, FCSANZ, FAICD, Professor, Head of Department Surgery, Monash University, Deputy Head School of Clinical Sciences, Monash Health, 823-865 Centre Rd, Bentleigh East, VIC 3163, 03) 9594 5500, Julian.Smith@monash.edu

Joseph Stemple, PhD, ASHAF, CCC-SLP, Professor, Communication Sciences and Disorders, Rehabilitation Sciences PhD Program, University of Kentucky, Lexington, KY 40506, (859) 218-0556, joseph.stemple@uky.edu

Acoustic Analysis of the Voice in Native and Non-Native English Speakers

Introduction: There are significant differences in voice parameters for nonspeech tasks between culturally and linguistically diverse sample populations. Normative data of standard clinical software programs typically comprises of North American speakers of Standard American English (SAE) There is a need for normative spectral and cepstral data across sociolinguistic groups to ensure clinical objective measurements are accurately classifying the voice quality of all individuals

Objective: The purpose of this study was to (1) compare objective measures of voice quality assessment of monolingual speakers of SAE with native speakers (L1) of French and Spanish on acoustic spectral and cepstral analyses; and (2) compare ratings on auditory-perceptual assessment with acoustic data secondary to degree of accentedness.

Method: Perceptual analyses and voice quality measures for frequency, intensity, cepstral measures and perturbation measures were analyzed using the Analysis of Dysphonia in Speech and Voice (ADSV) and the MultiDimensional Voice Program (MDVP) in 10 L1 English, 10 L1 Spanish, 10 L1 French speakers. An informal measure of accentedness of SAE was performed. Statistical analyses will include an ANOVA for identifying group differences in perceptual ratings and acoustic data. Pearson's correlation will examine the relationship between the degree of accentedness and CAPE-V scores.

Results and Conclusions: Data collection is complete and the analyses are ongoing. Visual inspection of preliminary data on a dyad (one L1 French female, one L1 English female) revealed multiple differences. The L1 English speaker had noticeably lower Cepstral Peak Prominence (CPP) and Low-to-High (L/H) spectral ratio values during sustained vowel and, CSID for all tasks than the L1 French speaker. The L1 French speaker had lower CPP F0 for all tasks and CPP in three out of the four CAPE- V sentence stimuli. Analysis of the full data set will identify any statistical differences.

Teresa Procter, MM, BA, Graduate Student, Department of Communication Sciences and Disorders, University of Houston, TX, tbrocter@uh.edu

Ashwini Joshi, PhD, Assistant Professor, Department of Communication Sciences and Disorders, University of Houston, Houston, TX, (713) 743-6136, ajoshi4@uh.edu

Effects of Lee Silverman Voice Treatment (LSVT LOUD®) with Spanish Speaking Population

The majority of people with Parkinson's disease (PD) experience speech and voice disorders at some point during the course of the disease; these deficits may impair their quality of life. Medical and surgical treatments alone have not sufficiently alleviated speech disorders for people with PD, and in some cases have exacerbated or resulted in voice and speech impairment. A speech treatment approach called Lee Silverman Voice Treatment (LSVT LOUD®) has generated efficacy data for successfully treating voice and speech disorder in this population. The LSVT LOUD targets vocal loudness as a means of increasing vocal effort and improving coordination across the subsystems of speech. LSVT LOUD is delivered in a high dose that consists of four consecutive, individual 1-hour treatment sessions per week for 4 weeks (i.e., 16 sessions in 1 month); daily homework practice is assigned. Research has documented that treatment results can last out to two years, making LSVT LOUD the "gold standard" in treating speech disorders for people with Parkinson's disease. Despite the established efficacy of LSVT LOUD, treatment of speech and voice remains an unmet need for many individuals in Puerto Rico due to lack access of trained and certified clinicians and inability to travel outside the island to receive the services. The objective of this study is to assess the clinical effectiveness of LSVT LOUD® in the Spanish speaking population of Puerto Rico for treating voice disorders associated with Parkinson's disease. A pre-test-post test design is applied to assess the effectiveness of LSVT for the improvement of vocal loudness in the Spanish speaking population diagnosed with Parkinson's disease. The findings from this study will have an important implication for enhancing treatment accessibility for individuals with Parkinson's disease who seek voice and speech treatment.

Leslie Ledee-Lozada, MS, CCC-SLP, Doctor of Speech-Language Pathology, Rocky Mountain University of Health Professions, Provo, Utah, (787) 485-2676, ledeepr@yahoo.com

Angela Halpern, MS, CCC-SLP, Chief Clinical Officer, LSVT LOUD Faculty, (720) 838-3093, angela.halpern@lsvtglobal.com

Maria Claudia Franca, PhD, CCC-SLP, Associate Professor, Communication Disorders and Sciences, Southern Illinois University Carbondale, (618) 453-8292, franca@siu.edu

Ecological Validation of Synthesized Speech for Studying the Effect of Dysphonia on Intelligibility

Objective: The use of synthesized speech allows us to systematically examine the relationship between acoustic parameters and perception. Accordingly, this approach would aid understanding how variabilities in glottal characteristics affect speech intelligibility. As the first step, we generated synthesized stimuli using the airway modulation model, and conducted a preliminary study to evaluate whether the stimuli represented two types of dysphonic voice quality.

Methods: Using the airway modulation model by Story (2013), a series of eleven “breathy” stimuli were generated to simulate different degrees of breathiness by varying the prephonatory width. Another series of eleven “irregular” stimuli were generated to simulate different degrees of roughness by increasing jitter with the prephonatory width of 0.16 cm. These stimuli were in the form of /h-V-d/ (e.g. “had”) with vowels in American English. From the eleven stimuli in each series, the third, seventh, and eleventh stimuli were selected as representations of mild, moderate, and severe breathiness or roughness. These stimuli were rated with GRBAS by five speech-language pathologists who had greater than five years of experience in the care of dysphonia.

Results: The “breathy” stimuli had a high level of agreement between the intended levels of severity and response (80 – 100%). For the “irregular” stimuli, the listeners rated the “mild” stimuli as normal voice 60% at the time. The agreement between the stimuli and response was higher with the “moderate” (70%) and “severe” (60%) stimuli. The inter-rater agreement was moderate ($k = .51$).

Conclusions: The model parameters were appropriate for representing the clinical presentation of breathiness but may need to be adjusted for roughness. The greater listener agreement in breathiness over roughness was in line with reports from past studies. The next step will be to evaluate the effect of these glottal variabilities on the identifiability of vowels.

Keiko Ishikawa, PhD, CCC-SLP, Assistant Professor, Department of Speech and Hearing Science, University of Illinois at Urbana-Champaign, 901 S. 6th St., Champaign, IL 61820, (217) 300-7017, ishikak@illinois.edu

Aubrey Stegich, Undergraduate Research Assistant, Department of Speech and Hearing Science, University of Illinois at Urbana-Champaign, 901 S. 6th St., Champaign, IL 61820, (217) 300-7017, stegich2@illinois.edu

Brad Story, PhD, Professor, Associate Department Head, Speech, Language, and Hearing Sciences, University of Arizona, 1401 E. University Blvd., Tucson, AZ 85721, (520) 626-9528, bstory@email.arizona.edu

Vocal Health Promotion Program in the School Setting

Background: Voice problems at schools have been explored in the last decades. However, there are several factors about voice use by teachers and students inside the classrooms that are still unknown. **Purpose:** To assess the effect of a vocal health promotion program implemented in school settings to reduce the occurrence of voice problems among teachers and students who attend to a primary school.

Methods: A longitudinal study was designed to identify associated factors of voice problems in school settings. Participants will be teachers and students of second and third grade of primary school. Self-reported questionnaires, voice recordings and perceptual analysis of voice will be used to collect information on associated factors and voice functioning. After the identification of relevant factors, a vocal health promotion program will be implemented with the purpose of reducing the occurrence of voice disorders among teachers and students.

Results and conclusions: It is expected to find a reduction of the occurrence of voice disorders among teachers and students after the implementation of the vocal health promotion program. Also, that the teachers and parents become a positive model on voice use for the students.

Ana María Castañeda Gamboa, SLP student, Universidad Manuela Beltrán, ana.casta2634@gmail.com

Dayanne Samantha Chaparro Ariza, SLP student, Universidad Manuela Beltrán,
dayannesamantha9@gmail.com

Lady Catherine Cantor-Cutiva, SLP, MSc, PhD, Professor, Universidad Nacional de Colombia, Universidad Manuela Beltrán, lccantor@unal.edu.co

Listening Effort and Accuracy to Hoarse Voices

Objective: There is much research evidence on the importance of a clear, healthy voice for educators so they can perform their job functions. However, there is far less evidence that an educator with a hoarse voice affects the comprehension of the students. Although some studies suggest that listening accuracy may be impaired while listening to hoarse voices, these studies do not assess listening effort, which may be a more sensitive measure of the effects of hoarseness on the listener. The purpose of this study was to assess listening accuracy and effort in a controlled research paradigm to determine if listening effort and accuracy differed in the degree of impairment experienced by the listener.

Methods: We conducted a speech perception study using a modified version of the QuickSIN Speech-in-Noise test in a within participant reversal paradigm. Participants listened to two lists of identical QuickSIN sentences, one with a clear voice and one with a hoarse voice, in three different signal-to-noise levels. These sentences were scored on accuracy of the listeners repeated response. In addition, the listener completed the NASA Task Load Index that captured the degree of effort participants experienced during the listening task.

Results: Preliminary results indicate that effort and accuracy are both impaired in listening to hoarse voices and that in some noise conditions, listening effort appears to degrade even though accuracy may be preserved.

Conclusion: These findings will inform the voice community on the influence of listening effort on those with hoarse voices and may suggest that improving vocal quality has affects not only on the speaker but also the listener. These findings will inform those in education about the educational impact on the student when an educator has a voice problem. In addition, audiologists involved in aural rehabilitation may benefit from assessing listening effort in those with hearing impairment, especially if their communication partners have voice difficulties.

Skylar McSorley, AuD student, Department of Communication Sciences and Disorders, The University of Memphis, (901) 678-5800, hbotzum@memphis.edu

Madison Hatchett, AuD student, Department of Communication Sciences and Disorders, The University of Memphis, (901) 678-5800, hbotzum@memphis.edu

Alexis Payne, PhD, Department of Communication Sciences and Disorders, The University of Memphis, (901) 678-5800, hbotzum@memphis.edu

Miriam Van Mersbergen, PhD, Department of Communication Sciences and Disorders, The University of Memphis, (901) 678-5800, mrvnmrsb@memphis.edu

Performance Evaluation of Audio Codecs in Remote Voice Monitoring

Objective: The use of Voice over IP - VoIP technology in the treatment of voice pathologies is an alternative to face-to-face rehabilitation, since it enables audio transmission over the internet and can mitigate the problems caused by the patients difficulty of locomotion. Furthermore is accessible from smartphones and tablets. This research aims to verify the implications of different audio codecs on perceptual and acoustic voice analysis in remote monitoring of vocal quality.

Methods: A VoIP-based transmission scenario was created, using Asterisk and the MicroSIP softphone, to aid the remote diagnosis of vocal deviations. For this purpose, 36 synthesized and 36 real voice signals were used, classified as normal and with the roughness and breathiness deviations.

Each signal was submitted to six transmissions, using a specific codec (G.711 A-law, Speex32, GSM Full Rate, LPCM16, Opus24 and SILK16). Before and after each transmission, a voice specialist performed the classification of the signals regarding the type of deviation, and by using the VoxMetria software to extract the acoustic measures: jitter, shimmer, GNE, fundamental frequency and its standard deviation.

Results: Among the codecs analyzed, Opus24 was the most promising for voice quality evaluation, since it was the only one to present an accuracy rate above 70% for both, the synthesized signals and the real signals. This codec was able to keep the vocal deviations unaltered for evaluation in more than 85% of the real signals. It was observed a greater preservation of the roughness deviation for the majority of codecs. Breathiness deviation was maintained in most of the signals, in codecs with sampling rates above 8 k samples/sec.

Conclusions: The study shows the importance of audio codec choice used for remote monitoring of vocal quality to not modify the diagnostic result, maintaining the integrity of the acoustic metrics used in clinical practice.

Anselmo de Vasconcelos Cavalcante, MSc, Technologist in Computer Network, Federal Institute of Paraíba (IFPB), Brazil, +55 (83) 98859-3804, anselmu@gmail.com

Suzete Élide Nóbrega Correia, PhD, Electrical Engineer/Professor, Federal Institute of Paraíba (IFPB), Brazil, +55 (83) 98709-9849, suzete@ifpb.edu.br

Michel Coura Dias, MSc, Electrical Engineer/Professor, Federal Institute of Paraíba (IFPB), Brazil, +55 (83) 99650-1458, michel.dias@ifpb.edu.br

Silvana Luciene do Nascimento Cunha Costa, PhD, Electrical Engineer/Professor, Federal Institute of Paraíba (IFPB), Brazil, +55 (83) 98757-1968, silvana@ifpb.edu.br

Leonardo Wanderley Lopes, PhD, Speech Therapist/Professor, Speech and Language Pathologist Dept., Federal University of Paraíba (UFPB), Brazil, +55 (83) 99985-5871, lwlopes@hotmail.com

Relation between Credibility and Different Styles of Communication of TV Reporters and Video Professionals

The cultural and social changes impacted by the new technologies have presented new perspectives and challenges to telejournalism. The increasing need to approach and interact with the viewer directly influences how reporters convey the information. The objective of this research is to study the relationship between the credibility of information and the style of communication adopted by television reporters and video professionals. The sample consisted of three groups evaluated: casual, laid-back reporters, serious reporters, and YouTubers. To compose the group of evaluators, 101 volunteers participated in this study. The analyzed material consisted of videos with live entries for reporters and videos with at least 30 views for YouTubers. For this evaluation, the *eye-tracking* device was used: a neuromarketing technology that analyzes the reaction to visual stimuli and later provides biometric data for measurement. Four metrics were analyzed: time of first fixation; time spent on fixations; number of fixations; and percentage of fixations. The data obtained were submitted to statistical analysis. It is concluded that there is a relationship between the credibility of an information and the style of communication adopted by television reporters and video professionals. Credibility is associated with how the video professionals behave in relation to the environment, being that serious reporters convey more credibility and trust to the evaluators. It is hoped that this research may contribute to the practice of videojournalism. It is expected that the results will instigate the reporter to envision a very prosperous and creative future. By carrying their experiences and mastery of communication skills to other media, they will bring together a legacy, which is a great differential in the transmission of information with credibility.

Maria Aparecida Stier, SLP, MS- RPC/Globo Television, Curitiba, Paraná, Brasil,
+5541999945725, cida@cidastier.com.br

Fernando Leocadio Pianaro, PhD, Professor and Business Administrator, FCU- Florida
Christian University, pianaro@fcuonline.com

Can a Larynx Change Its Spots? Tracking Change for Patients with Benign Vocal Fold Lesions

Background:

When benign vocal fold lesions (BVFLs) form, it is not yet established whether and how they change in size and nature over time, and in response to vocal load and voice therapy. Anecdotal information suggests that patients with benign vocal fold lesions experience variability in the nature and degree of their vocal symptoms across time and voicing contexts. Such fluctuations support the hypothesis that the lesions themselves may vary in size and impact on voice production, and tracking the changes objectively will provide important information about the nature of this potential change.

When evaluating response to treatment BVFL patient's, Schindler et al. (2013) suggested that a multidimensional approach to voice assessment is implemented, as they found with their group of BVFL patients that while only a small portion demonstrated improvement on stroboscopy, a significant number showed change in acoustic, aerodynamic, perceptual rating and patient self-report.

Methods:

The voice characteristics for patients with BVFLs will be presented at baseline and 4 time points over one month, with instrumental measures stroboscopy, acoustic and aerodynamic evaluation, perceptual analysis and patient self-report of phonatory effort and impact on quality of life.

Results and Conclusions:

Voice analysis data at baseline will be compared against normal data, and change across time will be analysed and discussed. The relevance of these measures for the understanding of vocal function and for planning therapeutic management with this population will be explored.

Nicole Free, BSpPath, CPSP, CCC-SLP, PhD Student, Monash University, Department of Surgery, Faculty Medicine, Nursing and Health Sciences, 823-865 Centre Rd, Bentleigh East, VIC 3163, +61413421822, nicole.free@monash.edu.au.

Debra Phyland, PhD, FSPAA, CPSP, Clinical Research Coordinator, ENT Department, Monash Health, 823-865 Centre Rd, Bentleigh East, VIC 3163, Debra.Phyland@monash.edu

Julian Smith, MD, FACS, FCSANZ, FAICD, Head of Department Surgery, Monash University, Deputy Head School of Clinical Sciences, Monash Health, 823-865 Centre Rd, Bentleigh East, VIC 3163, + 3 9594 5500, Julian.Smith@monash.edu

Joseph Stemple, PhD, ASHAF, CCC-SLP, Professor, Communication Sciences and Disorders, Rehabilitation Sciences PhD Program, University of Kentucky, Lexington, KY 40506, (859) 218-0556, joseph.stemple@uky.edu

Less Bamboozled Over Time: A Review of the Assessment and Management of Ten Professional Voice-Users with Bamboo Nodules

Bamboo nodules (BN) occur as transverse bands on the surface of the vocal folds, typically yellowish in appearance and located in the mid-fold region on opposing vibratory surfaces at fairly regular intervals ¹. Their orderly pattern of occurrence along probable contact points during the vibratory cycle suggests phonotrauma is integral to their development. They are relatively rare, seen exclusively among females, associated with immune dysregulation and are typically not obvious on normal light endoscopy. They may be more readily identified when a diagnosis of auto-immune connective tissue disease is already established. Such conditions include RA, SLE, Sjögren's syndrome and Hashimoto's thyroiditis. ² Stroboscopy may increase accurate identification of BN, revealing decreased mucosal wave amplitude at the site of the lesion and glottic insufficiency.

In this paper we describe 15 dysphonic professional voice-users diagnosed with BN with or without prior history of a diagnosed auto-immune connective tissue disorder but subsequent serologic abnormalities (including elevations in erythrocyte sedimentation rate, antinuclear antibody titres and other inflammatory markers). We will also discuss symptoms, stroboscopic and voice findings as well as the progression to systemic connective tissue disease where relevant and management of BN including control of the underlying autoimmune disorder, voice therapy to decrease potential phonotrauma and surgical intervention (intralesional corticosteroid injections and microsurgical excision). The crucial role of the laryngologist as the potential first-line diagnostician of autoimmune disorders and also the value of voice therapy will be highlighted. We also propose a management algorithm based on a review of the literature, the outcomes for these cases and our clinical experience.

(¹Kim & Sadoughi, 2018; ²Schwemmle, Kreipe, Witte & Ptak, 2013)

Debra Jean Phyland, PhD, MAppSc, BAppSc, Grad Dip Ed, FSPAA, Melbourne Voice Analysis Centre, East Melbourne, Victoria Australia, Department of Surgery, Faculty Medicine, Nursing & Health Sciences, Monash University, Department ENT, Head and Neck Surgery, Monash Health, Clayton, Australia, Debra.Phyland@monash.edu

Neil Vallance, MBBS, FRACS, Melbourne Voice Analysis Centre, East Melbourne, Victoria Australia, Department of Surgery, Faculty Medicine, Nursing & Health Sciences, Monash University

Charles Giddings, MBBS, FRCS(ORL-HNS), FRACS, Melbourne Voice Analysis Centre, East Melbourne, Victoria Australia, Department ENT, Head and Neck Surgery, Monash Health, Clayton, Australia

Translation and Validation of Vocal Fatigue Index (VFI) in Tamil Language

Objective: To translate and validate the Vocal Fatigue Index (VFI) in Tamil Language

Study design: Cross-sectional study

Method: Voice Fatigue Index (VFI) developed in English was translated into Tamil language, a South Indian Dravidian language. Five Speech Language Pathologists (SLPs) and three experts in Tamil language verified for contents of translation and suggested modifications. VFI in Tamil evolved after verifying the reverse translation. It was administered on 251 subjects with deviation in voice quality [based on GRBAS scale] with voice concerns/ problems and on 100 individuals with perceptually normal voice.

Results: SLPs and experts in Tamil language suggested modifications such as change of words & rephrasing of sentences were suggested by the SLPs and Tamil experts. This constituted changes of 68% and 36% in the translated Tamil version respectively. On reverse translation, content of translation had good agreement with English version of VFI. Principal component analysis (PCA) of Tamil version VFI yielded four factors as opposed to three factors in English version of VFI. The four factors were extracted based on Eigen value and variance contributed by each factor namely, I- physical discomfort; II- tiredness of voice; III- increased effort and its effect on voice quality; IV- Improvement of symptoms with rest. Varimax rotation and factor loading values for individual items identified five items under factor I; seven items under factor II; four items under factor III and three items were preserved under factor IV. Overall Cronbach's alpha co-efficient was 0.91 and alpha values for four factors ranged from 0.75 to 0.85. Item to total correlation revealed good internal consistency between the items. Statistically significant difference ($p < 0.01$) was found between scores of VFI in normal and individuals with voice problems.

Conclusion: VFI in Tamil evolved as valid tool to document vocal fatigue under four factors in individuals with voice disorders.

Sreya Srinivas MSc (ASLP), Speech Language Pathologist, Chennai

Shenbagavalli Mahalingam MASLP, Assistant Professor, Dept. of Speech Language and Hearing Sciences, Sri Ramachandra Institute of Higher Education and Research, Chennai, India.

Prakash Boominathan PhD, Professor, Dept. of Speech Language and Hearing Sciences, Sri Ramachandra Institute of Higher Education and Research, Chennai, India.

Tricky Tremor: The Clinical Presentation and Management of 20 Patients with Voice Tremor

Laryngeal tremor is a generic term characterised by rhythmic contractions of an agonist-antagonistic muscle group associated with the vocal tract and can incorporate benign essential tremor and dystonic-related tremors¹. The negative impact on the voice and associated compromise to quality of life can be significant. Rigorous laryngeal and voice assessment using specific tasks on nasendoscopy, the Tremor Scoring System² and perceptual, aerodynamic and quality of life measures are crucial in the identification of the nature and impact of the tremor on the person's voice and overall communication. Therapeutic management to date remains suboptimal with limited responsiveness to pharmacotherapy (such as propanidol and primodone) and variable success with Botox intervention. Voice therapy has been recently shown to play an adjunctive role in optimising voice production despite the presence of tremor but outcomes are also variable. Factors such as the site, extent and nature of the tremor, co-occurring conditions and extent of vocal deconditioning have been proposed to influence voice outcomes but prediction of treatment success is moderate^{1,2}.

We propose to provide a retrospective review of our experience with twenty-five cases of laryngeal tremor. Specifically, we will discuss the assessment findings and nature and outcomes of interventions including medications and Botox injection regimens. In addition, we will discuss the potential role of voice therapy, using both the Barkmeier et al (2011) and other approaches and as an adjunct to Botox to optimise glottic competence due to secondary deconditioning with laryngeal tremor. The importance of a team approach to assessment and management and the identification of key muscle groups implicated in the tremor for optimising Botox efficacy will be highlighted.

Debra Jean Phyland, PhD, MAppSc, BAppSc, Grad Dip Ed, FSPAA, Melbourne Voice Analysis Centre, East Melbourne, Victoria Australia, Department of Surgery, Faculty Medicine, Nursing & Health Sciences, Monash University, Department ENT, Head and Neck Surgery, Monash Health, Clayton, Australia, Debra.Phyland@monash.edu

Meaghan Sullivan, BSpPath, BMus (Voice), CPSP, Melbourne Voice Analysis Centre, East Melbourne, Victoria Australia

Andrew Hughes, MBBS, FRACP, Department Neurology, Austin Health, Heideleberg, Australia

Neil Vallance, MBBS, FRACS, Melbourne Voice Analysis Centre, East Melbourne, Victoria Australia, Department of Surgery, Faculty Medicine, Nursing & Health Sciences, Monash University

Motivational Style of the Speech-Language Pathologist

Background/Objective. The self-determination theory is a theoretical framework in which motivation can be explained. To date, no motivational research has been performed in the field of speech-language pathology. The purpose of this study was to investigate whether there is a relationship between experienced need satisfaction or need frustration and the patient's quality of motivation. Second, the relationship between the need supporting or need thwarting behavior of the speech-language pathologist (SLP) and the patient's quality of motivation was investigated. At last, it was checked if this relationship could be explained through need satisfaction or need frustration.

Design/Methods. Sixty-three SLP's and 116 patients (66 children, 50 adults) with a variety of logopaedic disorders participated in this study. The patients completed questionnaires to determine their quality of motivation, experienced need satisfaction or frustration, and perception of the SLP's need supporting or thwarting behavior. The SLP's also completed a questionnaire to determine their used behaviors. Additionally, the researchers observed a therapy session as a qualitatively assessment.

Results. Both need satisfaction and need supporting behaviors go along with more autonomous motivational types. Need frustration and need thwarting behaviors cause more controlled forms of motivation. The perceptions of the patients and the reports of the SLP's showed few similarities. The relationship between the style of the SLP and the motivational type of the patient can be explained by the mediating role of need satisfaction or need frustration. Most of the SLP's used a need supporting style.

Conclusion. Overall, it seems that the self-determination theory can be used in the context of speech-language therapy. An effective motivational style consists of need satisfaction and support.

Kristiane Van Lierde, PhD, Professor, Professor, Head of the master program Logopaedic and Audiological Sciences, Chair FCIGG, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University; Department of Speech-Language Pathology and Audiology, University of Pretoria, Pretoria, South Africa, +32 9 332 23 91, kristiane.vanlierde@ugent.be

Celien Dieleman, MSc, Logopaedic and Audiological Sciences, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University

Sharon Reyné, MSc, Logopaedic and Audiological Sciences, Speech-language pathologist, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University

Geraldine Dujardin, MSc, Logopaedic and Audiological Sciences, Speech-language pathologist, Department, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University

Brenda Verhellen, MSc, Logopaedic and Audiological Sciences, Speech-language pathologist, Department, Department of Rehabilitation Sciences, Research group: Speech, Language and Hearing Sciences, Ghent University

Leen Haerens PhD, Professor, Department of Movement and Sports Sciences, Ghent University, leen.haerens@ugent.be

Voice Characteristics among Female Primary School Teachers in the Wellawaya Education Zone

The present study aimed to determine the voice characteristics among female primary school teachers in the Wellawaya education zone. The teachers are at higher risk of having disordered voice characteristics than the general population. The significant disordered voice characteristics may have an impact on teachers' occupational, personal and social life. Objectives of this study were to perceptually analyse six voice parameters (overall severity, roughness, breathiness, strain, pitch, loudness) using the modified version of Consensus Auditory- Perceptual Evaluation of Voice (CAPE-V) protocol in Sinhala, to identify the most affected voice characteristics and to identify teachers' perception of their own voice. A descriptive cross-sectional quantitative study was conducted from february to august 2018 in 28 primary schools in the Wellawaya education zone. A total of 65 grade 01 and 02 female primary school teachers were included in the study. Data was collected as voice samples and the voice samples were perceptually analyzed using CAPE-V protocol. Descriptive statistics were used to measure mean value of each voice characteristic and measure percentage of teachers perceived having voice problem or not. Results showed roughness (22.65), overall severity (21.90) and strain (15.43) indicated mild-moderately deviant from the normal/typical voice. Other three voice characteristics loudness (3.78), breathiness (2.84) and pitch (2.05) indicated mildly deviant from the normal/typical voice. In addition the teachers presented with other features of voice such as vocal fry 63.1% (n=41), voice breaks 47.7% (n=31) and pitch instability 33.8% (n=21). Of the teacher population 76.92% (n=50) perceived having a voice problem and 23.08% (n=15) perceived as not having voice problem. According to results of the study confirms the teachers are prone to voice disorders, because of the presence of disordered voice characteristics.

Key words: voice characteristics, primary school teachers, modified version of Consensus Auditory-Perceptual Evaluation of Voice

Anusha Wimalathunga, SLP, Student, Faculty of Medicine, University of Kelaniya, Dambuwa Road, Ragama, Colombo, Sri Lanka, Monaragala, Wellawaya, +94713566737, anushawimalathunaga@gmail.com

The Relationship between Acoustical and Perceptual Measures of Vocal Effort

Objective: Vocal effort is a common clinical symptom that is not well understood. A series of acoustical measures are hypothesized to be related to the perception of vocal effort, yet these have not been examined in a combined model. Therefore, the purpose of this study was to evaluate the relationship between a large set of hypothesized acoustical measures of effort with speaker and listener perceptual ratings of vocal effort.

Methods: Twenty-six vocally healthy speakers increased vocal effort during productions of the utterance /ifi/ and rated their own perceived effort on a 100 mm visual-analog-scale. Then, 20 inexperienced listeners rated the speakers' vocal effort using the visual-sort-and-rate method. Acoustical analyses were completed on all recordings, including mean sound pressure level (SPL), mean fundamental frequency (f_0), relative fundamental frequency (RFF) offset cycle 10 and onset cycle 1, harmonics-to-noise ratio (HNR), cepstral peak prominence (CPP) and its standard deviation (SD), and low-to-high (L/H) spectral ratio and its SD.

Results: Speaker and listener ratings of vocal effort were strongly correlated (average $r = .86$). Separate mixed effects regression models for speaker and listener ratings showed that mean SPL, L/H ratio, and HNR were significant predictors of both ratings; however, RFF offset cycle 10 and mean f_0 were significant predictors of listener ratings only.

Conclusions: Speakers and listeners attended to similar acoustical cues when making judgments of vocal effort, leading to strong correlations between speaker and listener ratings. Still, listeners also used additional time-based acoustical information when judging effort. Further work is needed to determine how vocal effort manifests in the speech signal in speakers with voice disorders.

Victoria S. McKenna, PhD, CCC-SLP, Postdoctoral Research Fellow, Department of Speech, Language, and Hearing Sciences, Purdue University, West Lafayette, IN, (765) 494-6488, vmckenna@purdue.edu

Cara E. Stepp, Ph.D, Associate Professor, Department of Speech, Language and Hearing Sciences, Department of Biomedical Engineering, Department of Otolaryngology- Head and Neck Surgery, Boston University, Boston, MA, (617) 358-1395, cstepp@bu.edu

Self-Perception of Voice Problems in the Transgender Community of PR

The aims of this research is to investigate the self-perception voice problems among the Trans community of Puerto Rico, through the administration of the Voice Handicap Index (VHI) and a questionnaire. In addition, to explore the needs of therapy for the Trans voice. This research is a mixed design of concurrent triangulation in which intension is to corroborate results and perform cross validation between quantitative and qualitative data. Together with the concurrent triangulation, the data will be analyzed through descriptive statistics and analysis by theme. The participants (5-10) will be recruited through the chaining or snowball effect method. The inclusion criteria are: transgender individuals living in Puerto Rico, who use hormones for feminization or masculinization, and are over 21 years of age and under 65 years of age. The participants will choose the research scenario. The instrument for data collection are the VHI and a questionnaire.

Weldon Y. Maldonado Rodríguez, SLP, Master Student, Universidad del Turabo, Rd 189 KM 3.3, Gurabo, Puerto Rico, 00778-3030, +1787-568-8583, WMALDONADO15@email.suagm.edu

Maribel González Román, CCC-SLP, Associate Professor, Universidad del Turabo, Rd 189 KM 3.3, Gurabo, Puerto Rico, 00778-3030, +1787-568-8583, mgonzalezr@suagm.edu

Developing the Hindi Version of the Consensus Auditory Perceptual Evaluation of Voice (CAPE-V)

Aim: Hindi, along with English, is the official language of India and, is the fourth most-spoken first language in the world. The purpose of the current study was to develop the Hindi version of the CAPE-V for use in Hindi speakers around the world.

Method: This is a prospective cohort study design and participants were involved in a one-time assessment of their voice quality. Hindi stimuli that mimicked the sentence types in the original CAPE-V were created. The English and Hindi stimuli were recorded in adults who were fluent in Hindi and English, with normal (15 males, 15 females) and disordered voice quality (15 participants). The CAPE-V ratings in both languages will be compared to assess the validity of the Hindi stimuli. The Hindi stimuli will also be analyzed using the GRBAS and compared to the CAPE-V score to establish concurrent validity of the test. Statistical analyses will include primarily a comparison of means and correlational analyses.

Results: The study is in progress. Data collection for adults with normal voice quality is complete and analyses is ongoing. The data collection for the disordered voice group will be completed by January 2019.

Conclusion: We hypothesize that the Hindi version of the CAPE-V will have similar scores as the GRBAS and the English version of the CAPE-V. The Hindi version can be used as a clinical tool to assess auditory perceptual characteristics of voice in the Hindi speaking population and will be more accurate than just the GRBAS or other informal rating methods.

Isha Baheti, BS, Graduate Student, Department of Communication Sciences and Disorders, University of Houston, TX, ibaheti@uh.edu

Ashwini Joshi, PhD, Assistant Professor, Department of Communication Sciences and Disorders, University of Houston, Houston, TX, (713) 743-6136, ajoshi4@uh.edu

Self-Evaluation of the Dysphonia Impact in Professional Theater Actors with and without Vocal Complaint / Dysphonia Self-Referred Impact in Professional Theater Actors with and without Vocal Complaint

Objective: To verify the presence of vocal symptoms, vocal tract discomfort and self-reported vocal impairment in professional theater actors, with and without vocal complaint.

Method: 75 active professional theater actors (37 women; 38 men, between 18 and 64 years old) divided into two groups according to presence (G1-19 actors) or absence (G2-56 actors) of voice complaints answered to three self-assessment questionnaires: the Voice Symptom Scale (VoiSS), the Vocal Tract Discomfort Scaler (VTD) Scale and the Voice Handicap Index (VHI-10).

Results: A higher number of vocal symptoms (VoiSS, $p < 0.0001$), vocal tract discomfort (VTD_frequency, $p < 0.0001$; VTD_intensity, $p = 0.0004$) and vocal impairment (VHI-10, $p = 0.0149$) was observed for the G1. The average values of each protocol were lower for G1 (G1_VoiSS = 27.5 Vs. G2_VoiSS = 13.5; G1_VTD_frequency = 10 and G1_VTD_intensity = 12 Vs. G2_VTD_frequency = 4 and G2_VTD_intensity = 5; G1_VHI-10 = 4 Vs. G2_VHI-10 = 2.5). A strong correlation was found between VoiSS and VHI-10 (0.7737, $p = 0.0001$) and a very strong correlation was found between frequency and intensity scales of the VTD (0.912; $p < 0.0001$) for the G1. Considering G2, a moderate correlation was found between VoiSS and frequency (0.5714, $p = 0.000$) and intensity (0.5704, $p = 0.000$) scales of the VTD and between the VoiSS and the VHI-10 (0.3331, $p = 0.0009$). A very strong correlation was observed between frequency and intensity of the VTD (0.8991; $p = 0.0000$) for the G2.

Conclusion: Theater actors with vocal complaints have more vocal symptoms, more vocal tract discomfort and more vocal impairment although these does not stop them from working. The clinician may choose between the VoiSS or the VHI-10 when assessing a theater actor, due to a high correlation of results. Also, the high correlation between the VTD scales suggest that they can be reduced to one single scale.

Andresa Pecorari, SLP, BSc, Speech Language Pathologist, Centro de Estudos da Voz (CEV), São Paulo (SP), Brazil, dresapecorari@gmail.com

Flavia Badaró, SLP, BSc Associate Professor at Centro de Estudos da Voz (CEV, São Paulo (SP), Brazil, flabadaro@hotmail.com

Maria Cristina de Menezes Borrego, SLP, PhD, Associate Professor at Centro de Estudos da Voz (CEV), São Paulo (SP), Brazil, mcristinaborrego@gmail.com

Rosiane Yamasaki, SLP, PhD, Associate Professor at Centro de Estudos da Voz (CEV)– São Paulo (SP), Brazil, rosiane.yamasaki@gmail.com

Mara Behlau, SLP, PhD, Associate Professor at Centro de Estudos da Voz (CEV)– São Paulo (SP), Brazil, Centro de Estudos da Voz - CEV, Rua Machado Bittencourt 361, São Paulo, SP, Brazil 04044-905, mbehlaui@uol.com.br

Graphic Representation of ADSV Values

The Pentax Analysis of Dysphonia in Speech and Voice program (ADSV) has been hailed as an advance in voice assessment. It has been rapidly adapted by many voice centers around the country as a reliable standard of assessment. However, unlike the Multi-Dimensional Voice Protocol which preceded ADSV as a standard for voice assessment, packaged as part of the VisiPitch suite of assessments, the ADSV does not provide visual representation of the captured data. There are clear advantages to a visual representation of data over numerical representation. Visual representation of data provides for a quick assessment of a patient's progress. It can also be used as a biofeedback modality, where the patient themselves may appreciate the changes in their voice via a visual representation of the data. On occasion, this visual representation may be a very powerful tool for the voice patient, providing them insight into aspects of therapy, which can for many, be difficult to parse.

This poster session presents a simple Excel spreadsheet, which I have developed, that gives visual representation to otherwise dry numerical data. It utilizes data that typically is collected with voice assessment: sustained pitch, an all-voiced sentence, and a portion of the Rainbow Passage. This easy-to-read format speeds assessment of the voice from a clinical perspective, as well as provides a format for comprehension of complex data for the patient. As stated previously, it may also be used as an effective biofeedback tool as well as a motivational tool for the patient through it's easy to decipher visual representation of complex cepstral and cepstrum data.



Richard Rodriguez, M.S., CCC-SLP, Cedars-Sinai Voice Rehabilitation, Los Angeles, CA, (310) 423.1026, richard.rodriquez2@cshs.org,

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Virtual Man Project – Voice: Cross Cultural Adaptation of the Brazilian Portuguese into American English

Objective: This study aimed to develop and assess an educational website in the Portuguese and English languages based on the updated and translated content of the CD-ROM "Voice: Speech-Language Pathology and Audiology & Medicine", Vol.1 from the Virtual Man Project, originally created in Brazilian Portuguese.

Methods: Therefore, this work was conducted in three steps, aiming to update the existing content in Brazilian Portuguese, translate, and adapt it to the English language; develop a bilingual website; and assess its efficacy as an educational material for professors and direct users, the students. Initially, a translation, a back-translation, and a consensus version were prepared. Different translators were responsible for each version, and the consensus was submitted to a panel of ten experts. Then, the website was developed, and videos were added containing the production of English language phonemes and the audio recording of productions by a native American English speaker. In the final phase, 30 students participated in the project: 15 from a Language Undergraduate Course and 15 from a Translation Undergraduate Course of a Brazilian university. Students were divided into two equal groups denominated Experimental Group (EG), those that used the website as complementary material to the subject, and Control Group (CG), that did not use the website. Data were collected by the application of two questionnaires that gathered data related to cognitive aspects – a questionnaire before the website access, and a questionnaire after the website access and a Motivation Form answered after the study.

Results/Conclusion: Results showed the content of the Virtual Man Project/Voice was updated, adapted, and successfully translated into the American English language. In addition, based on the translation and adaptation, a bilingual website was developed and showed to be adequate as educational material for the academic training of speech-language pathologists and audiologists as well as for English language teaching.

Alcione Ghedini Brasolotto, PhD, Professor, Departamento de fonoaudiologia, Faculdade de Odontologia de Bauru, Universidade de São Paulo, +55 14 3235-8232, alcione@usp.br

Giédre Berretin-Félix, PhD, Professor, Speech-Language Pathology and Audiology Dept., Bauru School of Dentistry, University of São Paulo, Bauru, São Paulo, Brazil, gfelix@usp.br

Cássia P. Fantom, MS, Auxiliar Professor, Speech-Language Pathology and Audiology Department, Bauru School of Dentistry, University of São Paulo, Bauru/São Paulo/Brazil, +55 14 3235-8232, cassia.fanton@gmail.com

Jessica Argentim, MS, SLP, Speech-Language Pathology and Audiology Department, Bauru School of Dentistry, University of São Paulo, Bauru/São Paulo/Brazil, +55 14 3235-8232, je.argentim@gmail.com

Patrícia V. Belam, PhD, Professor, University of Sagrado Coração, Bauru/São Paulo/Brazil, +55 14 996786804, patricia.belam@gmail.com

Wanderléia Q. Blasca, PhD, Associate Professor, Speech-Language Pathology and Audiology Department, Bauru School of Dentistry, University of São Paulo, Bauru/São Paulo/Brazil, +55 14 3235-8232, wandablasca@usp.br

Chao L. Wen, PhD, Associate Professor, Telemedicine, Medical School, University of São Paulo, Brazil, +55 11 3061-7495, telemedicina@telemedicina.fm.usp.br

György M. Böhm, PhD, Emeritus Professor, Medical School, University of São Paulo, Brazil, +55 11 3061-7495, telemedicina@telemedicina.fm.usp.br

Carlos F. Santos, PhD, Full Professor, Bauru School of Dentistry, University of São Paulo, Bauru/São Paulo/Brazil, +55 14 3235-8000, cfsantos@fob.usp.br

Objective and Subjective Assessment of Voice in a Female-to-Male Transgender following Voice Therapy

Objective: The purpose of this study was to determine the effects of voice therapy for a female-to-male transgender individual using objective and subjective measures.

Methods: The study was a single-subject case study; the participant was A 22 year-old transman. He had not yet started testosterone therapy and sought to adapt his voice to sound more masculine. He enrolled in a six week course of voice therapy; the treatments focused on resonant voice therapy techniques to maintain appropriate laryngeal muscle activity levels and glissandos to shift his fundamental frequency to a lower level. Pre- and post-therapy recordings of the Rainbow passage were obtained; he also completed the Transgender Self-Evaluation Questionnaire to determine the extent of vocal attitude and usage. Twenty graduate students at Valdosta State University rated the participant's pre- and post-therapy recordings according to masculinity/femininity, resonance, and vocal strain.

Results: The participant's pre-therapy F0 averaged 174 Hz compared to 176 Hz post-therapy. The results of the TSEQ revealed that the client viewed his voice as "somewhat feminine" pre-therapy but "somewhat masculine" post-therapy. He also stated that he felt more comfortable using his masculine voice around others. The participant's voice was perceived as being more masculine post-therapy with an oronasal focus. Mild vocal strain was noted regardless of perceived masculinity/femininity. At the two-month follow-up, the participant had maintained his post-therapy voice.

Conclusion: The results of the study revealed an increase in perceived voice masculinity by the participant and naïve listeners. Minimal change in F0 was found. The participant's reports of improved vocal quality and increased ease in using a masculine voice indicate that the course of voice therapy was effective. In addition, the therapy resulted in greater self-acceptance and allowed him to use his masculine voice more often as he was aware that his voice was perceived to be more masculine.

Mary Gorham-Rowan, PhD, Professor, Dept. of Communication Sciences and Disorders & Special Education, Valdosta State University, (229) 219-1327, mmgorhamrowan@valdosta.edu

Richard Morris, PhD, Professor, School of Communication Sciences and Disorders, Florida State University, (850) 644-8459, Richard.Morris@cci.fsu.edu

Genevieve Kennett, B.S.Ed., Graduate Student, Dept. of Communication Sciences and Disorders & Special Education, Valdosta State University, (229) 219-1327, gmkenett@valdosta.edu

Resonance Tube Therapy in Parkinson's Disease: Pilot Study

Objective: to test the effect of Resonance Tube Therapy on vocal quality in individuals with Parkinson's Disease.

Method: This study was approved by Teachers College, Columbia University IRB (protocol 17-350) and all data baseline and post assessment measures were completed at the Laboratory for the Study of Upper Airway Dysfunction at Teachers College, Columbia University.. Sixteen participants (3 female and 13 male) aged 50 to 52 (average = 70.5), with Parkinson's disease and hypokinetic dysarthria (average disease duration 2.8 years; MOCA average =26.12) completed this prospective pilot treatment study. Participants completed a baseline assessment followed by four weeks of voice therapy (tube phonation) and then a post treatment assessment. The assessment visits included measurement of vocal intensity using a sound pressure level meter along with perceptual and acoustic vocal analysis. The perceptual analysis was performed by a blind judge using the GRBAS scale. PRAAT (Windows version, 64-bit edition: praat6037_win64.zip) was used to complete acoustic analysis (parameters: fundamental frequency and noise-harmonic relation). The tube phonation therapy consisted of 8 sessions, 4 weeks (twice a week), 45 minutes which was completed via telepractice. A resonance tube (27cm by 9mm) and a box (12cm x12 cm x 15cm) with water were utilized during treatment. The tube was kept between the teeth, the lips rounded and the free end into the water (about 2cm under the surface for sessions 1 to 4, and 9cm for the sessions from 5 to 8). The participant phonated /u/ making bubbles into the water. The therapy mixed exercises and conversation. Telepractice visits were completed via skype. Paired samples t-tests were applied to compare the results before and after training.

Results: There was significant improvement in vocal intensity as measured by SPL meter after therapy ($p=0.004$). There was no significant difference in perceptual voice analysis after resonance tube therapy. Additionally, there was no difference in frequency ($p=0.621$) or noise-harmonic relation ($p=0.073$) after therapy.

Conclusion: Resonance tube therapy improved the vocal intensity level of individuals with Parkinson's disease. However, the results need to be explored further and the therapy needs some adjustments in further studies with resonance tube, like therapy time and vocal fatigue in Parkinson's disease.

Key words: Voice. Voice Quality. Voice Training. Parkinson's Disease

Kelly Cristina Alves Silverio, PhD, Dental Oral Biology, Professor , Speech-Language Pathology and Audiology Dept. , Bauru School of Dentistry, University of São Paulo, FOB/USP, Bauru, São Paulo, Brazil., Speech-language Pathology Dept., Dentrist of Bauru Faculty, +55 14 32358332, kellysilverio@usp.br

James Curtis , MS, CCC-SLP, BCS-S, PhD candidate , Department of Behavioral Sciences, Teachers College, Columbia University, New York , 525 West 120th Street - Thorndike 1054^a New York, NY 10027, (212) 678-3953, jarthurcurtis@gmail.com

Sarah Perry, PhD, CCC-SLP, Post Doctoral Research Fellow of Speech-Language Pathology Program, Department of Behavioral Sciences, Teachers College, Columbia University , 525 West 120th Street - Thorndike 1054^a, New York, NY 10027, (212) 678-3953, sep2180@tc.columbia.edu

Jordanna Meisler Sevtiz, CCC-SLP, Clinical Fellow of Speech-Language Pathology Program, Teachers College, Columbia University , 525 West 120th Street - Thorndike 1054^a, New York, NY 10027, (212) 678-3953, jsm2210@tc.columbia.edu

Michelle S. Troche, PhD, CCC-SLP, Associate Professor, Speech-Language Pathology Program Director, Department of Behavioral Sciences, Teachers College, Columbia University , 525 West 120th Street - Thorndike 1054^a, New York, NY 10027, (212) 678-3953, mst2139@tc.columbia.edu

The Optimal Duration and Long-Term Impact of Voice Therapy on Vocal Fold Atrophy in Elderly

Objectives: Vocal fold atrophy (VFA) is one typical pathology in presbyphonia. Various studies reported positive effect of voice therapy (VT) on VFA, and we have recently reported the factors to predict the impact of VT on VFA in elderly. To further refine the VT on presbyphonia, optimal duration of VT, and long-term impact of VT on VFA were examined in this study.

Methods: Thirty-six patients (19 males, 17 females; age, 70-93 yo; mean, 77.5 yo) who underwent VT for their VFA between July 2016 and September 2018 were investigated in this study. Vocal hygiene instruction and vocal function exercise were performed as therapeutic options. Seven parameters including glottic closure, G score, MPT, range of vocal pitch, Jitter, Shimmer, and VHI were measured at their first visits and every 8 weeks during VT periods. Data were compared with each other to assess the proper period to achieve maximal impact of VT. Furthermore, vocal parameters at the end VT sessions were compared with the scores at 3, 6, and 12 months after VT in the patients who had long-time follow-up.

Results: VT sessions were performed for 8, 16, and 24 weeks in 18, 10, and 8 patients, respectively. Significant improvements in more than 4 parameters were observed at the end of all sessions. However, significant vocal improvements were not observed after 8 weeks in the patients who had longer VT sessions. Furthermore, 3, 6, and 12 months follow-up after VT sessions was performed on 22, 16, and 6 patients, respectively. Scores of vocal parameters in these patients were not significantly different compared with the scores at the end of VT sessions.

Conclusions: This is the first study which assessed the optimal duration and long-term impact of VT on VFA. Future studies to involve the increased number of patients are warranted.

Shogo Mato, SLP, Speech Pathologist, Dept.of rehabilitation, Kyorin University Hospital, Tokyo, Japan,
+81-422-47-5511, ma_shogo_0620@ks.kyorin-u.ac.jp

Makoto Miyamoto, MD, Research Associate, Kyorin University School of Medicine, Dept. of Otolaryngology-Head and Neck Surgery, Tokyo, Japan, +81-422-47-5511, miyamotm@ks.kyorin-u.ac.jp

Itaru Watanabe, MD, Research Associate, Kyorin University School of Medicine, Dept. of Otolaryngology-Head and Neck Surgery, Tokyo, Japan, +81-422-47-5511, itanabe413@yahoo.co.jp

Yoshiyuki Hayashi, SLP, Speech Pathologist, Dept.of rehabilitation, Kyorin University Hospital, Tokyo, Japan,
+81-422-47-5511, yoshiyuki-1007@ks.kyorin-u.ac.jp

Tsubasa Ishii, SLP, Speech Pathologist, Dept.of rehabilitation, Kyorin University Hospital, Tokyo, Japan,
+81-422-47-5511, ishii-t@ks.kyorin-u.ac.jp

Hideki Nakagawa, MD, PhD, Assistant Professor, Kyorin University School of Medicine, Dept. of Otolaryngology-Head and Neck Surgery, Tokyo, Japan, +81-422-47-5511, hnakagawa@seibokai.or.jp

Koichiro Saito, MD, PhD, Professor and Chairman, Kyorin University School of Medicine, Dept. of Otolaryngology-Head and Neck Surgery, Tokyo, Japan, +81-422-47-5511, k-saitoh@ks.kyorin-u.ac.jp

**Self-Perceived Knowledge and Confidence of Speech-Language Pathologists Working with
Individuals with Voice and Resonance Disorders**

Objective: Investigators have explored clinician knowledge and confidence levels in some areas of speech-language pathology but there is no current information regarding knowledge and confidence levels in the area of voice and resonance disorders. The purpose of this study was to examine speech-language pathologists' (SLPs) comfort levels in assessing and treating individuals with voice and resonance disorders.

Methods: A survey consisting of 25 items will be distributed on-line to practicing SLPs via e-mail and on-line speech-language pathology discussion boards to determine their confidence levels with assessment methods and treatment techniques.

Results: Data will be analyzed to determine the comfort level of SLPs in general practice compared to SLPs in more specialty practices. Correlations will be calculated between confidence levels and variables such as amount of continuing education, graduate training, years of experience and caseload.

Conclusions: Data obtained will inform graduate training programs regarding curriculum improvement in voice and resonance disorders. Findings will provide initial direction and strategies for enhancing SLPs knowledge and confidence in providing assessment and therapy for individuals with voice and resonance disorders.

Albert Villanueva-Reyes, Ed.D, CCC-SLP, Associate Professor, Jacksonville University, (904) 256-8913, Avillan3@ju.edu

Judith M. Wingate, PhD, CCC-SLP, Associate Professor, Jacksonville University, (904) 256-8912, Jwingat2@ju.edu

Stimulation of Auditory Abilities and Intra-rater Reliability in Auditory Perceptual Assessment of Voices

Objective: Auditory training to classify voices is a central clinical issue for SLPs. The goal is to verify the effect of an isolated traditional voice training (VT) and a combined VT plus auditory ability games (AG).

Methods: 26 SLP graduate students underwent auditory skills screening of central auditory processing (CAP) and were divided into 2 groups: G1 who failed ($n = 8$) and G2 ($n = 18$) who passed the screening. All students were submitted to VT; moreover, G1 plus part of G2 (G2b) were submitted also to AG. Participants performed a voice evaluation task, 30 samples and 20% of repetition to assess the predominant type of vocal quality (rough, breathy or strain). This task was performed 3 times: E1 (baseline) E2 (after VT) E3 (after VT + AG for G1 and G2b).

Results: All groups were comparable at the E1 condition, with 72% average of right categorization of voices. In all groups, no statistical improvement triggered by VT or AG was observed in the overall score ($p=0.142$; $p=0.891$, respectively) although a directional improvement of 6% was observed when comparing the E1-E3 interval. The intra-rater reliability improved only in G1 ($p=0.03$), who failed at the CAP screening and was submitted to both VT and AG. VT alone produced a small improvement in correctly categorizing the type of voice, but did not show any changes in the listener reliability (G2a, $p=0.57$; G2b, $p=0.61$).

Conclusion: The stimulation of hearing abilities through games increased the intra-rater reliability of SLP graduate students that failed in the auditory skills screening. Final results were similar to students that passed in the screening. The proposed games were instrumental for students with CAP difficulties, but not to normal CAP individuals who probably need more sophisticated challenges to change their reliability to a better level.

Letícia do Rosário Amado Pacheco, Graduate Student, Speech Language Pathologist, Centro de Estudos da Voz (CEV), +55 11 99941-1498, leticia-pacheco@outlook.com

Glauçya Madazio, PhD, Associate Professor Centro de Estudos da Voz (CEV), Centro de Estudos da Voz (CEV), +55 11 99916-1523, gmadazio@cevbr.com.br

Rosiane Yamasaki, PhD, Associate Professor Centro de Estudos da Voz (CEV), Centro de Estudos da Voz (CEV), +55 11 98524-6446, rosiane.yamasaki@gmail.com

Mara Behlau, PhD, Director Centro de Estudos da Voz (CEV), UNIFESP - Federal University of Sao Paulo and CEV – “Centro de Estudos da Voz”, +55 11 5575-1710, mbehlau@cevbr.com.br

Ingrid Gielow, PhD, Associate Professor Centro de Estudos da Voz (CEV), Centro de Estudos da Voz (CEV), +55 11 99144-8085, igielow@cevbr.com.br

Perception of Voice and Singing Voice Handicap of Non-Treatment Seeking Collegiate-Level Vocalists

Objective: Collegiate-level vocalists are a unique population whose vocal demands and environmental stressors are unlike those of professional performers. Collegiate-level performers are expected to balance private lessons, rehearsals with multiple ensembles, numerous full performances per week, and many other strenuous vocal activities. This population is also prone to unique stressors and less than ideal lifestyle routines, such as lack of sleep, managing coursework along with rehearsals, consuming exorbitant amounts of caffeine, and eating late at night. The purpose of this study is to further examine these trends among non-treatment seeking collegiate-level vocalists through the analysis of various quality of life index scores, self-reported vocal load and vocal symptomatology questionnaires, and videolaryngostroboscopy imaging.

Methods/Design: The data for this retrospective, descriptive study was obtained through vocal health screenings for collegiate-level vocalists that were completed at the University of Central Florida across a three-year span. Reflux Severity Index (RSI), Voice Handicap Index, Singer's Voice Handicap Index, and Vocal Disability Coping Index scores will be analyzed for mean value and standard deviations. Self-reported vocal load and vocal symptomatology will also be analyzed for mean values, SDs, and frequency counts. Videolaryngostroboscopy exams will be reviewed by two otolaryngologists who specialize in voice disorders to assess for absence or presence of laryngeal pathology.

Results/Conclusions: This study aims to further investigate non-treatment seeking collegiate-level vocalists' perception of voice handicap and to further describe the specific vocal demands and symptoms of this population. This study also aims to discuss the need for early identification within this population to assist with vocal longevity throughout their collegiate and professional careers.

Emily Dunn, MS, CCC-SLP, Clinical Voice Pathologist, The Center for Voice Care and Swallowing Disorders, Orlando Ear, Nose, Throat, and Plastic Surgery Associates, edunn@entorlando.com

Austin Collum, MA, CCC-SLP, Clinical Voice Pathologist, The Center for Voice Care and Swallowing Disorders, Orlando Ear, Nose, Throat, and Plastic Surgery Associates, jaustincollum@gmail.com

Breanna Henderson, Graduate Student Clinician, University of Central Florida, Orlando, Florida, breannahenderson94@knights.ucf.edu

Alexis Gedallovich, Graduate Student Clinician, University of Central Florida, Orlando, Florida, alexisvg@knights.ucf.edu

Brian Spector, MD, FACS, The Center for Voice Care and Swallowing Disorders, Orlando Ear, Nose, Throat, and Plastic Surgery Associates

Jeffrey Lehman, MD, FACS, The Center for Voice Care and Swallowing Disorders, Orlando Ear, Nose, Throat, and Plastic Surgery Associates, jjlehman@icloud.com

Bari Hoffman Ruddy, Ph.D., CCC-SLP, Professor, School of Communication Sciences and Disorders, Interim Associate Dean of Clinical Affairs, College of Health Professions and Sciences, University of Central Florida, Bari.HoffmanRuddy@ucf.edu

**Development and Technical Functionality of an Online, Self-Guided Educational Program
for Professional Voice Users in the US**

Objective: In order to address basic principles of voice use and vocal hygiene, targeted professional support programs are needed. The current pilot study will present the development and technical functionality of an evidence-based, minimally-guided online educational support program for professional voice users (i.e., iVoice) in the United States.

Method: iVoice was developed based on evidence-based principles and a user-friendly interface. Five expert voice professionals and five professional voice users will evaluate iVoice and complete an intervention satisfaction rating and an ePlatform performance questionnaire.

Results: The results of this pilot study will be reported at its presentation.

Conclusion: The conclusion of this pilot study will be reported at its presentation.

Abigail Dueppen, MM, MS, CCC-SLP, Director of Vocology Certificate Program, Department of Speech and Hearing Sciences, Lamar University, Beaumont, TX , (409) 880-8176, adueppen@lamar.edu

Monica Bellon-Harn, PhD, CCC-SLP, Department Chair, Professor, Department of Speech and Hearing Sciences, Lamar University, Beaumont, TX, (409) 880-8174, monica.harn@lamar.edu

Vinaya Manchaiah, PhD, AuD, Associate Professor, Department of Speech and Hearing Sciences, Lamar University, Beaumont, TX; The Swedish Institute for Disability Research, Department of Behavioral Sciences and Learning, Linköping University, Linköping, Sweden; Audiology India, Mysore, Karnataka, India, (409) 880-8927, vinaya.manchaiah@lamar.edu

Nandhu Radhakrishnan, PhD, CCC-SLP, Associate Professor, Department of Speech and Hearing Sciences, Lamar University, Beaumont, TX , (409) 880-7591, nandhu@lamar.edu

Determining Knowledge of Voice Teachers Regarding Management of Students' Vocal Health

Objective: One of the most important persons in young adult singers' training is their voice teacher. The relationship between singer and teacher is cultivated over years of study and characterized by great vulnerability and subsequent trust. Consequently, voice teachers often present as a first line of defense when a singer encounters a voice problem.. Past research (Kwak, et al., 2013) indicates that most singers approach their voice teachers first regarding voice problems. Because young western-classical singers rely on their teachers for information regarding vocal health, how well equipped are voice teachers to triage their students voice issues? For example, should the student take a wait-and-see approach or should the student be sent to a medical professional immediately. This study aims to determine what gaps in knowledge exist among voice teachers regarding recommendations regarding vocal health. .

Methods/Design: A short anonymous questionnaire was sent to voice teachers who train young adult singers (college and university instructors) electronically. The questionnaire assessed knowledge regarding vocal health education and practices. Data will be analyzed using descriptive statistics.

Results and Conclusions: The survey is currently in progress. Preliminary data suggests there are gaps in knowledge among voice teachers regarding recommendations for voice rest, similarities between the singing and the speaking voice, and the effect common medications, beverages, environments, and behaviors have on the larynx. Results may have implications for training and continuing education for voice teachers.

Gina Cruciani, BA (music), Master's student, University of Minnesota-Twin Cities, (715) 563-2458, ginacruciani@gmail.com

Peter Watson, PhD, Associate Professor, University of Minnesota - Twin Cities, 164 Pillsbury Dr SE, 115 Shevlin Hall, Minneapolis, MN, pjwatson@umn.edu

The Impact of Exercise on Age-Related Voice Changes in the Voice Literature: A Systematic Review

Laryngeal and respiratory changes resulting from the aging process are well documented in the voice literature. Respiratory changes include reduced lung volume excursion. Laryngeal changes include glottal insufficiency. Perceptually, age-associated changes manifest as decreased ability to project the voice, reduced phonation duration, and changes in pitch and quality.

The aging process is multifactorial and involves the whole body. Thus, improving the strength of other systems through exercise, in addition to vocal exercise, may be beneficial in minimizing these age-related changes. This poster will provide a review of the literature on the impact of exercise, both voice and aerobic, on the aging vocal mechanism. Conclusions will be synthesized and suggestions will be provided for future research in this area.

Shie Kantor, MM, MA, CCC-SLP, Purdue University , 715 Clinic Dr, West Lafayette, Indiana 47907, (765) 427-8740, skantor@purdue.edu

Preeti Sivasankar, PhD, CCC-SLP, Professor, Speech, Hearing & Language Sciences Department, College of Health and Human Sciences, Purdue University, West Lafayette, IN, (765) 494-3788, preeti@purdue.edu

The Role of Breathiness in the Identification of a Speaker's Gender

Objective: There is a lack of research regarding the perception of a speaker's gender, especially within the transgender literature. However, research that exists is centered around the influence of fundamental frequency on a listener's perception of gender. Analysis of male-to-female (MtF) vocal characteristics have established that a higher fundamental frequency does not necessarily correlate with perception of the female gender. Furthermore, in this focused area of research there is an 'androgynous' zone at about 160 – 175 Hz where frequency provides no clues to a speaker's gender and listeners must rely on other characteristics to determine gender. Other influences of voice on the determination of gender include breathiness. Yet, research has failed to verify if this characteristic is important and if so, to what extent. Additional speech and voice characteristics that may offer gender cues in a speaker also include the degree to which an individual produces consonant sounds. Because fundamental frequency training is insufficient in allowing an individual to present as their chosen gender, other speech and voice characteristics must be addressed. This research will investigate the relative contributions of both breathiness on the perception of gender.

Methods: We conducted a categorical perception task using a within participant reversal paradigm. Utilizing a physiologic vocal model, a stimulus, the word hello, was modified with multiple gradations of glottal width within the androgynous range of 160 Hz. A stimulus, was modified. stimuli were rated binarily, as "male" or "female" in gender by 30 normal hearing, English speaking participants.

Results: Preliminary results indicate the role of breathiness in the identification of a speaker's gender is shown to be impactful to a listener's gender identification.

Conclusion: These findings will inform the voice research and voice therapy community on the influence of breathiness on a speaker's gender identification. The findings of this research will begin to inform the clinical voice community on what vocal parameters influence gender identification and allow better clinical service to the population of individuals who have difficulty using gender appropriate speech behaviors.

Holly Botzum, MA, AuD student, Department of Communication Sciences and Disorders, The University of Memphis. hbotzum@memphis.edu, (330) 990-1942

Miriam Van Mersbergen, Ph.D., Department of Communication Sciences and Disorders, The University of Memphis. mrvnmrsb@memphis.edu, (901) 678-5800

Increased Laryngeal Tension in Undergraduate Trombone Majors Following Typical Practice Sessions

Objective: Undergraduate trombone players have self-reported excess throat tension during individual practice routines to their private trombone instructor. Their instructor has also visualized laryngeal elevation during their lessons and aurally perceived increased tension during many playing tasks, most notably articulatory tasks. This study will investigate the presence of increased laryngeal muscular effort through pre- and post-practice session endoscopic visualization, acoustic analysis of vocal quality, EGG, and a self-reported vocal fatigue questionnaire.

Method: Current undergraduate trombone majors will record the CAPE-V protocol, which will be analyzed using MDVP analysis and EGG, undergo endoscopic visualization of their vocal folds, and complete the vocal fatigue index (VFI) before their practice session with two voice expert SLPs. They will also record one typical scale and two typical études on their trombones. Students will complete a forty-five-minute, individual practice session. They will return to the voice lab and complete the same measures again, post-practice session. Pre- and post-practice session comparisons will be made. Additionally, expert professional undergraduate trombone professors will compare pre- and post-practice session recordings of the typical trombone scale and études and rate the post-session recording as a positive, negligible, or negative change.

Results: The results of this study will be reported at its presentation.

Conclusion: The conclusion of this study will be reported at its presentation.

Abigail Dueppen, MM, MS, CCC-SLP, Director of Vocology Certificate Program, Department of Speech and Hearing Sciences, Lamar University, Beaumont, TX , (409) 880-8176, adueppen@lamar.edu

Timothy Dueppen, DMA, Assistant Professor, Mary Morgan Moore Department of Music, Lamar University, Beaumont, TX, (409) 880-8068, tdueppen@lamar.edu

Nandhu Radhakrishnan, PhD, CCC-SLP, Associate Professor, Department of Speech and Hearing Sciences, Lamar University, Beaumont, TX , (409) 880-7591, nandhu@lamar.edu

Auditory-Motor Control of Pitch in Individuals with Essential Vocal Tremor: A Pilot Study

Objectives: Essential tremor (ET) is the most prevalent movement disorder affecting nearly one in every 100 people worldwide. The current literature on ET implicates cerebellar dysfunction as a hallmark of the disorder, contributing to both motor and cognitive deficits. Sixty-two percent of individuals with ET develop vocal tremor (VT), a hyperkinetic neurological speech disorder characterized by modulation of the pitch and loudness of the voice. Although the cerebellum is involved in feedback and feedforward control of typical speech, it is unknown whether the cerebellar deficits in ET impair feedback or feedforward control of pitch in VT. Thus, this study aims to assess feedback and feedforward control of pitch in individuals with VT.

Method: A sudden pitch perturbation paradigm was used to assess feedback control, and a gradual pitch perturbation paradigm was used to assess feedforward control in two individuals with VT.

Results: Both participants produced compensatory responses to sudden perturbation of the pitch of their auditory feedback, which were larger in magnitude relative to healthy speakers. Both participants produced responses to gradual perturbation of the pitch of their auditory feedback, which were in the following (rather than compensatory) direction unlike healthy speakers.

Conclusion: This pilot test indicated that speakers with VT may have abnormal feedforward and feedback control of voice. Further investigation is warranted to determine if this pattern is maintained in a larger sample of individuals with VT and to identify the factors that contribute to response variability.

Rosemary A. Lester-Smith, PhD, CCC-SLP, Assistant Professor of Communication Sciences and Disorders, The University of Texas at Austin, (512) 471-2690, rosemary.lester-smith@austin.utexas.edu

Charles Larson, PhD, Professor, Department of Communication Sciences and Disorders, Northwestern University, Evanston, IL, 847-491-2424, clarson@northwestern.edu

Measuring the Demands of Listening to Individuals with Parkinson Disease

Individuals with Parkinson disease (IPD) may be unaware of its effect on their speech and voice, but the burden associated with listening to disordered speech and voice may affect listeners' willingness to communicate with IPD. Perceptions of the mental (MD) and temporal demand (TD) involved in communicating with IPD may provide a unique insight into listener-speaker interaction, beyond ratings of severity, intelligibility, etc. This study investigates perceptions of the MD and TD of listening to low-context sentences produced by IPD. Forty adults transcribed stimuli and rated MD and TD using the NASA Task Load Index. Mean MD and TD were highly correlated ($r = .87$) across speakers, with greater variability in MD than in TD ratings. Intelligibility scores were strongly negatively correlated with MD ($r = -.96$) and TD ($r = -.87$). MD was consistently rated higher than TD across listeners. Raters were able to indicate differences in the MD they perceived necessary to understand these stimuli. Greater variability among MD ratings shows that listeners can differentiate the MD necessary to understand speech from temporal pressure associated with the task. If listeners can make these distinctions, clinicians may be able to customize treatment goals to address specific listener preferences.

Annie Bucca, BS, Graduate Student Research Assistant, Seton Hall University, (908) 307-5719,
Anniebucca94@gmail.com

Kathleen F. Nagle, PhD, CCC-SLP, Assistant Professor, Seton Hall University, (973) 761-9264,
naglekat@shu.edu

Speech and Voice Characteristics during Telephone Conversation

Objective:

Communication relies on both speech and gestures. Effect of speech communication may be different if body language is not included during communication. In such cases, vocal effort may increase to compensate. Communication over the telephone has increased steadily since its invention. Technological advancement has shifted to hands-free with Bluetooth connection.

The goal of this study is to analyze the difference communication and voice measures between conversation in person and telephone, both hand-held and hands-free.

Methods:

Subjects: Twenty phononormal subjects (10 males, 10 females) were recruited for this study.

Protocol: Each subject were recorded during three situations, (a) one-on-one, (b) hand-held telephone, and (c) hands-free telephone. For all the three situations, subjects were asked to read a paragraph, summarize a pre-determined one page story, and share a recipe that was given to them prior to the recording session. Subjects had a break between each situation. The break was not more than fifteen minutes. The listener, a research assistant, was away from the recording session.

Instrumentation: Acosutic and electroglottographic recordings were made during the scenarios described above.

Analysis: The data obtained from recordings will be compared between the three scenarios and correlations will be made between gender as well.

Results and conclusions: The results and conclusion of this study will be presented during the poster session.

Caitlin Eakin BS , Senior - (Speech and Hearing Sciences), Dept. of Speech and Hearing Sciences, Lamar University, Beaumont, Texas, (409) 880-8338, ceakin@lamar.edu

Nandhu Radhakrishnan, PhD, CCC-SLP, Director of Voice Lab and Vocology Clinic, Dept. of Speech and Hearing Sciences, Lamar University, Beaumont, Texas, (409) 880-7591, nandhu@lamar.edu

Immediate Effect of Laryngeal Surface Hydration Associated with Tongue Trill Exercise in Amateur Singers: Perceptual Evaluation

Objective: To analyze the immediate effect of laryngeal surface hydration associated with tongue trill exercise (TTE) in amateur singers through perceptual auditory evaluation. **Methods:** Thirty amateur singers (mean = 23.8 years), with no vocal complaints and no laryngeal alterations participated in this study. They were randomly divided into two groups, experimental (EG) and control (CG). EG was submitted to inhalation with 3 ml of saline solution (0.9%) and soon after they performed TTE (glissandos) during 5 minutes. CG only performed TTE for 5 minutes. Recordings of sustained vowel “a” were obtained for both groups. For GE, the recordings were performed initially (Baseline - Pre), immediately after hydration (Post H) and then, after the TTE associated to hydration (Post H+TTE). For GC, recordings were performed initially (Baseline- Pre) and after the TTE (Post TTE). All recordings were edited in pairs and randomized. EG paired recordings were PostH vs Pre, PostH+TTE vs Pre and PostH+TTE vs PostH. CG the paired recordings were PostTTE vs Pre. Three trained Speech-Language Pathologists performed perceptual evaluation of the recordings. They consensually indicated changes of vocal quality for better, worse or its maintenance. Intrajudge reliability analysis (Intraclass Correlation Coefficient Test) indicated moderate correlation. The non-parametric Wald-Wolfowitz Runs Test was used for intergroup judgements comparisons (EG vs CG). The Wilcoxon Matched Pairs Test was used for GE intragroup comparisons.

Results: There was a significant difference ($z = -2.22$, $p = 0.02$) for intergroup comparisons, suggesting that inhalation potentiates the effect of TTE on voice. No significant difference was found ($z = 1.46$, $p = 0.14$) between GE intragroup comparisons, suggesting that isolated hydration cannot promote a perceptible impact on the voice.

Conclusion: Laryngeal surface hydration has potentiated the effect of TTE on the vocal quality as perceptually identified.

Eliana Maria Gradim Fabron PhD, Speech Language Pathologist, São Paulo State University, (UNESP), School of Sciences and Philosophy, Campus Marília, Speech-Language Pathology and Audiology Department, Marília (SP), Brazil, +5514981159368, elianaf@marilia.unesp.br

Larissa Cristina Berti - PhD, Speech Language Pathologist, São Paulo State University, (UNESP), School of Sciences and Philosophy, Campus Marília, Speech-Language Pathology and Audiology Department. Marília (SP), Brazil, +5514998501171, berti.larissa@gmail.com

Maria Cecília Bayer Pereira, Master Student, Speech Language Pathologist, School of Sciences and Philosophy, Campus Marília, Speech-Language Pathology and Audiology Department, Marília (SP), Brazil, +5514996602513, cicabp@hotmail.com

Joyra da Silva Carrer - SLP, Speech Language Pathologist, School of Sciences and Philosophy, Campus Marília, Speech-Language Pathology and Audiology Department. Marília (SP), Brazil, +5514997054468, joyra.carrer@hotmail.com

Evelyn Alves Spazzapan - MS, SLP, Speech Language Pathologist, São Paulo State University (UNESP), School of Sciences and Philosophy, Campus Marília. Marília (SP), Brasil, +5518997492952, evelyn_spazzapan@yahoo.com

Suely Mayumi Motonaga Onofri - PhD, Otolaryngologist, School of Sciences and Philosophy, Campus Marília, Speech-Language Pathology and Audiology Department. Marília (SP), Brazil, +5514996546020, motonaga@marilia.unesp.br

Viviane Cristina de Castro Marino - PhD, Speech Language Pathologist, São Paulo State University (UNESP), School of Sciences and Philosophy, Campus Marília, Speech-Language Pathology and Audiology Department. Marília (SP), Brazil, +5514997214313, vivianemarino2@yahoo.com.br

Perceptual Assessment of Phonation in Speakers with Parkinson's Disease

Objectives: In the early-to-mid stages of Parkinson's disease (PD), the effects on voice quality are not homogenous. Authors have proposed that speakers with PD utilize compensatory mechanisms to overcome neuromotor impairments in these earlier stages. This study utilized perceptual analyses to investigate severity, roughness, breathiness and age in speakers with PD in non-advanced stages (Hoehn & Yahr 1 – 3) compared to older and younger healthy speakers.

Methods: Connected speech samples of 91 participants (29 people with PD, 32 old controls and 30 young controls) were recorded and assessed. The CAPE-V scale was adapted to assess only severity, roughness and breathiness. In addition, the raters were asked to assess the age. Before the assessment, the raters were trained using voice samples for young and old voices and moderate rough and breathy voices. Inter- and intra-reliability were calculated.

Results: Analyses revealed significant differences between the PD and control groups for age, severity, roughness and breathiness. The speakers with PD were perceived as older, more severely dysphonic and more breathy than both the old and younger healthy controls. The old controls were also perceived as older, more severely dysphonic and more breathy than the younger controls. Finally, the voices of the speakers with PD were rougher than the voices of the younger healthy controls.

Conclusions: The perception of vocal quality and age is influenced by PD. The age, severity, roughness and breathiness was greater in PD than in the older and younger healthy controls and greater in the older than the younger controls. Roughness was only different between the speakers with PD and the younger healthy controls. These results align with the expectations and previous research in speakers with PD. However, the extent of the compensatory mechanisms remains unclear.

Zoe Thijs, MS, Doctoral student, Texas Christian University, (817) 773-7750, zoe.thijs@tcu.edu

Christopher R. Watts, PhD, Director, Davies School of Communication Sciences & Disorders, Texas Christian University, (817) 257-6878, c.watts@tcu.edu

Acoustic Classification of Rough Voices: Description of a Two-Stage Cepstral Analysis Procedure

Objectives: The objective of this study was to investigate the ability of a two-stage method of cepstral peak identification to effectively discriminate rough vs. breathy vs. typical voice in sustained vowel productions.

Methodology: Central 1-second portions of sustained vowel /a/ productions were obtained from 90 subjects (rough, breathy, and normophonic voices). All voice samples were analyzed using a two-stage cepstral analysis process in which a CPP High-Low difference value was obtained by identifying cepstral peaks above and below a lower limit for expected F0 (150 Hz for females and 90 Hz for males), called CPP High and CPP Low, respectively.

Results: The CPP High-Low difference value was observed to be a highly significant predictor, with negative values for this parameter characteristic of a dominant subharmonic in the voice signal and the perception of diplophonic, rough voice. Correct classification of rough vs. non-rough voice samples was 82.2% using the full 90 voice dataset (sensitivity .80 and specificity .833), and 96.1% correct classification using a reduced dataset with highly aperiodic, severely dysphonic, and intermittent rough voice samples removed from analysis (sensitivity 1.0 and specificity .945).

Conclusions: Rough, diplophonic voices were consistently observed to have a subharmonic peak that was greater in amplitude than the cepstral peak obtained within the region of the expected F0, resulting in a negative value for the CPP High-Low difference. The two-stage cepstral analysis process described herein is visually intuitive from the graphical display of a cepstrum and is a simple extended calculation derived from cepstral analysis procedures that have been recommended as essential in the acoustic description of vocal quality.

Shaheen N. Awan, PhD, Professor, Bloomsburg University of PA, (570) 389-4443, sawan@bloomu.edu

Jordan A. Awan, PhD Candidate, MS, Penn State University, (570) 441-3573, awan@psu.edu

Tele-Practice and Voice Therapy: A Systematic Review

Background: Tele-practice is an increasingly utilized and rapidly changing, software driven clinical care format in all aspects of healthcare, including provision of speech-language therapy services. Although there are communicative disorders that do not interface well with tele conference software, clinical applications for voice therapy appear to be a viable option. The application of tele-practice for the clinical management of voice disorders warranted further analysis as an effective behavioral management application. **Purpose:** To provide a qualitative assessment of the applications of tele-practice in voice therapy and the efficiency of this approach in delivery of speech-language pathology services. **Method:** This study is an international collaboration between the programs of Communicative Sciences and Disorders of Michigan State University (USA) and Universidad Manuela Beltrán (Colombia). Undergraduate, master and doctoral students, and professors of both universities performed a systematic review of literature on the implementation of tele-practice on voice therapy using two computerized databases (PubMed and Scielo). The keywords used were “tele-practice” and “voice”. Information regarding the use of tele-practice and the definition of voice disorder were extracted from each paper. Quality assessment was performed by two reviewers using the Quality Assessment Tool for Quantitative Studies. **Results:** There were 668 potentially relevant papers identified during the initial literature search. After screening of titles and abstracts (for their relevance to the tele-voice health/therapy), a total of 14 publications met the criteria for inclusion. Each paper was assessed by two reviewers. Around 43% (n=6) of the papers were scored as STRONG quality, whereas around 57% were less than STRONG. **Conclusion:** This review suggests that the clinical utility of tele practice can be a good method to deliver services of speech-language pathology among users with voice disorders. there is a paucity of solid research on the topic and more study is needed.

Kristin Hicks, BS, MA CCC-SLP, SLP/Clinical Placement Coordinator, Department of Communicative Sciences and Disorders, Michigan State University, East Lansing, (517) 884-2257
hickskr@msu.edu

Matthew Phillips, BA, MA CCC-SLP, Graduate Program Director, Department of Communicative Sciences and Disorders, Michigan State University, East Lansing, (517) 353-3176, phill630@msu.edu

Julieth Ramirez, SLP, Professor, Department of Speech-Language Pathology, Universidad Manuela Beltrán, Bogotá, Colombia, daissy.ramirez@docentes.umb.edu.co

Russell Banks, PhD Candidate, MA, CCC-SLP BS, Graduate Research Assistant, Department of Communicative Sciences and Disorders, Michigan State University, East Lansing banksru1@msu.edu

David Ford, BS, MS CCC-SLP, PhD Student, Graduate Research Assistant, Department of Communicative Sciences and Disorders, Michigan State University, East Lansing,
forddav5@msu.edu

Michael Alexander Bejarano, Department of Speech-Language Pathology, Universidad Manuela Beltrán, Bogotá, Colombia michael.alexander.bejarano@gmail.com

Danae Alexis Brownell, BS. Master Student, Department of Communicative Sciences and Disorders,
Michigan State University, East Lansing browne77@msu.edu

Jenny Alejandra Méndez Mora, SLP, Department of Speech-Language Pathology, Universidad
Manuela Beltrán, Bogotá, Colombia ,+57 310 575 73 81, jennymendezmora@hotmail.com

Peter R. LaPine , PhD, MA, BA, Professor, Department of Communicative Sciences and Disorders,
Michigan State University, East Lansing , (517) 432-7044, lapine@msu.edu

Lady Catherine Cantor Cutiva, SLP, MSc, PhD. Professor, Department of Collective Health,
Universidad Nacional de Colombia, Bogotá, Colombia, Department of Speech-Language Pathology,
Universidad Manuela Beltrán, Bogotá, Colombia, +57 3004864136, lccantor@unal.edu.co

Defining Evidence-Based Voice Pedagogy: A New Framework

Evidence-Based Voice Pedagogy is a term used synonymously with science-based voice pedagogy, function-based voice pedagogy, or fact-based voice pedagogy. However, there is a precedent for defining Evidence-Based Voice Pedagogy (EBVP) with a broader understanding. This new framework provides a context for an inclusive perspective of what constitutes evidence in the field of voice training. The gold standard of evidence for any mentor/teacher is to achieve efficacy in the form of efficient and artistic performances. Tools necessary to be an effective teacher are acquired through a broad continuum of resources. EBVP is a voice pedagogy framework that acknowledges the importance of both scientific voice research, historical pedagogy, and anecdotal evidence; along with consideration of the experience acquired by a teacher, and the importance of individual student needs. EBVP provides a new framework which honors traditions while simultaneously leading to the integration of fact-based principles of voice production in the field of voice teaching.

The new framework for Evidence-Based Voice Pedagogy is modeled after Evidence-Based Medicine (EBM). The modern framework of systematized standards of care of EBM integrates three important components: (1) best external evidence, (2) clinical expertise, and (3) patients' values and preference. The framework of EBM eventually advanced to other behavioral health arenas including Speech and Hearing Sciences, which label it Evidence-Based Practice (EBP), a term that has different connotations for different professional disciplines.

The recently published *Journal of Singing* paper defines Evidence-Based Voice Pedagogy as the integration of voice teacher expertise and experience, student goals and perspectives, and relevant research into voice science and production to effectively evaluate and identify technical inefficiencies to guide students toward vocally healthy and efficient, stylistically accurate, and artistic performances. It is an important contribution to the field of voice pedagogy which needs to be adapted as a framework for any academic or independent voice teacher.

Kari Ragan, DMA, SVS, Artist in Residence, University of Washington, Seattle, WA, (425) 246-1326,
KRagan@uw.edu

Listener Ratings of Male Singer Technical Ability

Abstract: Perceptual judgments of singer technical ability have not been widely researched. A few studies have examined perceptions of singers versus non-singers (Usha 2017) and evaluations of vocal beauty in the male voice (Robison 1992). The investigators used recordings of male voices singing [i] in an online survey instrument using a Likert-type scale. Listeners were divided into four groups (non-musicians, music ensemble participants, music students, and music professionals). Listeners rated the technical ability of each singer (27 recordings) on a 6-point scale from beginning to advanced. Survey responses of the four listener groups were compared with vibrato rate, extent, and jitter of the recorded samples. Preliminary results indicate a correlation between listener ratings and vibrato jitter.

Rachel Stern, MM in Vocal Performance/Pedagogy, The University of Texas at San Antonio
Department of Music, One UTSA Circle, (254) 230-5133, sternrachel1@gmail.com

John Nix, MM, MME, BM, Certificate in Vocology, Professor of Voice and Voice Pedagogy,
Music Department, The University of Texas at San Antonio, (210) 458-5678, john.nix@utsa.edu

Work-related Communicative Profile of University Voice Teachers

Objective:

Singing teachers are one the largest occupational groups developing voice-related problems. They use their voices at high intensities for long periods during their workday. This project aimed to describe hearing and voice behaviours of voice teachers. Both areas focused their analysis on two main divisions: (1) pre- and post-monitoring before and after voice classes and (2) occupational dosimetry during teachers' activity.

Methods:

Eight voice teachers were involved in the study. In regards to voice, there was (1) an evaluation before and after voice classes; (2) voice dosimetry during classes. During the evaluation before and after classes subjects were asked to produce sustained vowels and a speech sample in three different voice levels. Several voice parameters were measured from the recordings. The considered parameters were SPL, f_0 , SPL_{sd} , f_{0sd} , AVQI, CPPS and Pitch Strength (PS). During the voice dosimetry, subjects wore the VoiceCare dosimeter while teaching. In regards to hearing and noise exposure, there was (1) a hearing assessment before and after voice classes; (2) noise dosimetry during classes.

Results:

Even if high vocal loads were measured during the working time, the analysis of the parameters pre/post showed an improvement of the voice quality of the teachers after class. As it concerns hearing, the noise exposure was on average 85 dB(A). Hearing assessments showed a majority of subjects with hearing loss. The typical nature of the hearing loss was in the form of sloping high-frequency hearing loss and noise notches occurring at 4000 Hz - 6000 Hz, bilaterally.

Conclusion:

The preliminary results suggest that voice teachers are exposed to intense noise levels during the workday. This exposure is significantly impacting their hearing health. However, the teachers' voice quality seems unaffected by their high workload.

Yvonne Gonzales Redman, BM, Associate Professor, School of Music, University of Illinois, Urbana-Champaign, Illinois, USA, (217) 244-9122, ygredman@illinois.edu

Lady Catherine Cantor-Cutiva, PhD, Assistant Professor, Department of Collective Health, Universidad Nacional, Colombia, lccantor@unal.edu.co

Chiara Vercelli, Master student, Politecnico di Torino, Italy, chiaravercelli@libero.it

Pasquale Bottalico, PhD, Assistant Professor, Department of Speech and Hearing Science, University of Illinois Urbana-Champaign, Illinois, USA, (217) 300-0327, pb81@illinois.edu

Pelvic Floor Activity in Breathing and Phonation: A Pilot Study

Aim: The aim of this pilot study was to demonstrate physiological movements of the muscular walls surrounding the abdominal cavity during breathing and phonation in female singers by means of real-time dynamic magnetic resonance imaging (MRI). **Methods:** Fifteen volunteers underwent MRI measurements in a 1.5-T whole body MR-scanner. Coronal and sagittal slices were acquired simultaneously to assess respiratory-and phonatoy-related cranio-caudal movement of diaphragm and pelvic floor (PF) and concomitant changes in horizontal abdominal diameter. **Results:** The MRI exam revealed that both the diaphragm and the pelvic floor move caudally during inspiration and cranially during expiration and phonation and the diaphragm and pelvic floor move in a parallel phase-locked relationship to one another during both respiration and phonation in seven healthy subjects. Eight subjects demonstrated paradoxical movement of their pelvic floor during an initial clinical (physical) exam also demonstrated a paradoxical (bearing down) movement of the pelvic floor during cough, Valsalva, and some of the phonatory tasks during MRI imaging. However, all but one of the fifteen women demonstrated a normal pelvic floor contraction with forced exhalation, including seven of the eight women with signs of pelvic floor dysfunction. **Conclusions:** In healthy women, real-time dynamic MRI demonstrates parallel cranio-caudal movement of the diaphragm and the PF during breathing and phonation and synchronous changes in abdominal wall diameter.

Keywords: Abdominal Musculature, Respiration, Breathing, Diaphragm, Pelvic floor, Phonation

Kate Emerich, MS, CCC-SLP, Voice Pathologist, Singing Voice Specialist, Vocal Essentials, Denver, CO 80127, (720) 317-8303, kaemerich@gmail.com

Helena Talasz, MD, Internal Medicine Physician, Helena.talasz@tilak.at

Ansgar Rudisch, MD, Radiologist, Ansgar.rudisch@i-med.ac.at

Christian Kremser, PhD, Physicist, Christian.kremser@i-med.ac.at

Markus Kofler, MD, Neurologist, Markus.kofler@i-med.ac.at

Teacher's Thoughts on Teacher Voice: Elementary Music Teacher Perceptions of Voice Use in the Workplace

Objectives: Compilation of three full time, public elementary school teachers' thoughts regarding occupational voice use in the classroom. Data was collected over the span of three months. This study provides insight into differences between the experience of teachers and their perceptions of vocal use. Attention is paid to what personal and professional value teachers place upon their voices and how vocal health may affect their careers.

Methods / Design: Survey, interview, and observational study.

Results: Vocal professionalism and caring for the voice varied in definition and importance, and participants seemed more conscious of their physical health than aspects of professional vocal demand. Participants considered themselves vocal professionals while also engaging in behaviors which did not support sustainable vocal health. Teachers considered performances outside of school more "professional" than the rigors of daily music instruction. None of the teachers had received training in what to do if their voice was injured or how to use their voices safely while teaching. Each teacher reported mild to no voice handicap on both the Voice Handicap Index and the Singing Voice Handicap Index. This may reflect some degree of label avoidance.

Conclusion: Defining professional awareness is necessary to understand the teacher's perspective of voice use in the workplace. Teachers at the elementary level of music come from diverse backgrounds and teach in widely varying circumstances. Teachers, not have been trained in how to use the voice while teaching, may develop habitual practices which are not conducive to a career of healthy vocal production. Increased attention is indicated for the populations who professionally use their voices in both speech and song.

Kimberly Stephenson, MEd, EdM, EdD, Director of Education, Tobin Center for the Performing Arts;
Teachers College of Columbia, (210) 223-3333 x 7035, kimberly@tobincenter.org

Effects of Three Voice-Matching Methods on Acoustical and Perceptual Measures of a Soprano Section's Choral Sound

Research suggests that careful selection of chorister seating arrangement based on matching acoustically-compatible voices (termed “acoustic voice-matching” or “acoustic placement of voices”) could improve choral sound (Elkholm, 2000; Giardiniere, 1991; Tocheff, 1990). Choral pedagogues suggest that certain voice-matching methods will improve homogeneity of choral sound, however there is currently no research to support these claims.

The purpose of this study was to assess the effects of three voice-matching methods on acoustical and perceptual measures of a soprano section's overall sound. Singer participants ($N = 12$) constituted the soprano section of an established university choir. In order to determine singer position for each of the three voice-matching methods, singers: a) were asked to stand on any of the pre-positioned markings on the floor (random placement); b) were arranged by unanimous agreement of three experienced choral conductors according to Weston Noble's Voice Compatibility Placement method; and c) were arranged by unanimous agreement of three experienced choral conductors according to John Molnar's Voice Timbre Classification method.

The researcher audio-recorded the singer participants standing in each of the three voice-matching placements. Singer participants sang a unison choral piece while following the same video-taped conductor in each of the three placements. After each recording, singers rated the conditions on ease of singing, self-to-other ratio, and overall choral sound. A week later, the same singers acted as listeners and blindly ranked the three randomly-ordered recordings by preference using sort-and-rank procedures similar to Confredo, Geringer, Flowers, Brittin, and Parisi (2018). Collected data was analyzed acoustically using long-term average spectra and perceptually through intonation analysis software, singer perceptions, and listener perceptions. Results indicated more spectral energy, more in-tune singing, and preferences for the Weston Noble Voice Compatibility Placement method. Results were discussed in terms of future research and application to choral pedagogy.

Tianna Smith, BA Mus; BA Spanish, Graduate Teaching Assistant in Vocal Pedagogy, University of Kansas, Murphy Hall, 1530 Naismith Drive, Kansas 66044, (910) 431-9911, TiannaS@ku.edu

Relationship of Vocal Fry in a Speech Task with Listener Ratings of Popular Vocal Music Performances

Abstract: This study combines linguistic inquiry with music, exploring the relationship between vocal fry usage in speech and listener perceptions of vocal fry in *a cappella* music. Subjects (N=60) were recorded speaking the Rainbow Passage (Fairbanks, 1960) before and after taking an online survey which included a matched guise perception task (Lambert et al., 1960) of sung performances with and without vocal fry onsets. The survey instrument, previously used by the authors (Chappell, Nix, Powell, *Journal of Voice*, 2018) was structured to determine what social properties, such as laziness, heteronormativity, and emotional commitment, are ascribed to singers based on their production of fry. Each listener subject's use of vocal fry in the two recordings of the Rainbow Passage was compared with his or her survey responses. The two recordings pre- and post-survey were also compared to examine whether listening to singers using fry in a musical context had any effect on the amount of vocal fry in the listener's speech. Preliminary results are mixed. The authors believe a conversational task might be more revealing of behavior than the reading task used in this study.

John Nix, BM, MM, MME, Certificate in Vocology, Professor of Voice and Voice Pedagogy
Music Department, The University of Texas at San Antonio, (210) 458-5678, John.Nix@utsa.edu

Whitney Chappell, BA, MA, PhD, Assistant Professor, Spanish, Linguistics, Department of Modern Languages and Literatures, (210) 458-5223, whitney.chappell@utsa.edu

Mackenzie Powell, BM, MM, Private Voice Instructor, San Marcos, TX, (713) 906-2894,
Mackenzie.lanae@gmail.com

Do Classical Singers Maintain Training Program Post College?

Objective: Academic programs seek to prepare their vocal students for a successful and viable career through use of a consistent discipline in the performing arts.

Within the discipline of performing arts, singers are required to have skills in voice, acting and possibly dance. The aim of this study is to determine whether training patterns for recent graduate vocal performers differ when not in an academic program.

During an academic program, aspiring professional singers must adhere to participation in voice and possibly acting and dance training in many Bachelor of Arts (B.A.), Bachelor of Music (B.M.), Bachelor of Music Education, (B.M.E.), Master of Music (M.M.), Masters of Music Education (M.M.E.) Doctor of Musical Arts (D.M.A.). Our survey targets graduates of programs with comprehensive versus minimal academic preparation to meet the degree requirements for BA, BM.

Methods: Recent graduates of these programs will be identified through survey links to professional voice performance organizations. Subjects will describe their current choices in training post-degree completion. Subjects will be queried on their performing arts preparation prior to and during their academic program compared to their first five years following graduation.

Results: We project that subjects will follow a pattern more closely aligned with their past history of training and preparation outside of academic years rather than during their academic years. It is further hypothesized that subjects will seek to return to the more rigorous academic schedule when they have an upcoming important audition.

Conclusions: Those students who excelled in regular, repeated preparation for performances in college are predicted to maintain steady pattern of self-motivated practice and career preparation. Educational programs are recommended to address self-motivation during summer term breaks to more fully prepare their alumni for achievement for their performance beyond academia.

Edrie Means Weekly, BME, MM, Associate Professor of Voice and Vocal Pedagogy, Musical Theatre Styles Specialist, Contemporary Commercial Music Vocal Pedagogy Institute, Co-Founder, Shenandoah University and Conservatory of Music, 1460 University Ave., Winchester, VA 22601, 703-470-9443, EdrieW@aol.com

Marquita Lister, BM, MM, Negro Spiritual Scholarship Foundation, National Association of Negro Musicians, Inc., Morgan State University, Opera Director, Vocal Studies Program Coordinator 1700 East Cold Spring Lane, Baltimore, Maryland 21251, (240) 432-7991, Lister1408@aol.com

Linda M. Carroll, PhD, CCC-SLP, ASHA/F, Private Practice in Speech Language Pathology, NY, NY, Senior Voice Research Scientist, Dept. of Surgery, Division of Otolaryngology, The Children's Hospital of Philadelphia, PA, Research Scientist, Department of Otorhinolaryngology-Head and Neck Surgery, Montefiore Medical Center, Bronx, NY, (212) 459-3929, Fax: (212) 459-2585, LMCarrollPhD@aol.com

'Straddle' Technique of Formant Tuning

The application of feedback from spectrum analysis to the process of formant tuning (of the first two vowel formants) has received considerable attention in the pedagogy of singing in recent decades [Sundberg: F1-H1 in high female voice; Miller & Schutte: F2 tuning in male passaggio, Miller: Resonance in Singing, etc.]. The basic point is to adjust one or the other of the two formants to approximate, at a given fundamental frequency, an available harmonic with one of the two vowel formants of the vocal tract, with the result that resulting sound is enhanced as the SPL of the resonated harmonic becomes a major, sometimes dominant, factor in the total SPL.

The present study will consider a related, alternative strategy for augmenting the SPL of a given harmonic (or harmonics) to achieve a desired sound by adjusting a pair of formants that are sufficiently proximate to strengthen any harmonic that falls between the two formant frequencies. This strategy is typically used with the 'back vowels' (especially [O] and [a]), where the two lowest resonances can be brought within 400 Hz of one another. We see this in practice at F0s from the male zona di passaggio (beginning ca. B3-flat) and higher.

The study will consider examples from the historical recorded literature, as well as original data that will be gathered. This will include not only specimens considered exemplary in the classical tradition, but also those employed in commonly used alternative traditions

Donald Gray Miller, PhD, MM, Researcher, Groningen Voice Research, Stavangerweg 21-2, 9723JC, Groningen, Netherlands, + 31 50 501 2010, d.g.miller@vocevista.com

Hubert Noé, MD, Researcher, Voice Teacher, hubert@dr-noe.at

Characteristics of the Ageless Voice

Objective: Resonance and vibrato are essential features of the unamplified, classical singing voice, with several measurable characteristics that reflect quality. To maintain a viable voice for performance, older singers should be aware of potential changes and corrective techniques.

Methods/Design: Participants to date are four classically trained singers across four *Fächer*, with an extensive and long-lasting, and current performance career. Additional participants will be included.

A segment of an opera recorded an average of 34 years prior was compared with a current recording of the same segment. Data were obtained for vibrato rate, vibrato excursion, and a measure of symmetry of the rise and fall segments of a vibrato cycle, as an indicator of smoothness. The presence of a singer's formant was judged visually. The participants also completed a questionnaire highlighting strategies they employed to maintain a viable voice.

Results Vibrato: All singers demonstrated a reduction in vibrato rate, averaging a decrease from 5.7 to 4.8 cycles per second. The greatest difference was from 5.6 to 4.2, and the smallest from 4.7 to 4.4. Vibrato extent increased slightly, from an average of 1.93 to 2.26 semitones. The smallest difference was from 1.9 to 2.1, and the largest from 2.1 to 2.8. Regarding symmetry of the vibrato rise and fall slopes, as well as the presence of a singer's formant, there was little difference between the original and recent recordings.

Questionnaire: Each singer highlighted the importance of increased awareness to maintain the desired quality, and were able to state strategies to counteract specific problems. Two of the four mentioned the importance of a trusted teacher, indicating that counterintuitively, a "veteran" singer cannot continue to be self-taught.

Conclusions: With conscious effort, it is possible for older singers to maintain a viable professional singing voice, with little change in key features of quality.

Monica McHenry, PhD, CCC-SLP, Professor, New York Medical College, 30 Sunshine Cottage Road, School of Health Sciences and Practice, Ste. 213, Valhalla, NY 10595, (914) 5943951, monica_mchenry@nymc.edu

Joseph Evans, MM, Professor, jevans3@Central.UH.EDU

Psychophysiological Symptoms of Music Performance Anxiety in Singers

OBJECTIVE: Music performance anxiety (MPA) affects many performers, often with debilitating and career threatening consequences. Despite preparation and training, singers may experience MPA symptoms such as increased heart rate, shaking, sweating, shallow respiration, and cognitive difficulties that may affect performance quality. The physiological effects of anxiety during non-musical tasks have been examined, but these studies are of limited utility in singing voice pedagogy because a singer is both the instrument and the performer. A psychophysiological study measuring heart rate parameters and electrodermal activity (EDA) will differentiate the athletic effects of singing from MPA symptomology. Future studies may produce data-driven strategies for ameliorating the deleterious effects of MPA.

METHOD/DESIGN: Collegiate undergraduate voice majors who suffer from MPA each sing in three environments with graduated levels of stress: practice room, rehearsal, and public performance. Each participant's self-reported state anxiety is measured using the state portion of the Spielberger State-Trait Anxiety Inventory (STAI). Additionally, heart rate and electrodermal activity data is captured during singing in real time using ambulatory monitoring technology (Empatica E4 wristband) to determine the level of activation of the sympathetic nervous system. Baseline physiological data (no singing) is collected to compare resting state to active singing.

RESULTS: The participants' heart rate, electrodermal activity, STAI scores, and self-reported anxiety during singing in the three performance environments will be analyzed using descriptive statistics and compared to their baseline data, creating a profile for each participant.

CONCLUSION: The results will provide a baseline for future treatment studies using ambulatory monitoring devices in singing performance.

Katherine DeFiglio, MM, Doctoral Candidate in Voice Pedagogy, Shenandoah Conservatory; Voice Faculty, University of North Carolina at Pembroke, 1 University Drive, Pembroke, NC 28372; (914) 475-9122; kdefigli12@su.edu

David Meyer, DM, Director of the Janette Ogg Voice Research Center, Associate Professor, Voice, Shenandoah Conservatory, 1460 University Drive Winchester, VA 22601 ; (540) 665-4544; dmeyer2@su.edu; (540) 665-4544

Paul D Lyons, MD, PhD NeuroSynchrony Inc., 5 Gildersleeve Wood Charlottesville VA 22903; Medical Director, Virginia Comprehensive Epilepsy Program, Winchester Medical Center, Winchester, VA 22601; (540) 409-6336; pdjlyons@gmail.com; (540) 409-6336

Ron DuPlain, MEng, NeuroSynchrony Inc., 5 Gildersleeve Wood Charlottesville VA 22903; (434) 260-0330; ron.duplain@gmail.com; (434) 260-0330

A Survey of Basic Vocal Technique, Vocal Knowledge, and Vocal Health Awareness in African-American Gospel Singers and Worship Leaders

Objectives

To provide insight on the current state of African-American Gospel singers and worship leaders who use their voice on a daily or weekly basis and to aid the plight of ensuring that this population of singers can continue to gain tools and knowledge for optimal voice use.

Methods

An online survey is being conducted to obtain data from the pool of singers. The survey includes questions relating to vocal production and technique, their understanding of vocal trauma, their schedule as it relates to their voice use, their awareness of medical professionals who can help them with their voice, facets of their vocal health regimen, and their background in formal voice training.

The demographic of polled singers are at least eighteen (18) years of age, identify as African-American, and meet at least one of the following qualifications:

The singer currently serves as a worship leader at a place of worship

The singer actively serves in the music ministry at their respective place of worship as a vocalist (i.e. sing on a worship team, sing in a choir, etc.)

The singer has served as a worship leader or as a vocalist in a music ministry for at least a calendar year within the past five consecutive years

The singer actively sings Gospel music as a professional soloist, performing artist, or professional background vocalist.

Results & Conclusions

Collection of surveys and data are currently underway. Results from this study may provide ideas and ways for private and collegiate voice teachers, speech pathologists, singing health specialists, and other voice science professionals to help Gospel singers and worship leaders in this population use and care for their voice more efficiently.

Jaron M. LeGrair, MA, Private Voice Teacher, Jaron M. LeGrair Studio, Assistant Professor of Theatre, Point Park University, Adjunct Professor, Indiana Wesleyan University, (330) 940-9878, jaron@jmlegrairstudio.com

A Comparative Study of Physiological Structure and Functional State between Chinese Folk Soprano and Bel Canto Soprano

OBJECTIVE: Whether is the physiological structure of the Chinese Folk soprano consistent with that of Bel Canto Soprano ? Since Bel Canto singers do not use microphones in singing while most of Chinese folk singers use microphones, are there some differences in breathing patterns or the degree of throat relaxation? Due to differences in language and aesthetics, are there some differences in use of vocal folds?

METHOD: Questionnaire survey, Indirect laryngeal mirror and rigid laryngoscopy measurement , Sound pressure meter, B-ultrasound measurement, 15 Chinese Folk Soprano and 15 Bel Canto Soprano

RESULTS: 9 Chinese folk soprano have vocal fatigue while 4 Bel Canto Soprano do. 8 Chinese Folk soprano raise their larynx position up while only 1 Bel Canto soprano does it. Almost all Chinese Folk soprano(15) whose vocal folds could not exposed completely while 6 Bel Canto soprano do. Bel Canto soprano have larger glottis opening angle (47.89 degrees)than Chinese folk sopranos (43.40 degrees). Among 15 Bel Canto soprano there are 6 singers whose glottis opening angle more than 50 degrees (6:0). Chinese Folk soprano have longer vocal folds and greater change rate when they sing high tones.

CONCLUSION: Chinese Folk soprano have different voice types like Bel Canto. Their physiological structure also affect their song types. Bel Canto singer's inhalation pattern is different from Chinese Folk singer's. No matter Chinese Folk soprano or Bel Canto Soprano, the vocal folds change rates are increased from the low-mid vocal register to the middle-high vocal register. Their contraction are based on isotonic. From middle-high vocal register to highest vocal register, the vocal folds change rates become smaller and their contraction are based on isometric. Longest is not best. We should consider other factors as vocal tension, vibration area and subglottic pressure.

Wanwan Niu MA, Voice Research Center of the Central Conservatory of Music, Beijing ,100031, China, (86)10-66425747, 593218835@qq.com

Liyan Han, MD, MA, Voice Research Center of the Central Conservatory of Music , Qinghua Changgeng Hospital, Beijing ,100031, China, (86)10-66425747, hly51772@vip.163.com

The Use of Focused Ethnography as a Methodology in CCM Voice Pedagogy Research

Introduction: Traditionally the ability to observe voice teaching within the CCM private studio has been difficult due to the one-to-one, often secretive nature of private voice lessons. Previous methods of studying how voice teachers work in the voice studio include interviews and video recordings. These methods may be problematic due to discrepancies between interview information and studio practice, and video creating an unnatural atmosphere in the studio, unless it is usual practice.

Objective: This paper explored the use of focused ethnography methodology to gain deeper insight into practices within the CCM private studio.

Methods: Focused ethnography was used to investigate the practices of university-level pedagogues as they relate to teaching CCM to music theatre students. Triangulation of data was required using observations, interview and video recordings. Personal reflexivity was necessary to address issues of potential bias and issues arising from researcher presence in the field.

Results and Conclusions: Focused ethnography as a tool for accessing the voice studio requires long term relationship building with singing teachers. The ability to access voice studios to observe in situ practical application of vocal pedagogy methods in voice teachers requires the establishment of trust, the ability to work within cross-national IRB / Ethics boundaries, a strong baseline understanding of voice science and pedagogical practice before entering the field and the generosity of participant teachers. This methodology requires long term planning, empathy, patience and reflexivity. This methodology can yield surprising, conflicting and interesting results.

Dale Cox, M. Music Studies (Voice Pedagogy), PhD student, University of Southern Queensland, Toowoomba QLD, 4350. Visiting Research Scholar, Shenandoah Conservatory, Winchester, VA, 22601. (571) 228-9825. Dale.Cox@usq.edu.au

Vocal Fold Vibration of Mixed Voice Observed by High-Speed Digital Imaging

Introduction: A vocal register is defined as a totally laryngeal event, and a series of tones that are perceived to be of similar vocal quality and produced by the same mechanical principle. Typical registers are chest and falsetto, but trained singers have additional register, that is, mixed voice. Mixed voice is an important singing technique among singers, making it possible to bridge the chest voice to falsetto without noticeable voice break, and to utter a sounds like a chest voice in the high pitch.

Objective: The purpose of this study was to compare vocal fold vibratory movements between three registers (chest, mix, and falsetto), using high-speed digital imaging (HSDI) and Electroglottography (EGG). Also, we wanted to find out acoustic characteristics of each register.

Study Design: Cross-sectional study.

Methods: HSDI and EGG were simultaneously performed on 3 healthy singers (2 men and 1 woman) during production of a variety of pitches in these three registers. Both open quotient (OQ) and speed quotient (SQ) were detected from HSDI data. OQ value was also estimated from EGG signals by DECOM method. Furthermore, five sustained vowels ([a], [i], [u], [e], [o]) were recorded, and Fast Fourier transforms (FFTs) were performed to determine the amplitude of harmonics.

Results:

For all singers, OQ was different among registers even in the same pitch; OQ of mix was higher than chest but lower than falsetto. The difference of OQ between three registers was statistically significant. SQ of mix was tend to be higher than 1.0, which seems to be one of the factor that sound of mix is similar to chest. Acoustic analysis using FFTs showed that mix was between chest and falsetto in terms of the mean value of the amplitude of harmonics.

Conclusions: Mix voice was significantly distinguished by OQ. Singers can change register intentionally by varying OQ.

Yogaku Lee, MD, Otolaryngologist and Phoniatician, Department of Otorhinolaryngology, Faculty of Medicine, Kyushu University, 3-1-1 Maidashi Higashi-ku, Fukuoka 812-8582, Japan, +81-92-642-5668, y.lee.003@s.kyushu-u.ac.jp

Mitsuru Oya, Graduate School of Design, Kyushu University, 4-9-1 Shiobaru, Minami-ku, Fukuoka, 815-8540, Japan, +81-92-553-4572, 2DS18017W@design.kyushu-u.ac.jp

Tokihiko Kaburagi, PhD, Professor, Faculty of Design, Kyushu University, 4-9-1 Shiobaru, Minami-ku, Fukuoka, 815-8540, Japan., +81-92-553-4572, kabu@design.kyushu-u.ac.jp

Takashi Nakagawa, MD, PhD, Department of Otorhinolaryngology, Faculty of Medicine, Kyushu University, 3-1-1 Maidashi Higashi-ku, Fukuoka 812-8582, Japan, +81-92-642-5668, nakataka@med.kyushu-u.ac.jp

Acoustical Characteristics and Possible Benefits of the Manually Occluded Vocal Tract Posture

Semi-occluded vocal tract postures (SOVT) such as lip trills, raspberries, straw phonation, and humming, have a long-standing history in the voice studio as tools to encourage an easy onset, forward sensation, and an efficient production. Berton Coffin's "open mouth hum," or Manually Occluded Vocal Tract posture, provides similar forward sensations to the nasal consonants, while allowing the singer more freedom to consider vowel shapes that other SOVT postures do not permit. Subjects (n=12) sang three vowels [a], [i], and [u] in open and occluded conditions. Using vocal fry, the authors collected and assessed shifts in vowel formants as a result of the occlusions, and compared vibrato rate, extent, and jitter in vowels produced with and without the occlusion used as a pilot into the vowel. Preliminary results indicate the expected downward shift in all formants during the occlusion, and a variety of formant shift directions following the occlusion. Pedagogical implications will be discussed.

Sarah Miga MM, Voice Faculty, San Antonio Music Academy, 9910 W Loop 1604 N, Suite 103, San Antonio, TX 78254, (210) 837-2646, Sezzo.sirois@gmail.com

John Nix, Professor of Voice, The University of Texas at San Antonio Department of Music
One UTSA Circle, San Antonio, TX 78249, (210) 458-5678, John.nix@utsa.edu

Examining the High Belt Strategies of Female Singers

Objective - The intent of this study is to gain a clear understanding of the acoustic strategies and techniques used by female singers to successfully produce the musical theater high belt singing technique.

Method - The study is composed of two data collection methods: acoustic and aural analysis of ten female musical theatre college students producing the high belt technique, and interviews with these participants about their vocal production. Participants were recorded singing an F#⁵ in the belt vocal style, the mix vocal style, and the legit vocal style. The audio recordings were sent to a panel of five musical theatre voice experts to aurally verify each singer's perceived vocal style production. Only vocal data aurally verified to be of the belt, mix, or legit style by the majority of the panel will be used for acoustic analysis. The VoceVista acoustical analysis data of each aurally verified example will be compared and contrasted for similarities among vocal styles. A cross comparison of acoustic strategies of belt and mix vocal production examples will also be analyzed.

Results and Conclusions: This research is currently in progress. Results from this study may have implications for the training and pedagogy of the musical theatre high belt singing technique.

Christianne Roll, BFA, MA, Ed DCT, Associate Professor of Musical Theatre, Florida Southern College, AEA, NATS, (917) 226-8767, christianneroll@hotmail.com

Understanding the Vocal Skill Set for Contemporary Christian Singers: Insights from Elite Singers

Summary: Objective/Hypothesis. Contemporary Commercial Music (CCM) places unique demands on the singing voice. Voice science and pedagogy support style-specific instruction for CCM singers. Unfortunately, most are untrained or their training is primarily based on Western classical (operatic) music. Accordingly, the vocal skills CCSs need for commercial success may not be reflected in the manner in which they are trained. Elite singers are seen as models of excellence and represent what the marketplace has selected as commercially viable in their musical genre. Their unique insights on the skills required for CCS commercial success were solicited, specifically their perceptions of the “ideal” vocal characteristics for this population of singers.

Study Design. Semi-structured interviews, qualitative inquiry. Code transcription analysis.

Methods. Dove and Grammy award-winning CCSs (n=3) were interviewed to solicit their perception of the ideal vocal skill set of a successful CCS. Each participant took part in a 25-30 minutes semi-structured interview. The interviews were transcribed, member checked, thematically coded and peer checked for accuracy.

Results. Participants believed that ideal CCSs’ voices should use a pop sound and not sound overly classical, should sing easily, comfortably, and with freedom. The singing should not be distracting and should use good diction in order to communicate the message clearly. Among the most relevant findings is the suggestion that CCSs have a heavy and demanding vocal load and may face higher risks of vocal injury.

Conclusion. The ideal vocal skills for successful CCSs (as identified by elite performers) may inform our style-specific training of these singers to better prepare them for the music marketplace. Directions for future research will be discussed.

Key Words: contemporary Christian singers – elite singers – contemporary commercial music – voice pedagogy – recording industry

Leon Neto, DMA, MA, BM, Associate Professor, Guitar and Voice, Liberty University; 1074 Cedar Fox Court, Forest, VA, 24551; (434) 592-4683; lneto@liberty.edu

David Meyer, DM, Director of the Janette Ogg Voice Research Center; Associate Professor, Voice, Shenandoah Conservatory, 1460 University Drive Winchester, VA 22601; (540) 665-4544; dmeyer2@su.edu

The Effects of Visual, Auditory, and Kinesthetic Learning Stimuli on the Quality of Vocal Sound

Objective: The process of improving in singing can be described as learning through sensorial memory. In essence, singers advance in their technique by correlating physical sensations with what they and their teachers deem good vocal sound. Once the singer can remember these sensations, they begin to sing more efficiently on a consistent basis. Since no two voices are exactly the same, the voice teacher must develop pedagogical approaches that help each student discover what sensations allow them to produce their best possible sound. One way to create student-focused instruction is to tailor learning stimuli to their learning modality preference.

Method: Participants ($N = 40$) constituted singers ($n = 30$) and expert listeners ($n = 10$) specializing in either choral or solo voice instruction. Singers performed the first verse of the hymn-tune *Amazing Grace* a total of four times. The initial recording served as a baseline, and the remaining three recordings utilized either auditory, visual, or kinesthetic learning stimuli in a randomized order. Expert listeners ranked excerpts of the four recordings (learning stimuli x 3, baseline x 1) for each singer. I also obtained LTAS data for each of the singer recordings and computed a one-way repeated measures ANOVA to compare the differences in spectral energy for each of the learning stimulus types.

Results and Conclusions: Analysis of the current study is ongoing, but results from a pilot study indicated a strong positive correlation between a singer's learning modality preference and their overall preference for each stimulus type. Similarly, acoustic analysis shows differences in spectral energy between each learning stimulus type.

Winston Sullivan, BM Vocal Performance, MM Vocal Performance, Graduate Teaching Assistant in Vocology, University of Kansas, (865) 455-7284, winston.sullivan@ku.edu

Which Sung Pitch Range is Best for Boys during Voice Change?

The question of how and what boys should sing during adolescent voice change has challenged educators and choir leaders for the last century. The established historic and cultural practices can now be reassessed in the light of quantitative analyses of vocal function. This longitudinal case study used electroglottographic measures from two boys over a three-year period to investigate the efficiency of vocal fold adductory behaviour in both pre-change and mid-change singing. A comparison was made between the first boy who sang in his treble range up to and including Stage III, and the second boy who sang in his new baritone range as he progressed beyond Stage II of voice change. The observed regularity and efficiency of vocal fold adduction suggests that singing in the new baritone range enables the larynx to achieve a more healthy and efficient phonation; this is also represented in the overall perceived vocal comfort levels heard in the recordings. The implications for educators are that the longitudinal development of singing habits will be enhanced for boys who move to singing with their new baritone range as their larynx grows, rather than remaining in a treble range.

Jenevora Williams, PhD, Singing Teacher, +44 7885 967474, jw@jenevorawilliams.com

Graham Welch, PhD, Established Chair of Music Education, University College London, +44 7785 535440, graham.welch@ucl.ac.uk

David Howard, PhD, Professor of Electronic Engineering, Royal Holloway University, University of London, +441784443655, david.howard@rhul.ac.uk

Pathology Pathways of Professional Singers Singing in Multiple Styles

Care and management of professional voices in today's health care system continues to remain controversial.

The aim of this study is to provide insights into current practices related to vocal health and health care choices of professional singers who may sing in multiple styles.

The demand today is for singers to be trained in a variety of music styles. It is important to understand that current musical theatre productions may encompass blues, country, jazz, rock and even rap all in one show. Frequently one character is required to sing equally well in multiple styles within the same show.

Methods: Subjects were solicited via survey links to members of professional vocal organizations. Singers completed an online survey focused on situations and preference for voice care advice. Specific vocal symptoms or conditions which subjects felt would warrant evaluation was also queried, as well as their preference for voice use and management should laryngeal pathology be diagnosed during a medical exam.

Results: The specific practices of singers' management of vocal health concerns may show contrasts between those who sing in numerous styles versus those who sing in fewer styles.

Conclusions: While insurance availability and believed credibility of internet information may influence choices, singers are also more likely to glean information and knowledge from conferences, journals, and past experience. Traditional and alternative medical approaches to dysphonia appear to be based on available and not always best options for rapid recovery of voice. Ideally, a combination of traditional and alternative management would appear to be the best long-term strategy for voice professionals.

Edrie Means Weekly, BME, MM, Associate Professor of Voice and Vocal Pedagogy, Musical Theatre Styles Specialist, Contemporary Commercial Music Vocal Pedagogy Institute, Co-Founder, Shenandoah University and Conservatory of Music, 1460 University Ave., Winchester, VA 22601, (703) 470-9443, EdrieW@aol.com

Demographic Changes that will Forever Alter the Future of Voice Pedagogy

Objective: To use data from Opera America, the HEADS Data Summary (NASM), the League of American Orchestras, and the United States Census along with writings from historical resources to provide a clear picture of the state of music degrees in higher education today, how we got here, the challenges we face, and suggestions for curricular changes that will prepare us for the future.

Methods: This analysis is based on a review of literature in performance attendance, national demographics, higher education enrollment, studies on cultural and musical identity, and historical documents.

Results and Conclusions: The demographics of the United States are rapidly changing. By 2020, the 18 and under population will be less than 50% white. Yet, our vocal performance curricula are largely based on the Paris Conservatory model, a model based on music from white European traditions. Since 2012, enrollment in university choral music education and vocal performance programs has fallen by 21%. Operatic and classical music live performance attendance has either fallen or remained stable despite millions of dollars of spending on educational outreach. There are currently 375 universities in the United States offering undergraduate vocal performance degrees with over 5,000 students enrolled. These programs are largely built upon classical repertoire from the European tradition even though only half of the population under the age of 18 are from European heritage and only .6 % of the population under 21 have attended an opera in the previous twelve months. Research on cultural and musical identity suggests that citizens are more likely to attend live events and/or listen to music from those genres that are most closely associated with their identity. Since performers usually want to perform music that they identify with, it should be no surprise that as the United States shifts from predominantly white to a diverse population, that training based solely on European influenced music is no longer sufficient. In order for bachelor performance degrees in voice to survive, we must create a new vocal training paradigm in higher education that includes non-European genres and tonal goals. The presentation will conclude with suggestions to begin transitioning our programs to meet the demands we will face in the coming decades.

Matthew Edwards, DMA, Associate Professor of Voice, Shenandoah Conservatory, (937)231-8320, medwards09@su.edu

Third Register (*terzo passaggio*) Transitions of Classically Trained Operatic Tenors

Introduction:

A great deal of research has been done studying the male *secondo passaggio* and the register above it, frequently called head voice. This *secondo passaggio* and third register or 'head voice' are such an important aspect of male operatic singing that the lack of it can, alone, determine the success or failure of a singer in this genre. Spectral analysis has shown this *secondo passaggio* to be a definitive register transition with harmonic dominance shifting decisively from H2 to H3. But does this harmonic shift remain constant for the duration of the third register? Pedagogues and tenors, for over a century, have acknowledged that a difference or a change or 'a certain something special' occurs between Bb4 and B♯4. So much so that many tenors say, "B♯4 and C5 (high C) are in a completely different place than the rest of my head voice." The purpose of this research is to examine this unique upper area of the operatic tenor third register (head voice). Using previous registration research models that follow harmonic dominance shifts as well as changes in CQegg, this study hopes to shed light on whether this is merely a change in weight, color, timbre, glottal closure or an actual register transition or *terzo passaggio*.

Method:

Eight operatic professional working tenors will be utilized for this research. All will demonstrate the ability to, not only successfully transition into third register (head voice), but also be able to navigate to C5 and D5 consistently with ease and stability. Data will be collected using a standalone microphone and an electroglottograph. These signals will be displayed and analyzed for spectrographic and closing quotient values using, Audacity, VoceVista and Voce Vista Video Pro software. Each participant will be asked to sing a pentatonic F major scale from F4 to C5 on the vowel /a/. Each participant will also be asked to sing a pentatonic G major scale from G4 to D5 on the vowel /a/. Resonance strategies will be monitored during the singing of these scales as they will incorporate significant shifts in register.

David Okerlund, MM, BM – Director Graduate Voice Research and Pedagogy, Associate Professor, College of Music, Florida State University, (850) 645-6821, dokerlund@fsu.edu

Dynamic Magnetic Resonance Imaging Study of Vocal Tract Kinematics in Contemporary Musical Theatre Singing

Objective: Contemporary Commercial Music (CCM) singing requires the use of a wide variety of vocal qualities, from traditional “legit” sounds to rock belt. These qualities are likely produced by differences both at the source (larynx) and in the filter (vocal tract). Although teaching how to produce these different qualities has been increasingly accepted in the pedagogical world, our understanding of the physiology behind these differing vocal qualities has remained limited. This lack of knowledge creates challenges for both habilitation and rehabilitation of CCM singers. The goal of this study is to investigate patterns of vocal tract configurations within and across singers during production of different vocal qualities of CCM singing.

Methods: Professional CCM singers will be recruited and studied using dynamic resonance imaging (MRI) with simultaneous audio recording. Participants will first sing a 16-32 bar song excerpt representing their primary genre. Then, they will be asked to sing arpeggios covering their performance range on the vowel /a/ using 5 different CCM styles: legit, brassy belt, neutral belt, warm belt, and rock. We will perform both a descriptive analysis of differences in vocal tract shapes during the different styles as well as a quantitative analysis of vocal tract configurations (distance and angles for jaw opening, tongue dorsum, jaw protrusion, pharynx width, and soft palate height, and maximal laryngeal displacement).

Results and Conclusions: Data has been collected from two participants. We expect to complete the scanning this fall and will have a data set that will allow us to compare how individuals change their own vocal tract shape across vocal qualities and examine if there are consistencies across singers within each vocal quality.

Acknowledgement: This work is the culminating project of the 2017 Van Lawrence Fellowship.

Aaron Johnson, M.M., Ph.D., CCC-SLP, Assistant Professor, Otolaryngology-Head & Neck Surgery , New York University School of Medicine, (646) 754-1207, aaron.johnson@nyulangone.org

Tobias Block, PhD, Associate Professor, Department of Radiology, New York University School of Medicine, (212) 263-3342, kaitobias.block@nyulangone.org

Matthew Edwards, DMA, Associate Professor of Voice, Shenandoah Conservatory, (937)231-8320, medwards09@su.edu

How Individual Singers' Dynamic Ranges Impact the Dynamic Range of the Choral Ensemble

Objective: In a choral ensemble, the vocal qualities and capabilities of individual singers amalgamate into the final ensemble output. In many instances, ensembles are formed from singers with quite disparate vocal ability. The purpose of this study was to examine how one element of those individual voice qualities, their ability to vary dynamic range across their pitch range, influences the overall dynamic range of the ensemble.

Methods: Individual voice range profiles (VRPs) were collected from 24 volunteers (12 males and 12 females, gender self-identified). Subjects were asked to phonate “as softly as they could sustain” and “as loudly possible without discomfort” on each of seven pitches, covering a two octave range (G2-G4 for males, and G3-G5 for females). Sound pressure levels (dB C) were recorded using a sound level meter positioned 30 cm in front of the mouth of the subject, and plotted against pitch. Once individual VRPs were collected, the singers were placed into two choirs, one male and one female. A choral VRP was then collected in an acoustically treated rehearsal room with the singers positioned along an arc 7.6 m from the microphone of the sound level meter. For each pitch, the choir was systematically reduced by 3 singers, from 12, to 9, 6, then 3 singers according to the soft dynamic capabilities of the individual singers (i.e. the singers with the softest capabilities on a given pitch were the last remaining singers singing on that pitch).

Results and Conclusions: Individual dynamic ranges of singers had a considerable impact on the overall dynamic range of the ensemble. In particular, “loud” singers had a larger effect on the “loud” singing of the ensemble than “soft” singers had on the “soft” singing of the ensemble. If a maximum dynamic range is sought, a choral director would benefit from understanding how the individual capabilities of singers is impacting the ensemble sound.

Lynn Maxfield, PhD, Associate Director, National Center for Voice and Speech, University of Utah, 136 S. Main St., Ste #320, Salt Lake City, UT 84101, lynn.maxfield@utah.edu

Jeremy Manternach, PhD, Assistant Professor, Vocal Music Education, School of Music, University of Iowa, 4304 Voxman Music Building, Iowa City, IA 52242, jeremy-manternach@uiowa.edu

Ingo R. Titze, PhD, Executive Director, National Center for Voice and Speech, University of Utah, 136 S. Main St., Ste #320, Salt Lake City, UT 84101, ingo.titze@utah.edu

Effect of the Comprehensive Voice Rehabilitation Program in Teachers with Behavioral Dysphonia

Objective: Analyze the effects of the Comprehensive Vocal Rehabilitation Program (CVRP) and the motivational stages during speech therapy in teachers with behavioral dysphonia.

Methods: Retrospective, longitudinal, observational study using data from the medical records of 33 teachers regarding auditory-perceptual, acoustic, self-perception analyses and the Voice Handicap Index (VHI-10) protocol in pre- and post-speech therapy situations, and motivational stages of adherence to treatment.

Results: Auditory-perceptual assessment of the voice showed that 64.7% of the participants improved voice quality post-speech therapy. Comparison between the pre- and post-speech therapy moments showed that 82.4% of the teachers improved their voice according to self-perception. The VHI-10 showed no statistically significant difference between the pre- and post-speech therapy moments ($p=0.879$). Acoustic analysis of the voice showed improvement in the means of all evaluated parameters. Statistically significant correlation was observed in the analysis between the pre- and post-speech therapy moments only for the variables maximum phonation time and shimmer. Most of the teachers were at the stage of contemplation on the URICA-VOICE scale. No statistical significance was observed in the correlation analysis between VHI-10, auditory-perceptual assessment of the voice, maximum phonation time, and parameters of acoustic analysis with vocal self-perception of teachers and with auditory-perceptual assessment of voice.

Conclusion: The use of CVRP for the treatment of behavioral dysphonia presented positive results in the pre-and post-speech therapy evaluation. As for motivation, the teachers strongly believed in the possibility of facing the problem, but still without much effort to change this situation.

Bárbara Oliveira Souza, Master Student, Program in Speech, Language, and Hearing Sciences, Universidade Federal de Minas Gerais, Brazil, +55 31 9 9872-5468, bbarbara.oliveira@gmail.com

Nilceneide Ramos Cavalcanti, Speech Therapist, Universidade Federal de Minas Gerais, Brazil, +55 31 9 8499-4312, neidefono12@gmail.com

Ana Cristina Côrtes Gama, PhD, Associate Professor, Department of Speech, Language, and Hearing Sciences, Universidade Federal de Minas Gerais, Brazil, +55 31 9 8866-1349, anaccgama@gmail.com

Adriane Mesquita de Medeiros, PhD, Associate Professor, Department of Speech, Language, and Hearing Sciences, Universidade Federal de Minas Gerais, Brazil, +55 31 9 9128-4876, adrianemedeiros@hotmail.com

The Use of Mental Imagery and the Teaching of Head Voice Register for Beginner Singing Students

This paper aims to identify some mental images and metaphors most commonly used by teachers of singing to teach head voice register for beginner singing students and its supposed physiological efficiency in the teaching of head voice. With a predominantly qualitative approach, the exploratory research uses as data collection tools interviews with voice teachers of different vocal styles, besides cognitive and vocal literature analyze. For the interviews, it is contacted 10 teachers of singing, 5 of them teaches contemporary commercial styles and 5 teaches classical singing. All teachers have more than 7 years of experience. The subjects are interviewed using online questionnaires. The results reveal that all the teachers interviewed in this study use some kind of mental image in their pedagogical vocabulary to teach head voice to their beginner students. The analyze of the vocal and cognitive literature combined with the terms and concepts related by the teachers suggest that mental images and metaphors can help beginner students to access more easily laryngeal adjustments for head voice register by bringing to mind concrete experiences they have lived or felt before in their own bodies. Explanations in vocal and cognitive literature help us to conclude that mental imagery and metaphors are cognitive instruments used for human mind to structure thoughts and actions, and can be a useful tool to lead beginner students to structure head voice register concept, connecting their mind (thoughts) and body (previous experiences and sensations).

Keywords: Mental Imagery; Head Voice; Voice Pedagogy.

Maíra Jaber, Master of Music in Music Education (UFRJ), Director and Voice Teacher, SING Studio, Rua Silva Rabelo, 10 sala, 318 Rio de Janeiro, RJ. Brazil, CEP: 20735-080, +55 (21) 97523-1347, mairajaber@singstudio.org

The Short-Term Effects of Acidic Versus Non-Acidic Meals on Acoustical and Perceptual Measures of Female Singers

The purpose of this study was to determine the short-term effects, if any, of eating acidic versus non-acidic foods on acoustical and perceptual (voice handicap index [VHI], Evaluation of the Ability to Sing Easily [EASE], reflux symptom index [RSI]) measures of female university singers ($N = 30$) taken at three time increments (before food consumption, 1 hour after food consumption, and after sleeping in a supine position for 8 hours). For acoustic analyses, singers performed a portion of a song and a range of vocal exercises. Results will be discussed in terms of advice that may be given to female singers concerning food choices and reflux and the direction of future research in this area.

Haley Doerr, Student, BFA Performing Arts (Musical Theatre), BS Communication Sciences and Disorders, Western Kentucky University, 1906 College Heights Blvd. #71086 Bowling Green, KY 42101-1086, (502) 751-6709, haley.doerr123@topper.wku.edu

Amelia Rollings, PhD, MM, Assistant Professor of Musical Theatre Voice, Western Kentucky University, 1906 College Heights Blvd. #71086, Bowling Green, KY 42101-1086, (803) 348-8119, amelia.rollings@wku.edu

The Effects of Three Heel Heights, Two Vowels, and Formant Location on the Head Position and Jaw Opening of Male Singers

Persian male warriors anchored themselves on horses by using high-heeled shoes (Kremer, 2013). Louis XIV regularly put on high heels to elevate his social status and forbid others to wear red high heels or heels taller than his own (Wade, 2013). One might believe that singing in heels would only affect female performers; however, men in opera and musical theatre may also be required to wear heels or lifts. While studies have been conducted concerning the effects of high heels on postural and acoustical measures of female singers (e.g., Rollings, 2014, 2015, 2017); no studies with male singing participants have been completed.

The first portion of this large data collection, presented at the 48th Annual Voice Foundation Symposium in May 2018, detailed the effects of 3 simulated high-heel conditions (0.0 in., 1.5 in., and 3.0 in.) on postural (head position, jaw opening) and acoustical (LTAS) measures of male singers ($N = 15$) in 2 conditions (silence, singing sustained [a] and [i] vowels on each pitch from C3-F4). Following Sundberg and Skoog (1997), the purpose of the second portion of this study was to disaggregate and calculate mean data for each postural dependent variable into levels of $X_{\text{PITCH} > \text{F}_{\text{LOWF0}}}$ (pitches higher than the location of F_{LOWF0}) and $Y_{\text{PITCH} < \text{F}_{\text{LOWF0}}}$ (pitches lower than the location of F_{LOWF0}) to determine if participants exhibited different head position and jaw opening configurations based on the first formant location and heel height. The results will be discussed in terms of advice that may be given to male singers performing in high heels, and the direction of future research in this area.

Amelia Rollings, PhD, MM, Assistant Professor of Musical Theatre Voice, Western Kentucky University, 1906 College Heights Blvd. #71086, Bowling Green, KY 42101-1086, (803) 348-8119, amelia.rollings@wku.edu

Vocal Health Care Survey Among Classical Singers

Objective: Appropriate care and management of professional voices in today's health care system continues to remain controversial. Although many professional voice users are aware of the risks associated with continued use on an injured laryngeal mechanism, many are unlikely to seek medical attention due to a variety of reasons including lack of insurance, fear of results, and lack of knowledge on where to seek appropriate care. The aim of this study is to provide insights into current practices related to vocal health among classical singers.

Methods: Subjects were solicited via survey links to members of professional vocal arts organizations. Classical singers completed an online survey related to their practice in seeking medical care for vocal health concerns, with specific focus on current preference for traditional (laryngology/SLP team), alternative medical (homeopathic, Eastern medical approaches, nonmedical), or a combination of these options. Specific vocal symptoms or conditions which subjects feel would warrant evaluation is also queried, as well as their preference for voice use and management should laryngeal pathology be diagnosed during a medical exam.

Results: The impact of traditional and alternative medical assessment and management continues to evolve as performers seek financially and timely recovery of dysphonia. The specific practices of singers' management of vocal health concerns is expected to show contrasts across professional and amateur levels as well as geographical locations.

Conclusions:

Traditional and alternative medical approaches to dysphonia appear to be based on available and not always best options for rapid recovery of voice. Ideally, a combination of traditional and alternative management would appear to be the best long-term strategy for voice professionals.

Edrie Means Weekly, B.M.E., M.M., Associate Professor of Voice and Vocal Pedagogy, Musical Theatre Styles Specialist, Contemporary Commercial Music Vocal Pedagogy Institute, Co-Founder, Shenandoah University and Conservatory of Music, 1460 University Ave., Winchester, VA 22601, 703-470-9443, EdrieW@aol.com

Baroque Ornamentation and CCM Riffing: A Comparison of Pedagogical Tools and Application

This project draws parallels between the stylistic roles, pedagogical methods, and execution of baroque vocal ornamentation and modern-day riffing in contemporary commercial music (CCM) styles. An examination of the role of training in Baroque performance practice informs an effective method of teaching modern singers how to riff. By taking specific examples from Baroque vocal music and modern pop musicals, a practical and systematic method for teaching riffing can be created utilizing ear-training, recognition of vocal factors, and stylistic function.

Elizabeth Bemis, BM, Master's of Music student, Classical Vocal Pedagogy , Graduate Assistant,
Shenandoah Conservatory, 1460 University Dr, Winchester, VA 22601, (251) 752-6931,
ebemis17@su.edu

An Acoustical Comparison of Western Classical and Musical Theater Male Singers-in-Training

Background: While much attention has been directed to the female Musical Theater (MT) voice, relatively little focus has been given to the male MT singer as compared to his Classical counterpart, with even less attention directed to the male MT singer-in-training. Furthermore, recent literature indicates that singing voice research is in need of an expanded set of protocols for acoustic analysis. Spectral moments offer the potential to improve our understanding of the differences between various styles of singing.

Objective: The purpose of this study is to examine and compare the acoustical characteristics of male singers in training in both Classical ($n = 15$) and Musical Theater ($n = 15$) genres through a specific analysis of spectral moments (spectral mean, standard deviation, skewness, kurtosis).

Method/Design: This study attempts to replicate aspects of the methods used by Bourne, Garnier, and Samson (2016) in the *Journal of the Acoustical Society of America*. Collegiate male singers-in-training for MT or Classical genres were asked to sustain a note for three seconds at four frequencies up to their highest comfortable range. Each singer produced these notes on two vowels [e] and [ɔ] for a total of three times each per stylistic quality. Classical singers employed registrational and resonance strategies typical of operatic singing while MT singers used the stylistic qualities of "belt"/"contemp" and legit. The middle three tokens of each participant were analyzed and an LTAS of the middle one second of each token was extracted. A *Praat* script was then implemented to compute various spectral moments for each token.

Results: Results are reported in light of creating a clear picture of the spectral moments for both the MT and the Classical male singers-in-training in order to understand acoustically what is heard perceptually by voice teachers, conductors, and audiences. As data collection is ongoing, specific results are not reportable at the time of this writing.

Conclusion: By investigating spectral moments in relation to these two different singing styles, this study may bring to light potential acoustic correlates to stylistic differences between MT and Classical male singing and could provide a foundation for future study of the biomechanical and physiological causes of said stylistic differences. Pedagogical considerations could embrace this newer method of acoustical examination in light of resonance qualities and registration.

Joshua D. Glasner, MM, PhD Candidate, Adjunct Professor of Voice, New York University, (239) 896-0339, jdg467@nyu.edu

Kathy Kessler Price, PhD, MM, Associate Professor of Voice, Westminster Choir College, (816) 853-4882, price.kk@gmail.com, kprice@rider.edu

Jonathan Price, BM, MM, Priority Adjunct Professor of Musical Theater Voice; Adjunct Musical Theater Voice, Rider University, Marymount Manhattan College, Rowan University, (816) 853-4772, jprice@rider.edu

Down and Out or In and Up: The Controversy over Breath Support

Observation:

It has been my observation, as a voice professor for more than 20 years, that there are two basic schools of thought when it comes to achieving breath support for singing. The first school of thought is based on the idea that when one inhales, there should be an expansion downward and outward in the lower abdomen; this can be described as “down and out” school. The second school of thought is based on the idea that on inhalation, there should be an expansion that encompasses the whole torso with a slight contraction/tuck inward in the lower abdomen area; this is described as the “in and up” school.

Method:

Twenty-seven singers were observed once a week over a three month period. A comparison was made when they sang using the “in and up” method versus the “down and out” method. The following criteria was used to compare the two methods:

- 1) Ability to sustain breath through the phrases
- 2) Tension issues in the tongue, jaw, neck and elsewhere
- 3) Tuning - the ability to consistently stay in tune
- 4) Tone Quality – breathiness, forced tone, steadiness of tone (wobble, tremolo, straight tone)

Conclusion:

In every one of the students, the “in and up” method was superior to the “down and out” method. Students had better control of the outgoing air; the tone was healthier, steadier and more vibrant. Two students required work on tuning issues that were related to placement through the passaggio and not to breath support. Once the passaggio difficulties were resolved, they had no further tuning issues when using the “in and up” method. There was one remarkable case of a student with a tense and unruly jaw that constantly moved while she sang; after mastering the “in and up” method, her jaw became still and relaxed.

Pamela Shannon, DM, Doctor of Music, Professor of Music, Northwest Missouri State University, 800 University Drive, Maryville, MO, (816) 400-7186, shannon@nwmissouri.edu

Laryngeal Manipulation in Singing Warm Up: A Pilot Study

Background/Objective: The purpose of this study is to determine what effect laryngeal manipulation (LM) may have in a singing warm up routine. Very few singers in a recent survey claimed to incorporate neck or laryngeal massage in their daily warm up. Laryngeal Manipulation Therapy has been documented to reduce muscular tension in patients with muscle tension dysphonia. Relaxation of the same musculature can prepare the singing voice for optimal performance. We hypothesize that incorporation of LM in a warm up routine could have similar effects in a non-disordered singer.

Method: Eleven college-aged voice students participated. Each was screened by stroboscopic exam and perceptual evaluation using the CAPE-V to confirm normal voice function and health. Four subsequent study visits took place on consecutive mornings. Aerodynamic measures were taken before and after each day's limiting task using the voicing efficiency protocol in the KayPentax Phonatory Aerodynamic System. The four days' tasks were 1) ten-minute traditional vocalization instructed from a video, 2) ten minutes of silence, 3) ten minutes of LM performed by the subject, instructed from a video, and 4) a combination of the LM and vocalization videos. Post-data collection audio recordings were made each day of sustained /i/ and /a/ vowels and the six CAPE-V sentences for perceptual analysis.

Results: More than half of subjects demonstrated increased mean airflow or mean reduced laryngeal airway resistance on days of vocalization, silence, and LM. A high percentage of subjects (n=8-10) demonstrated mean increase in sound pressure level each day except silence. CAPE-V scores were consistently low reflecting that subjects were in good vocal health, therefore, changes were non-congruent with the aerodynamic data.

Discussion: An equivalent number of subjects demonstrated increased airflow and reduced airway resistance after LM, but not always intrasubject. The aerodynamic data seem to indicate that LM could be an effective way for some singers to prepare for optimal singing performance.

Nicholas Perna, DMA, Associate Professor of Voice Pedagogy, Mississippi College Department of Music, Box 4021, Clinton, MS 39058, (601) 925-3900, NKPerna@mc.edu

John Schweinfurth, MD, Professor of Otolaryngology, University of Mississippi Medical Center, Department of Otolaryngology 2500 N. State St. Jackson, MS 39216, (601) 984-4550, jschweinfurth@umc.edu

Josephine Alston, MA, CCC-SLP, Chief of the Division, Speech Language Pathology, University of Mississippi, Medical Center, Department of Otolaryngology, 2500 N. State St, Jackson, MS 39216, (601) 984-4550, jalston@umc.edu

Sarah Pigott, MM Student, Mississippi College Department of Music, Box 4021, Clinton, MS 39058, (901) 277-1447, SMWelch@mc.edu

Leah Oswalt, MM Student, Mississippi College Department of Music, Box 4021, Clinton, MS 39058, (601) 946-0241, LOswalt@mc.edu

The Significance of Clinical Voice Examination in Vocal Pedagogy

The act of singing uses structures such as the vocal folds that are largely hidden from view. Other factors such as airflow are similarly difficult to observe.

Vocal pedagogues who rely solely on aural assessment of student voice type (Fach) face common difficulties. These difficulties are due to many factors, including the idiosyncratic vocal development of each student, the student's personality traits, and their speaking habits.

A clinical voice examination given by a physician with specialized knowledge of the singing voice provides useful insight for the singing teacher to determine a student's voice type (Fach). This examination reveals laryngeal structure and the vocal instrument's acoustic characteristics, and greatly enhances individualized singing voice instruction.

A team approach incorporating the singing voice pedagogues' experienced ear and the physician's clinical examination may benefit voice type classification accuracy, maintenance of voice health, and help singers live up to their vocal potential.

Liyan Han, MD, MA, Director of Voice Research Center of the Central Conservatory of Music, Outside experts of Qinghua Changgeng Hospital, Vice-president of China Arts and Medicine Association(CAMA), Beijing, 100031, China, (86)10-66425747; hly51772@vip.163.com

Feng Jiang, MA, Soprano, Singing teacher, Jiangfeng Voice Studio, Executive director of China Arts and Medicine Association(CAMA), Beijing, 100143, China, +86 10-88148517; Jiangfeng_soprano@hotmail.com

Voice Functioning and Working Conditions among Broadcasters

Background: Broadcasters are workers who use their voices to present news and shows. Very often, this occupational voice users have exclusively their voices to communicate efficiently. Therefore, a healthy voice production is essential, otherwise voice disorders can appear, and they will have restrictions to perform their job efficiently. **Objective:** Analyze the effects on voice functioning of broadcasting. **Methods:** Longitudinal descriptive type study. We will examine the working conditions of 30 broadcasters in Bogotá (Colombia), and the effect of these working conditions on voice functioning. Participants will be followed for 3 weeks to analyze changes in voice functioning associated with the working conditions of broadcasting, specifically those related to the physical environment and occupational vocal load. Participants will be monitored at the beginning and end of their work week. The data collection will be done before and after their working time. **Expected results:** Considering preliminary results, we expect to find an increase in fundamental frequency after the working time, which may indicate early vocal fatigue related with the occupational voice use.

Keywords: Broadcasters; Work Conditions; Occupational users; Lombard Effect.

Claudia Carolina Velásquez Bernal, SLP, Specialist in Health and Safety at Work, Master student, Universidad Nacional de Colombia, +57 319 347 65 46, ccvelasquezb@unal.edu.co

Lady Catherine Cantor Cutiva, SLP, MSc, PhD, Professor, Universidad Nacional de Colombia, +57 3004864136, lccantorc@unal.edu.co

Vocal Register Terminology: Where Are We Now?

Objective: Vocal register terminology, as used in the singing voice, although pedagogically useful, varies widely over approaches and methods and is therefore confusing. The terms traditionally used refer to subjective physical sensations, but it is not always clear if these terms refer to the source or the resonance in the vocal tract.

Methods/Design: Beginning with historical statements by Manuel Garcia, Jr., we will compare the perceptive aspects with electroglottographic and laryngostroboscopic data. Then, based on the studies of Roubeau, Henrich and Castellengo, we will approach vocal registers from a teaching perspective based on the underlying laryngeal mechanisms: glottal closure (CQ), mass, degree of cover involvement in vibration, and the recruitment of other vibrating sources.

The various laryngeal mechanisms underlying the teaching terms used in singing pedagogy will then be examined in detail and examined: M0: vocal fry, pulse register and distorted voices (false folds and arytenoids)

M1: full register in chest and head consonance, modal register, belting, heavy mechanism

The "mixed" register: M1 mix2, M2 mix1

M2: muscular and postural falsetto, falsettone, flute, stop-closure falsetto, light mechanism

M3: laryngeal whistle, stop-closure whistle

Results/Discussion: Practical demonstrations will be presented by Italian singing teachers Erika Biavati and Eleonora Bruni.

Dr. Franco Fussi, MD, Phoniatics and Otorhinolaryngology, Head of the Foniatic Audiological Center ,
Ravenna, Italy, +39 544 217953, www.voceartistica.it, ffussi@libero.it

Vocal Tract Contributions to Voice Quality: A Comparison of Twang and Squillo Qualities Using Magnetic Resonance Imaging

Objective: Efficiency and physiologic accuracy in our approaches to both singing voice pedagogy and voice therapy are highly dependent upon a detailed understanding of the relationship between vocal tract adjustments and voice quality. While the use of magnetic resonance imaging (MRI) to quantify vocal tract movements has been increasing in the last two decades, specific information regarding a variety of voice qualities or singing styles remains limited. The purpose of this study was to compare three-dimensional (3D) vocal tract configurations of “twang”- a bright, piercing quality often produced in contemporary commercial singing and “squillo” – a darker, rich quality heard in classical repertoire such as opera.

Methods: Five subjects, two females and three males (age range: 24-61 years), with extensive professional singing and pedagogy experience (range: 9-35 years) participated in this exploratory study. Subjects were asked to sustain the vowel /i/ in “twang” and “squillo” qualities while holding pitch constant. Acquired MRI data included two-dimensional (2D) mid-sagittal and axial images during the quality-specific, sustained vowel productions as well as 3D data of the head and neck with 1 mm isotropic resolution at rest. During the MRI voicing tasks for each subject, a noise-cancelling microphone (FOMRI III, Optoacoustics, Israel) simultaneously recorded voice output for purposes of reliability testing and use in future acoustic analysis. Vocal tract measurements were made on the 2D and 3D images using Amira 5.6 (ThermoFisher Scientific, Hillsboro, OR). On the mid-sagittal images, these included larynx height and velar height. On an axial slice running between the superior mandible, through the tongue base, and to the superior surface of C3, measurements included antero-posterior vocal tract width, lateral vocal tract width, and area of the airspace surrounded by the pharyngeal walls and tongue base.

Results: Across subjects, “squillo” quality revealed a lower larynx position (average mean difference of 9.32 mm) and higher degree of velar elevation (average mean difference of 5.66 mm) as compared to “twang” quality. In the axial view, “twang” quality displayed a smaller lateral vocal tract width and overall area of the airspace (average mean difference of 7.12 mm and 135.7 mm², respectively). The area of the airspace at rest was consistently smaller than the airspace for “squillo” quality.

Conclusions: Two vocal qualities were characterized by distinct vocal tract configurations including larynx height and velar height. Our findings provided additional physiologic explanations concerning pharyngeal wall contributions to two vocal qualities, particularly in the mediolateral dimension. Due to the lowered larynx position during the production of “squillo” quality, the narrowed-vocal tract area of interest observed in “twang” quality appeared to move inferior to the level that the axial images were obtained. Therefore, it is possible that vocal tract narrowing is maintained in a ringing yet darker quality, though in a more inferior plane. Further investigation of the physiological and acoustic characteristics of “twang” and “squillo” qualities is currently underway in our laboratory.

Karen Perta, MS, CCC-SLP, PhD Student, Department of Speech and Hearing Science, The Ohio State University, 1070 Carmack Rd, Pressey Hall, Columbus, OH 43210, perta.2@buckeyemail.osu.edu, (717) 645-6699, perta.2@buckeyemail.osu.edu

Dr. Youkyung Bae, PhD, Assistant Professor, Department of Speech and Hearing Science, The Ohio State University, 1070 Carmack Rd, Pressey Hall, Room 134C, Columbus, OH 43210, (614) 688-4948, bae.180@osu.edu

Kerrie Obert, MA, CCC-SLP, Research Faculty, Department of Otolaryngology, The Ohio State University, 915 Olentangy River Rd, Columbus, OH 43212, (614) 738-0209, kerrieobert@gmail.com

Tahrir Patterns in a Professional Iranian Classical Singer

Objectives: “Iranian classical singing”, called “avaz” in Persian, contains the ornament called a tahrir. It typically is a sequence of tekyeh fundamental frequency gestures that quickly increase and then decrease. Performing artists produce different patterns of tahrirs during their singing. The primary aim of this research was to determine and describe the tahrir patterns produced by a professional avaz singer.

Methods: A live unaccompanied recording was made of a professional avaz singer singing the popular song “Morghe Sahar” (“Dawn Bird”) which lasted 201 seconds. After listening to the song numerous times, consistent patterns of tahrir productions were determined.

Results: For this song and performer, 4 primary tahrir patterns were identified. These patterns were categorized based on (1) the number of tekyehs within the tahrir, (2) fundamental frequency extent from the baseline to the tekyeh peaks, and (3) inter-tekyeh interval durations. Pattern 1 consists of one tekyeh and is called a “zinat”. Pattern 2 is a multiple tekyeh gesture with relatively long inter-tekyeh intervals. Pattern 3 is a multiple tekyeh gesture with relatively short inter-tekyeh intervals. This pattern has multiple tekyehs within a prolonged vowel and occurs between two consonants. Pattern 4 is a vibrato-like pattern with multiple tekyehs with short inter-tekyeh intervals like Pattern 3 but with relatively short frequency extents. An interesting finding is that f_0 rise from the baseline to the peak is faster than f_0 fall from the peak to the baseline in all patterns.

Conclusions: The results are pertinent to voice scientists interested in the special mechanics of phonatory production, to singing teachers and artists interested in pedagogy based on acoustic and perceptual information, and to ethnomusicologists interested in cultural musical performance and production. A future study will determine tahrir patterns that are consistent across the singing of seven professional avaz singers.

Mahdi Tahamtan, MSc, Research Assistant, Department of Communication Sciences and Disorders, College of Health and Human Services, Bowling Green State University, +1 419 819 9190, Mahdit@bgsu.edu

Ronald C. Scherer, PhD, Distinguished Research Professor, Department of Communication Sciences and Disorders, College of Health and Human Services, Bowling Green State University, +1 419 372 7189, ronalds@bgsu.edu

Examining Flexibility in CCM Voice Pedagogy

Introduction: There are several codified methodologies in CCM singing which are available in workshop format or through publications. Some pedagogues train in one method and employ it exclusively, but there is a strong faction promoting more flexibility in CCM voice pedagogy. In both commercial (independent) studios and educational (university) CCM voice studios, savvy business practices warrant solution-focused and student-centered pedagogy. Pedagogues often draw from a large toolbox of skills and customize their tactics for the unique student and situation.

Objective: To examine the extent to which exemplary CCM pedagogues use flexibility in each of the following elements of vocal training: Posture and alignment, breathing, support, registration, consistency, belting, vowels, tension, and expression. This study also aims to identify and analyze contextual factors which may correlate to the prevalence of flexibility, such as studio setting (independent or university), approximate age, and country of residence.

Methods/Design: 25 exemplary CCM pedagogues were interviewed as part of a larger study on CCM voice pedagogy. These pedagogues include the founders of CCM methodologies, university teachers, and independent studio teachers. Each teacher was asked to describe their approach to teaching singing in general, and within specific elements of training. The responses were open ended.

Results and Conclusions:

The majority of the pedagogues reported drawing from a combination of methodological training(s), singing and teaching experience, and knowledge of voice science to teach specific elements of vocal technique. The prevalence of flexibility varies based on the vocal skill being taught, as well as contextual factors such as studio setting, approximate age of the pedagogue, and country of residence. The overall trend reflects a growing preference to draw from a large and continually developing toolbox of pedagogical skills. The preference toward flexibility will not necessarily result in a decreased demand for methodological training. In fact, it may indicate that CCM pedagogues are likely to train in more than one codified methodology which could facilitate dialogue and mitigate confusion caused by terminological variations. The preference toward flexibility may also indicate an increase in demand for CCM pedagogy training programs that do not align with one methodology exclusively.

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Time Use of University Voice Students during Self-Guided Practice Sessions: A Quantitative Content Analysis

Objective: Little research has appraised the behaviors of musicians in practice rooms during self-guided practice sessions, and no study to date has investigated singers' behaviors across multiple self-guided practice sessions. Therefore, the purpose of this study was to document by audio-recordings the audible behaviors of university vocalists ($N = 40$) across 5 self-guided practice sessions with attention to (a) duration of practice sessions, and (b) audible behaviors occurring during the first 15 minutes of practice.

Method: Participants audio-record 5 independent practice sessions using a digital device of their convenience. Recordings were then sent to the researcher after each practice session for analysis. After determining full practice session durations from the length of the original audio files, I used *CowLog 3.0.2* open-source software application to analyze the first 15 minutes of each audio recording and codify all audible behaviors. Following quantitative content analysis procedures (Krippendorff, 2004) it was determined that the following ten exhaustive and mutually exclusive categories would be used to codify and document participants' audible behaviors during the first 15 minutes of practice: (a) silence, (b) breath activation exercises, (c) speaking voice [non-repertoire], (d) speaking voice [repertoire], (e) singing voice [non-repertoire], (f) singing voice [repertoire], (g) rhythmic exercises [no text or keyboard], (h) keyboard only, (i) NKEPA [no voicing], and (j) NKEPA [voicing].

Results and Conclusions: Among primary results: (a) Singers overall evidenced during the course of this study a mean practice session duration of 28 minutes; (b) There were significant differences in practice durations between male and female participants, and among some participants grouped according to reported years of voice lessons (<1-3 years and 6-9 years); (c) Analyses of the first 15 minutes of recorded lessons indicated that these voice students on average spent the largest percentage of time (43%) on singing of repertoire, and the second largest percentage of practice time (36%) on warm-ups and vocal technical exercises, with non-performance majors spending significantly more time on repertoire and less time on technique than voice performance majors; (d) To a significant degree, practice time devoted to technique generally increased and time devoted to repertoire generally decreased as years of reported voice lessons (<1 – 9 years) increased; (e) Of the 200 individual practice sessions examined, 141 (70.5%) began with singing behaviors not focused on repertoire. Results were discussed in terms of directions for future research, singing voice pedagogy, and limitations of the study.

Alan J. Martin, PhD, Assistant Professor, Department of Music, SUNY Oswego, 7060 NY-104, Oswego, NY 13126, (315) 312-3032, alan.martin@oswego.edu

Effects of Historical Recording Technology on Vibrato in Modern-Day Opera Singers

Objective: Many present-day scholars and voice professionals note that the use of vibrato in modern-day opera singers differs from that of opera singers who sang in the early twentieth-century. Studying the effect(s) of wax cylinder technology (the oldest form of mass produced audio recording technology) on recorded voice output signals offers a way to contextualize historical recordings so that voice teachers and other voice professionals can better understand historical singing. This study is a portion of a larger inquiry about the way in which early audio recording technology, namely wax cylinders, distorts voice output signals. The purpose of this study is to analyze the effect of wax cylinder audio recording technology on the rate and extent of vibrato of modern-day professional opera singers.

Method/Design: This study recorded 19 professional opera singers (5 sopranos, 6 mezzo sopranos, 4 tenors, 2 baritones, and 2 basses) with an Edison Home Phonograph onto brown-wax cylinder replicas and, simultaneously, with a flat-response omnidirectional microphone. Vibrato rate and extent measurements were extracted from: a *mesa di voce* on C4/C5 on the vowel [a] and a short phrase from “Caro mio ben” in a key chosen based on voice type. Commercial historical audio samples were downloaded from the UCSB Cylinder Audio Archive and the Library of Congress Sound Recordings collection in order to compare vibrato rate and extent with both versions of the modern recordings.

Results and Conclusions: Data collection is ongoing. Wax cylinders will be digitized through the use of an *Archéophone* at the Thomas Edison National Historical Park and vibrato rate and extent will be compared (using Audacity and Voce Vista) between modern singers recorded on microphones vs. modern singers recorded on wax cylinders, as well as modern singers recorded on wax cylinders vs. digitized historical singers recorded on wax cylinders.

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Joshua D. Glasner, MM, PhD Candidate, Adjunct Professor of Voice, New York University, (239) 896-0339, jdg467@nyu.edu

Aaron M. Johnson, PhD, MM, CCC-SLP, Assistant Professor, New York University School of Medicine, (646) 754-1207, aaron.johnson@nyulangone.org

Tonality and Technique: How Pitch Content Affects the Way We Sing

Singing atonal music is, for most young singers, a demanding endeavor. The pitch content and harmonic structure test the musicianship of novices and experienced performers alike. But does atonal music present a challenge to a singer's technique as well as their ear? Very little research has been done on this particular issue, but multiple studies demonstrate the difference in our physiological response to tonal and atonal music, as well as the technical response of singers to varying conditions of emotion and familiarity. In this study, 15 female graduate students were asked to perform four short excerpts – two atonal, two tonal. Their singing was analyzed using the Phonatory Aerodynamic System and VoceVista to examine differences in air flow and vibrato extent. No significant differences were found in airflow measurements or vibrato extent between the atonal and tonal examples. However, there were significant correlations present between tonality, confidence, and consistency of airflow. Furthermore, for each participant, confidence and consistency of airflow were significantly correlated when singing atonal examples, but this correlation was not significant nor as strong for the tonal examples. These interesting results warrant further study, so that young singers and their voice teachers can better understand how best to approach atonal repertoire.

Kirsten Brown, BM, MBA, Graduate Student, Westminster Choir College, 101 Walnut Ln, Princeton, New Jersey 08540, (386) 682-0711, brownkir@rider.edu

Fully Integrated Vocal Training – The Voice of the Clown

Objective: to develop practical, creatively physical techniques for ensuring that vocal range and colour, impulse, physical awareness and spontaneity are integrated to provide close, if not immediate correlation with the demands of performance.

Acting, dance, and musical theatre students, whether training in conservatories or private studios, often struggle to connect their voice training with other elements of movement, acting and singing training. They may be able to execute vocal exercises with great expertise in the class room, yet fail to bring those skills into the rehearsal room, and subsequently onto the stage. Musical Theatre students learn how to sing while dancing, yet can be challenged by the need to move freely (un-choreographed), as they speak and act with equal poise, power and creative agency.

Method: Students warm up vocally as they practise certain physical theatre techniques, experiencing their voices as a necessary physical aspect of their bodies in motion – and in stillness. This reinforces the value of the breath which supports their entire range, vocal and otherwise physical. They are then introduced to certain clown training exercises which encourage them to expand their vocal, physical, imaginative and intellectual curiosity and expressivity.

Results: Performers actively engage their whole selves imaginatively in a structured process by means of which the body informs the voice; subsequently they develop an integrated, informed voice/body/mind. This brings intelligent, embodied power and complexity to their spoken text or singing.

Minimum space requirements: large enough for participants to move freely with arms outspread

Participants are invited to wear comfortable clothing, and to bring a short memorized piece (spoken or sung) for exploration.

Fllloyd Kennedy, PhD (Theatre), Freelance Voice Coach, Associate Artist – I.S.A.A.C,
International School for Acting and Creativity, +44 (0)7492 454 683,
fllloyd@beinginvoice.com

Myofascial Release/Manual Therapy for Voice Disorders: A Patient-Directed Model

Myofascial release (MFR) is a manual therapy intervention that has long been accessible to speech and voice professionals for the treatment of voice disorders, though traditionally relies on the perception of expertise and experience of the clinician to drive treatment. Walt Fritz is a physical therapist who teaches MFR to SLPs and Voice Professionals through his Foundations in Myofascial Release Seminar for Neck, Voice, and Swallowing Disorders and has taken the traditional MFR narrative and applied a patient-directed model of evaluation and treatment that better aligns with current pain and related sciences. Through this workshop, participants will have the opportunity to see, feel, and hear the possibilities of how neural tension, soft-tissue tightness, and other factors may influence voice disorders, all of which may be perceived by the patient and palpated/treated by the practitioner through the anterior neck region. The workshop will consist of a brief introduction to Walt's version of myofascial release, framed from a patient-directed model of intervention. There will be a hands-on experience where participants will have the opportunity to experience a one-on-one engagement of the fundamental principles of this work. The emphasis of this workshop will be to educate the participant to the possibilities of engaging issues of voice and vocal dysfunction through direct touch and manual therapy evaluation, with logical carryover into intervention. Application to an evidence-based model will be presented through handouts.

Learning objectives would include:

1. Provide the participant a brief overview of the Foundations Approach to myofascial release as it applies to the treatment of vocal dysfunction, with a strong emphasis on a patient-directed model
2. Provide evidence for myofascial release/manual therapy with vocal dysfunction
3. Provide the participant opportunities to explore evaluation and treatment of vocal dysfunction via hands-on experience using the core principles of the Foundations Approach to myofascial release

Walt Fritz, PT, BS, Myofascial Release Seminar, Neck, Voice, and Swallowing Disorders, Pain Relief Center, Rochester, NY, (585) 244-6180, walt@myofascialpainrelief.com

Tools of the Trade: Creating Kinesthetic Awareness in Singers

Singers confidence is born of repetition and is the essence of kinesthetic awareness. Over the past few decades there has been a growing body of research exploring the application of motor learning theory to the acquisition of music performance skills. There is an assertion that these principles can be transferred to those who work with voice. Kinesthetic sense is the awareness of the position and movement of the parts of the body by means of sensory organs (proprioceptors) in the muscles and joints. Kinesthetic singing tools can be very useful in leading singers to explore and understand the sensations teachers ask of them. Kinesthetic singing tools help illicit a positive response in developing singing technique effectively and quickly. By utilizing specific tools singers build “muscle memory” towards functional singing because they provide tangible feedback. The tools guide singers towards consistent singing sensations both in the studio and during their own practice. They further provide a bridge towards a heuristic approach to teaching singing whereby the singer develops more independence for developing successful practice habits and better self-advocacy. This leads to a clearer understanding of singing technique and more consistent performance. Some of the tools demonstrated are informed by scientific/objective evidence as to their usefulness, others are more anecdotal in nature but still informed by principles of voice production. The workshop will demonstrate in a masterclass format use of tools such as a Flow-ball, water bubbles, exercises balls (large and small), wine corks, candy, gauze and more in order to develop functional singing.

Kari Ragan, DMA, SVS, Artist in Residence, University of Washington, Seattle, WA, (425) 246-1326,
KRagan@uw.edu

**May the Ease Be with You:
Taming Tension and Performance Anxiety with Feldenkrais Awareness through Movement**

A dynamic performance requires a fine balance between excited energy and calm control. Performance anxiety generally manifests itself as tension because we feel over-matched, under-prepared or somehow threatened by the situation. We instinctively try harder and only succeed in increasing the tension in areas that are already too tight. Such a vicious cycle causes the performer to focus on his or her short-comings and only on what is “wrong” rather than the bigger picture of what is “right”.

For the performer, being “in the flow” is a heady sensation, one of such freedom and ease that it is almost as if someone else was singing. All too often, however, this elevation to the “flow state” is elusive, inaccessible, blocked and impeded by barriers which range from the psychological to the physical. One of the biggest culprits is “negative” physical tension.

Tension is necessary to life; without tonus (muscle tension), we cannot stand, sit, or even breathe. Problems arise when tension is excessive, misplaced, or insufficient, causing extra effort and blockage. Named after its discoverer, Moshe Feldenkrais, the Feldenkrais Method is a self-discovery process using movement. Its aim is to produce an individual organized to perform with minimum effort and maximum efficiency. The movements are simple, gentle, exploratory, and fun; they are usually repeated a number of times to clarify and enhance performance.

The Feldenkrais Method is one approach which can help a performer to focus appropriate attention to physical cues via kinesthetic awareness, thereby offsetting negative attention on feelings of inadequacy. It can alleviate or even eradicate such negative tension, thereby enhancing “ease of flow”. This workshop is designed to lead participants through “modular” Feldenkrais work, thus helping calm the nervous system without loss of performance energy.

Complete Workshop Description:

1. A brief introduction to the Feldenkrais Method
2. “Pre-test” short group vocal warmup and individual tension identification: Dr. Blades leads the participants through a series of brief, simple vocal exercises designed to a) warm up the voice and, b) give the participants kinesthetic feel and sense of the vocal instrument before a Feldenkrais lesson. Individuals are asked to identify awareness of any areas in which undue negative tension seems to impede vocal freedom.
3. Dr. Nelson leads participants through a short Feldenkrais Awareness Through Movement lesson.
4. “Post-test” with Dr. Blades: group vocalization and individual reports of any changes, especially in the “pre-test” areas.
5. Individual assessments: Volunteers from the group receive Feldenkrais work (Functional Integration) with Dr. Nelson, specific to “blocked” or impeded areas. The number of individuals included is flexible according to time restrictions.
6. Questions/answers

Elizabeth Blades, DMA, Adjunct Associate Professor of Voice, Shenandoah University Conservatory, 217 Academy Street, Berryville, VA 22611, 703-517-6451, eblades@su.edu

Samuel Nelson, PhD, Feldenkrais Practitioner, 1501 East Avenue, #108 Rochester, NY, 14610, 585-271-5296, samnel@aol.com

Introduction to Mindfulness and Meditation

The creation of an entirely new motor plan for voice production in speech and singing would logically require extensive practice. Why then, do some people have a much easier time with the process than others? Some individuals seem to make vocal adjustments with relative ease. Then there are the others, those for whom modifying the voice is an extreme challenge: they often can't hear or feel a difference, even when they manipulate the voice exactly as we intend. They have us pulling out our entire bag of tricks and asking our colleagues for their bags too. It seems that those who have more facility with their voice generally also have more awareness of their body sensations than those who struggle through voice change. One way of developing awareness of the body and improving focus for difficult tasks is mindful meditation. Mindful meditation practice (MMP) is designed to increase one's awareness and acceptance of the present moment. There are various approaches to MMP, but they all aim to lead participants closer to a state of mindfulness. Mindfulness has been described as a nonjudgmental, present-centered awareness in which each thought, feeling, or sensation that arises is acknowledged and accepted as it is. In a state of mindfulness, thoughts and feelings are observed, without reacting to them. MMP is linked to improvements in attention, cognitive flexibility, mood, stress management, and self-regulation. Although there are no reported controlled trials to date utilizing MMP in the field of voice, it has been used in related fields to improve stage fright with instrumental musicians, for social anxiety related to public speaking, and in stuttering treatment. This workshop will introduce participants to MMP and explore its relationship to voice. We will experience guided meditation suitable to novice practitioners, and no prior experience with meditation is necessary.

Carissa Maira, MS, CCC-SLP, Emory Voice Center, Emory Voice Center, Emory Department of Otolaryngology, 550 Peachtree St. NE Suite 9/4400, Atlanta, GA, 30308,
carissa.maira@emoryhealthcare.org

Hands On! Hands Off! Using Manually Occluded Vocal Tract Postures in the Singing Voice Studio

Manually Occluded Vocal Tract Postures, mentioned in the writings of the late Berton Coffin as ‘the open mouth hum,’ and in the teaching of Coffin’s student, the late Barbara Doscher, as ‘the standing wave exercise,’ are a less-well known type of semi-occluded vocal tract posture in which the singer covers his or her open mouth with the web of the hand while simultaneously singing specific vowels. The hand seals the mouth opening, occluding the vocal tract so that only the nares are open. Thus, in addition to having the benefits of other SOVTs, the MOVTS positions allow singers to perform different vowels while occluded. This aspect of the MOVTS can provide greater flexibility for the teacher in addressing technical issues in the studio, especially tongue tension, pharyngeal constriction, fine tuning the pre-passaggio area of males and females, and accessing the whistle register. The author’s presentation will begin with a brief overview of the rationale behind the MOVTS’ use, then quickly turn to an interactive demonstration comparing the MOVTS to other more familiar SOVT postures and an exploration by all attendees of how to apply these postures in singing training. The author will also work with two students in order to demonstrate how to apply the MOVTS in addressing issues in the context of vocal repertoire. A list of resources and video links will be provided to all attendees.

John Nix, MM, MME, BM, Certificate in Vocology, Professor of Voice and Voice Pedagogy, Music Department, The University of Texas at San Antonio, (210) 458-5678
john.nix@utsa.edu

Can You Sing Or Teach It? If You Can't Hear It?

Objectives:

Singers rely on their hearing to interpret and perform music. Voice teachers are paid for their ability to discern subtle aberrations in pitch, tone, technique, nuance and emotion in their students' voices. Once hearing is damaged, there is no treatment to reverse it. Therefore, protection and prevention are essential!

Our studies on hearing loss in generally healthy singers and voice teachers and occupational noise exposure in voice teachers showed that 51.7% of teachers (7.5% voice students) had hearing loss of 30dB or greater at one or more frequencies from 1kHz -8Khz and 43.1% of teachers (5.7% voice students) had high frequency sensorineural hearing loss (4kHz, 6 kHz, 8Khz). High noise exposure in studios/rehearsal venues was also documented. Noise exposure definitions and risks associated with studio, rehearsal and performance venues will be discussed. An interactive format will be used to teach hearing protection strategies including studio and choral room arrangement, judicious use of full voice singing in rehearsal, use of sound level meter apps and judicious use of ear plugs. Ways to easily incorporate protection/prevention strategies into daily life will be discussed.

Methods:

Noise exposure literature and recommended exposure maximums directly correlated to singer's daily life exposures will be briefly presented. Leaders will teach participants to use sound level meter apps, evaluate the safety of their ear buds, and interpret ear plug specifications. An interactive discussion utilizing real life scenario worksheets of studio, choral room, performance and recording spaces will be used to develop and implement hearing preservation and prevention strategies and reinforce the material presented.

Results:

The participants will leave armed with practical, easy-to-implement strategies to protect their hearing in their professional and daily lives.

Conclusions:

YOU CAN ONLY SING AND TEACH IT, IF YOU CAN HEAR IT.

Lucinda Halstead, MD, Associate Professor, , Medical Director, Evelyn Trammell Institute for Voice & Swallowing, Dept. of Otolaryngology HNS, Medical University of South Carolina, MUSC 550, 135 Rutledge Ave, Charleston, SC 29425, (843) 568-5167, halstead@musc.edu

Deanna McBroom, MM, Professor Emerita, Dept. of Music, College of Charleston , Medical University of South Carolina, (843) 270-3505, mcbroomd@cofc.edu

Real-Time Visualization Feedback of Voice Production Physiology with Electroglottographic Wavegrams

Electroglottography (EGG) is a non-invasive, low-cost technology for monitoring the relative vocal fold contact area during voice production. The EGG signal may – under certain conditions – give insights into the vocal register (chest vs. falsetto, or M1 vs. M2) [1] and the degree of vocal fold adduction (breathy, normal, pressed) [2] of an individual. However, careful interpretation is required, particularly for quantitative analysis parameters, such as the ubiquitous contact quotient [3]. An alternative is constituted by qualitative assessment of EGG data, either through visual (real-time) display of the EGG waveform [4], or via the recently introduced EGG wavegram visualization technique [5].

EGG wavegrams provide an intuitive means for quickly assessing vocal fold contact phenomena and their abrupt or gradual variation over time. This allows to document changes of vocal register and vocal fold adduction, as well as related indirect effects introduced by variation of pitch or loudness.

Currently available software for generating EGG wavegrams is limited to *ex-post* (i.e., offline) analysis [6]. In this workshop, two new tools for real-time EGG wavegram feedback are demonstrated: After a brief review of the theoretical background for EGG wavegram interpretation, CTH will introduce a rudimentary freeware prototype for real-time EGG wavegram feedback, documenting the effects of variations of laryngeal voice production settings (such as vocal registers or adduction). In the second part of this workshop, BM will present the novel wavegram extension incorporated into the 2nd generation VoceVista software by Sygyt Software. In both software demonstrations, workshop attendees have the opportunity to test and try various phonation types and the respective EGG wavegram real-time feedback.

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Christian T. Herbst, Mag. art., Ph.D., Affiliated post-doctoral researcher, Bioacoustics Laboratory, Department of Cognitive Biology, University of Vienna, Althanstrasse 14, 1090, Vienna, Austria, +43 660 6675792, herbst@ccrma.stanford.edu

Bodo Mass, MA (Oxf.), Founder and CTO, Sygyt Software, Steinkuhlstr. 23, 44799 Bochum, Germany, +49-1577-3849147, bodo.maass@sygyt.com

The Act-Out Larynx: Experiential Physiology

Participants in this group activity are "cast" in the roles of Adam's Apple, anterior commissure, arytenoids, LCA/PCA/IA/CT muscles, and upper esophagus, then positioned to create a room-size "larynx." Cued by the leader to manipulate 9-foot long "vocal cords," basic maneuvers of ad/abduction, phonation, pitch change, and swallowing come to life; common disorders such as vocal nodules, cough, and reflux are also easily demonstrated. This workshop reinforces the dynamic, 3D nature of the vocal mechanism in a fun and memorable format, and it can be modified for groups of different sizes and knowledge-levels. Come and play along, and learn how to recreate this learning experience for your classroom or community.

Joanna Cazden, MFA, MS-CCC, Outpatient Voice Care Services, Cedars-Sinai Medical Center, Los Angeles, Holistic Voice Rehabilitation, 836 N California St, Burbank, CA 91505, (818) 845-6654, joanna.cazden@gmail.com

Getting Eyes on the Larynx for Non-Medical Professionals: Translating What You See into What You Do

This proposed workshop is intended to provide basic information to voice teachers, vocal coaches and pedagogues about laryngeal visualization and interpretation. Current standard of care for all patients with dysphonia, especially those designated as professional voice users, emphasizes the necessity to visualize the larynx (Patel et al, 2018). Laryngeal imaging and videostroboscopy are essential components of a professional voice user's comprehensive voice evaluation, and greatly improve the precision and personalization of care. Given that rehabilitation of the professional voice is an inter-professional pursuit, the findings from these examinations should be relevant and available to all providers involved in this process.

In this workshop, basic stroboscopic parameters (glottic closure, mucosal wave, amplitude, etc.) will be discussed, and the following goals will be addressed:

1. Participants will be provided with rating forms adapted from materials commonly used to facilitate perceptual assessment of videostroboscopy (Poburka, 1999; Bless et al., 1987), and will have the opportunity to rate a variety of examinations and compare their reliability with peers and the instructors. Video examples will include common acute and chronic vocal fold pathologies. .
2. Participants will be asked to match hypothetical written interpretations of stroboscopic findings to a collection of videostroboscopy examples.
3. What you see isn't always what you hear: Participants will be given suggestions regarding which facilitators or specific exercises might be used based on the potential impact of various aberrant vibratory characteristics observed during visualization.

Note: Since visual interpretation is an essential component of this workshop, we are requesting an exception to the rule for audiovisual aids, as has sometimes been granted in past symposia. Presenters will provide two laptops. Relevant media could either be made available through a single projector screen (preferred), or with laptop(s) or iPad(s) in small groups.

Brienne Ruel, MA, CCC-SLP, Senior Clinical Speech Language Pathologist, University of Wisconsin Madison Voice and Swallow Clinic, (608) 263-3477, ruel@surgey.wisc.edu

Evan Kennedy, MScA, CF-SLP(C), Speech Language Pathology Clinical Fellow, University of Wisconsin Madison Voice and Swallow Clinic, (608) 263-2607, kennedyev@surgey.wisc.edu

Let's Hear from the Kids: Child Voice Pedagogy

“Let's Hear from the Kids: Child Voice Pedagogy” is a workshop with and about child singers. Robert Edwin, a veteran of over forty years of teaching, will work with kids on voice technique and repertoire, paralleling what he does with his adult students while highlighting the significant and essential differences in both approach and content that children require. Mr. Edwin's child students have appeared on Broadway, in national tours, in regional theaters, and in elementary school productions of shows such as *Annie*, *Gypsy*, *Oliver*, and *Les Miserables*. His pedagogy is fact-based, gender-neutral, age-appropriate, and genre-specific.

Leader bio: Robert Edwin has gained international recognition as a singer, songwriter, teacher, and author. His diverse “Bach to rock” performing career is matched by an equally diverse teaching career. A pioneer in Contemporary Commercial Music (CCM) and child voice pedagogy, he preaches what he practices at his independent studio in Cinnaminson, New Jersey (USA) where classical singers interact with music theater performers, commercial music artists, and pageant contestants. Mr. Edwin is an Associate Editor of the NATS *Journal of Singing* shepherding his “Popular Song and Music Theater” column. He is a frequent faculty member of the Voice Foundation's Annual Symposium: *Care of the Professional Voice* and is a member of the distinguished American Academy of Teachers of Singing. www.robertedwinstudio.com

Robert Edwin, BA, Independent Singing Teacher, NATS/AATS, (856) 829-0770,
robert@robertedwinstudio.com

Methods of the “Breathe, Sing, Move!” Program for the Promotion of Better Lung Health.

Objective: The “Breathe, Sing, Move!” program held in Calgary, Canada combines traditional group singing lessons with physiotherapy to improve symptoms of lung disease. Mounting evidence suggests people with lung diseases such as asthma and COPD can benefit from breath pattern retraining. Furthermore, patients with lung disease often have dysphonia due to poor airflow. The techniques associated with breathing for singing closely mirror those taught by physiotherapists. Although these benefits may not manifest themselves in pulmonary function tests, recipients of breath retraining often report a reduction of breathlessness and an overall quality of life enhancement. Breath retraining and singing may also reduce voice handicap.

Methods: This interactive workshop will highlight the tenets of the “Breathe, Sing, Move!” program, which is taught jointly by a singing teacher and physiotherapist in Calgary, Canada. Participants will learn to identify sub-optimal breathing strategies and how to address them in a group singing setting. Tools that can be used to improve breathing patterns such as inspiratory muscle trainers, Flowballs and resistance bands will be demonstrated. A hand-out will be given featuring the exercises and information presented.

Results and Conclusions: Participants will leave with a better understanding of lung disease and breathing disorders, and how to address breathing pattern issues in both a clinical and studio environment.

Rachel B. Goldenberg, DMA. Sessional Instructor (Voice), Ambrose University, 150 Ambrose Circle SW, Calgary, AB T3H 0L5 (403-410-2000) rgoldenberg@ambrose.edu.

Jessica DeMars, BSc, PT, Physiotherapist, Breathe Well Physio, 4411 16 Avenue NW, Calgary, AB T3B 0M3 (403-681-8640) breathewellphysio@gmail.com.

Dynamic Voice Therapy for Voice Professional Users

The importance of the dynamic exercises for professional voice users is known and there are different body movements that can be made at the same time of voice production. In this workshop the participants will practice dynamic voice exercises during movements of the body through jumps (1), march (2), using a foam tube (3), therapeutical band (4) and dance (5). The examination of posture of the body, column, pelvis and head with a correct breathing during all the movements is made. The voice production takes care of voice onset with labial (b,d,s,f), nasal (m,n,ñ), explosives (p,t,k) in legato and staccato form, phrases and songs.

- 1.-Rhythmic jumps are performed with the right posture and in a comfortable way.
- 2.-March can be slow or quick taking care of the breathing rhythm and respiratory capacity. Posture of body and head, support, correct articulation and resonance are crucial.
- 3.-The use of a foam tube gives a reference for arms, shoulders and back movements. The body needs a correct musculoskeletal posture with a light knee bending in order to have the right strength with the help of the pelvis for a correct situation of the column. There are different exercises with arms and thorax movements to get a balance between posture, breathing, support, glottal attack and resonance.
- 4.-The elastic band gives us the possibility of exercising extra and intralaryngeal forces during voice production.
- 5.-Dance: practicing easy dance rhythms like short steps to the side and forth and back or circles. These techniques and routines offer a dynamic way of exercising voice production, and they make an adequate balance of the body.

R. Eugenia Chávez Calderón MD, PhD, Director of Centro de Foniatría y Audiología, President of Collegium Medicorum Theatri 2018-2020, Centro de Foniatría y Audiología, + 52-55-56632073, eugeniachavez@hotmail.com

Breathing for Minimalists: Coordinated Vocalization with the Alexander Technique

Objective:

Breathing is the most fundamental yet often contested aspect of vocal pedagogy. This workshop will approach breathing from the perspective of the Alexander Technique, through the whispered “ah” procedure. This approach is suitable for all genres and styles of singing.

Workshop Overview:

The whispered “ah” procedure addresses coordination issues during phonation by identifying the habitual, excessive muscular effort used during extended exhalations. Participants’ observation of habitual muscular interference is facilitated when the mechanics of vocalization is approximated without the stimulus of phonation. By producing a whisper over the extended exhalation, participants begin to explore the proportionate amount of effort needed for efficient phonation. Preparation for this procedure will be addressed in terms of postural balance, mechanical position of the tongue and jaw, as well as engagement of facial and palatal muscles. With discernment, constructive conscious choices and changes become possible.

This minimalist exercise is particularly useful for students with pressed phonation, those who have excess tension in the ribs, abdomen, jaw, or tongue, or anyone who tends to ‘fix’ themselves in preparation to vocalize.

A discussion of more advanced uses of the whispered “ah”, with the incorporation of semi-occluded vocal tract exercises, will follow the preparation and execution of the procedure. Alexander Technique fundamentals, including instruction on the semi-supine position, the recommended foundation for this procedure, will also be addressed.

Method:

Introduction and anatomy review: 8 minutes

Preparation of the whispered “ah”, all participants: 10 minutes

Execution of the whispered “ah”, all participants: 10 minutes

Incorporating SOVT exercises into the whispered “ah”, all participants: 10 minutes

Description and demonstration of the semi-supine position: 7 minutes

Questions and discussion: 10 minutes

Michele Capalbo, BM, International Opera Singer, Voice and Alexander Technique Teacher (AmSAT), The Dimon Institute, 356 West 123rd Street, New York, New York 10027, (201) 857-3746, mail@MicheleCapalbo.com

Danielle Amedeo, BA, Faculty at CAP 21 Center, Molloy College, Private Voice and Alexander Technique Teacher (AmSAT), Dimon Institute, 356 West 123rd Street, New York, NY 10027, danielleamedeo@gmail.com

Teaching the Current Versions of Rock/Pop Vocal Ornaments

Rock and pop ornamentation continuously evolves, inventing new ornaments, nuancing old ornaments and eclectically combining ornaments in new ways. Listening without the filter from one's genre of origin is key in noticing and appreciating the latest embellishments. Performers who acquire specific rock/pop ornamentation skills present as credible rock/pop performers.

The skills covered will include:

1. Learning the “let go vibrato”
2. Nuances of the shadow vowel
3. The final “r” consonant brush stroke
4. Nuances of the flat major third
5. Nuances of the sharp minor third

Note: The workshop will work best if singers (of any level) are available to learn and demonstrate the skills; however, it is possible to work with anyone from the audience who wishes to participate.

Neal Tracy, DM, MM, BM, Adjunct Associate Professor, Rider University, Westminster College of the Arts, School of Fine and Performing Arts, 2083 Lawrenceville Rd, Lawrenceville, NJ 08648, nealtracy@aol.com

IPA Hand-Jive: Using Gesture for Shaping and Voicing IPA Symbols

Learning the International Phonetic Alphabet and producing the sounds is often challenging for the beginning student of voice and speech for actors. Mastery of the system is critical for the study of the basic work and continues on into the advanced work including the study of accents and dialects.

While much of the training often relies on description of the actions of the articulators, imitation of the teacher or recorded sound, use of a mirror to see what the articulators are doing, I have found that engaging a series of gestures reinforces a kinesthetic connection to the production of each phoneme. The connections are supported with additional guidance and direction as needed.

In this experiential workshop, all the participants will be guided through these specific gestures and gain their own kinesthetic connection with the basic sounds of the IPA. To start, we will focus on the shape, production and voice of the vowels and diphthongs.

Lester Thomas Shane, BA, Lecturer, Pace University; Adjunct Faculty, American Academy of Dramatic Arts; Adjunct Faculty, New York Film Academy; Freelance Voice/Speech/Text and Dialect Coach, Stage, Film, and Television, 428 East 77th #3D, New York, NY 10075, (212) 249-7076 (h), (917) 447-4802 (c), LesterTShane@aol.com

Resistance Band Exercises for Posture, Breathing and Voice: A Practical Experience

Introduction: Resistance bands are latex bands or tubes that are used for physical therapy and light strength training exercises. They are commonly used by athletes, but also by people who are looking for a low-impact strength-training workout. Band exercises require proper posture and the knowledge of which exercises to do. Once you understand how to use resistance bands and which exercises to do, it can be a great tool to help singers to improve muscles required for posture, breath and singing.

Resistance bands are available in 8 color-coded levels of resistance. Proper use of these systems for resistive exercise provides both concentric and eccentric resistance on the muscles, improving strength, range of motion and muscle balance.

Objective: to demonstrate several exercise possibilities using resistance bands for posture, breathe and voice.

Method: authors will present several resistance band exercises for the audience. Participants will be encouraged to perform with each other and experience some exercises.

Thays Vaiano, MD, Speech Pathologist, CEV, UNIFESP, + 55 11 5575-1710, tvaiano@uol.com.br

Flávia Badaró, SLP, Speech Pathologist, CEV, + 55 11 5575-1710, flabadaro@hotmail.com

Mara Behlau, PhD, Speech Language Pathologist, Unifesp – “Universidade Federal de São Paulo” and CEV – “Centro de Estudos da Voz”, +55 11 5575171, mbehlau@uol.com.br

M0 and Supraglottic Extreme Voice Workshop

Extreme and distorted vocal mechanisms can be used for educational and expressive purposes in singing and acting voice. As a singer, teacher, and researcher, I've developed specific training methods which teach the use of supraglottic structures, excluding or minimizing the role of the true vocal folds, thereby resulting in effective, safe and healthy vocal production.

In this workshop, participants will experience supraglottal techniques for growls and screams, using false folds, arytenoid cartilages, and various supraglottic structures. We'll also explore "distortions" and "scratched" sounds involving the true vocal folds with light and incomplete adduction. The use of these extreme sounds in singing styles such as rock, metal, pop, musical theater, gospel, R&B and in acting will also be discussed.

Eleonora Bruni, Teacher of Voice and Singing, Vocal Coach for Singers and Actors. Professor of Singing and Extreme Voice Bologna Alma Mater Studiorum University, Professor at Clinic Vocology Master Bologna University, Vocologist Expert, Voice Researcher with Dr. Franco Fussi, Singing Voice Specialist, Founder and Master Teacher VOICEtoTEACH®, Director Voice Program Associazione Voices, Via del Nibbio 11 Roma 00169 Italia, +393498659072, elebruni@icloud.com

Training Whistle Register

Whistle register, also known as Mode or Mechanism 3 (M3), are two separate laryngeal mechanisms: “laryngeal whistle” and “stop closure whistle”. Both mechanisms can be taught, developed and used for educational and expressive purposes by singers and actors.

Using the techniques that I’ve developed, workshop participants will experience how to produce both laryngeal and stop closure whistles without damaging the true vocal folds, as well as learn how to connect whistle to M2 (Mechanism 2/head voice/falsetto/ loft register) for artistry and register control.

In addition, we will examine the roles of the cricopharyngeus muscles (aka the upper esophageal sphincter), false fold adduction, and tongue action in whistle register production as well as resonator shaping and harmonic reinforcement to manage the M3-M2 passage.

Erika Biavati, SVS, Teacher of Voice and Singing, Professor of Singing and Extreme Voice Bologna Alma Mater Studiorum University, Vocologist Expert, Founder and Master Teacher VOICEtoTEACH®, Director of Live Music School, Via Rubizzano 67/a San Pietro in Casale (Bologna) 40018 Italia, +3284128687, erikabiavati@gmail.com

Freeing the Individual Voice through Group Improvisation of New Music

Objective: To have individuals experience vocal freedom (dynamics, timbre, facility) and playfulness through group vocal improvisation and group interaction. Structural guidelines will assist the group in the improvisation of new music.

Method: Games and exercises.

All of the activities will be hands on. There will be a five to ten-minute warm up component (depending on the size of the group) where the group gets to meet and interact with each other. Games of sound and motion will break down cognitive processes, physical improvisation led by the workshop leader will free the body, and tongue twisters will free the articulatory mechanism.

The next part of the workshop will focus on music making in small groups and large groups. Some of the exercises will involve physical as well as vocal improvisation. The group will improvise choral music through random pitch, vowel, and consonant selection by individuals in the group. The workshop will also explore the effect of spatial orientation, listening, and emotion-laden words on vocal improvisation. Exercises in rhythmic improvisation and vocal quartets on suggested sounds or words will comprise other components of the workshop.

The final section of the workshop will be to improvise the performance of new music, both already composed and newly composed at the workshop. The pieces to be explored are Cathy Berberian's Stripsody and Pauline Oliveros' Meditation I.

Conclusion: By the end of the workshop, participants may experience a sense of physical and vocal freedom not previously thought possible. Laughter and fun are also possible outcomes of the workshop.

Patrice Pastore, MA, MM, MMusicology, Professor of Voice, Ithaca College, James J. Whalen School of Music, (607) 275-7330, ppastore@ithaca.edu

Now Is the Time: Style Conditioning Exercises for Jazz

Style conditioning exercises are designed to condition the voice to freely and authentically execute technical or stylistic components that are specific to certain style of music. Many of the stylistic components are best rehearsed in the context of a full band. However, most voice studios are limited to that of simple piano accompaniment. With the help of music technology, we can now create a more realistic platform that will allow students to transition the application of vocal technique into a live musical context more seamlessly.

Now Is the Time is an interactive workshop that will show teachers and singers how to address vocal training objectives for jazz music styles using the application “ireal pro- music book & play along.” While the “ireal pro” application is currently used by thousands of students and professional all over the world to practice songs and improvisation, this application also serves as a great tool for teaching in the applied studio.

In this workshop, participants will be led in style conditioning exercises that address the following style objectives:

- Ear training/chord scale relationships
- Rhythmic and Melodic phrasing
- Intonation and articulation in scat singing
- Tempo conditioning
- Using vocal nuances as part of interpretation

The 55-minute workshop will be divided into four segments that will demonstrate a 1-2 style conditioning exercises specific to the style. Participants will not only learn exercises that can be used in their own voice studios and practice time, they will also learn how to create their own.

Trineice Robinson-Martin, EdD, EdMM, MM Jazz Studies, Lecturer, Jazz Applied Voice, Princeton University, Soul Ingredients® Voice Studio, (812) 320-5882, info@drtrineice.com

An Introduction to Accent Method Breathing for Singing.

Accent Method Breathing is a well therapy technique used extensively by the speech and language therapists in the UK, Europe and Australia. In the UK and some parts of Australia this breathing training technique has also been used for the development of breathing and support in singers. Following extensive anecdotal evidence the technique was studied in young developing classical singers with very significant benefits observed. Accent Method closely follows the function and physiology of the respiratory system allowing a scientific approach to the development of breathing and support in singers.

In this workshop a brief overview of the results of the study will be presented but the main focus of the workshop will be on attendees experiencing the first steps of Accent Method Breathing training for singers. Participants will be actively engaged in the exercises which include some floor work so appropriate clothing is recommended.

Ronald Morris, PhD, Lecturer in Vocal Pedagogy and Vocal Health, Brisbane Speech and Hearing Clinic, Speech Pathology Australia, Australian Voice Association, GPO Box 2647, Brisbane, Australia, Australian Capital Territory 4001, +61407150482, r.morris@griffith.edu.au

Resptrack. A System for Real-Time Display of Breathing Movements

The Resptrack system, developed at the Department of Linguistics of the Stockholm University, uses two elastic respibands to record the cross-sectional areas of the ribcage and the abdominal wall and displays these DC signals in real-time on a computer. It also can display the sum of these signals which reflects lung volume, if their sensitivities have been equalized by means of adjusting a knob during iso-volume manoeuvres (contracting and relaxing the abdominal wall with closed glottis). The system can also record and display a fourth DC track, e.g. subglottal pressure, captured in terms of oral pressure during /p/ occlusion. The signals can be recorded and stored in a wav file. In addition, two audio tracks can be simultaneously recorded in a separate wav file. For analysis, synchronization of the wave files is feasible by means of pulses that are recorded in both files. The system, which thus allows visualization of breathing behavior during speech and singing, will be demonstrated and participants will be offered the opportunity to try it.

Johan Stark, Researcher, Department of Linguistics, Stockholm University, SE-106 91 Stockholm, + 468-16 20 00

Peter Branderud, Researcher, Department of Linguistics, Stockholm University

Johan Sundberg, PhD (Presenter), Department of Speech, Music & Hearing, School of Electrical Engineering and Computer Science, KTH, Royal Institute of Technology, Lindstedtsv. 24, SE-10044, +4687907873, jsu@csc.kth.se

Joint Openers, Cartoon Dogs, and Smoothing Vocal Transitions

Alignment, freedom of movement, and smooth vocal transitions are desirable goals of most singers, professional and amateur alike. Movement of one part of the body can either interfere with or support the desired motor outcome, in this case smooth vocal transitions. In our workshop, audience members will participate in a series of joint openers and basic visual and vestibular drills to improve somatosensory mapping, proprioception and movement. Dr. Orbelo will guide the audience through these gentle movements, pulling from the Z-Health Education curriculum often used in training of elite athletes. Joint work will move from metatarsals to metacarpals to skull base and visual vestibular drills will be facilitated using a simple pencil or finger focus. Following this, participants will learn how certain cartoon inspired voices can be used to smooth out vocal transitions going from lower registers to higher registers and back again without the dreaded “voice break.” These techniques that likely manipulate the relationship of resonance between the first and second harmonics allows singers to smooth register transitions regardless of the genre of the repertoire. This later work is based Mr. Burke’s own vocal techniques and teachings and pulls from classical and contemporary vocal training techniques. Participants will have the opportunity to perform all activities, dissect movements and discuss outcomes with two experts that bridge the fields of speech pathology and singing in both clinical and professional settings.

Diana Orbelo, PhD CCC-SLP, Assistant Professor, Mayo Clinic, (507) 226-2316,
orbelo.diana@mayo.edu

Tom Burke, MS CCC-SLP, CEO/Owner, Tom Burke Voice, (201) 921-6695,
tomburke@tomburkevoice.com

Cross-Training: How To Shift Gears Authentically from Classical to Music Theater and other CCM Styles

Going from one style of music to a different one is more than just learning the conventions of the music as style alone. The idea that individual singers can make “different sounds” in “different styles” is valid, but singers who cannot authentically and freely change the spontaneous responses from their throats may end up sounding inappropriate when “crossing over” to a new style. Singing rock music with operatic vocal production isn’t effective and vice versa.

In this workshop, we will start with vocalists who sing one style and then show, through vocal exercises, how they can sing authentically in another style in a relatively short time, without using any direct manipulation of the structures in the throat (including the vocal folds, the larynx, and surrounding musculature). It will demonstrate why it is not necessary to understand “resonance” or formant tuning to produce authentic changes. And, since all CCM music is amplified, it will demonstrate why relying on “bone vibration” or voice analysis software is not useful as a teaching tool, but is needed only as an intellectual framework to describe results.

Auditory acuity and proprioceptive feedback of vocal behavior will be demonstrated and explained. Those who are trained as classical singers and who would like to experiment with singing in other styles honestly and freely are encouraged to volunteer to sing in the master class.

The technical work with singers will be drawn from *Somatic Voicework™* The LoVetri Method.

Jeannette L. LoVetri, Director, The Voice Workshop, New York, NY 10025, (212) 662-9338, (917) 715-1655 (Mobile), lovetri@thevoiceworkshop.com

Transgender Voice: The Art and Science of Clinical Care

The need for quality speech, voice and communication intervention for transgender individuals has been well established in recent years. As early adopters in this clinical landscape, speech-language pathologists have modified standard clinical practices in serving this population. But, is this what should be done? Would an entirely new approach better meet the needs of this fragile group of people. In a practical and comprehensive manner, this workshop will guide participants through hands-on techniques and strategies aimed at providing detailed processes and measurable outcomes to help begin a clinical practice or to expand the existing knowledge and skills of clinicians already working with trans people. Demonstration of techniques will lead to a discussion of a suggested therapy model for the voice and communication needs of trans feminine and trans masculine speakers.

Outcome 1: The participant will be able to develop techniques of the individual training elements such as pitch and resonance to assist transgender people in changing their voices.

Outcome 2: The participant will be able to identify two clinically relevant overarching methods for helping transgender people change their voices.

Outcome 3: The participant will be able to develop appropriate and effective voice and communication intervention strategies for their transgender clients.

Kathe Perez, MA, CCC-SLP, Speech-Language Pathologist, Exceptional Voice, 930 W 7th Ave, Suite B ,
Denver, AL 80204-444, (303) 722-2181, kathe@exceptionalvoice.com

Consonant Connections

Connect to consonant sounds in whole new ways. Connect articulatory action breath, thought, and feeling for healthy, efficient, and effective learning. Connect your entire body to the perception, sensitivity, and unique communicative capacities of American English consonants. In *The Principles of Sound Production*, Ingo Titze teaches that “acoustic pressures from the vocal tract are fed back into the glottis [creating] different driving pressures on the vocal folds” and that “some vocal tract shapes, particularly those for consonants that occlude the vocal tract, may affect phonation to the degree that they cause register changes or total disruption of phonation...” For this reason, it is imperative to play with speech as part of our entire somatic system of sound production, and to belie the antiquated thought that only “vowels communicate feelings, and consonants thought.” For those who have felt discomfort by demands to “enunciate clearly” or to “spit out your words,” join us as we allow consonants to connect to our deeper physical and intuitive pleasures of emotional and thoughtful communication.

Tom Marion (MFA Acting / Rutgers '85), Associate Professor of Theatre, York College CUNY, 94-45 Guy R. Brewer Blvd., Jamaica, Queens, NY 11451, (917) 763-7423, tmarion@york.cuny.edu

Workshop on ‘Complete Vocal Technique (CVT) in Practice

‘Complete Vocal Technique’ (CVT) is a well-established genre-free method of teaching voice, with the biggest group of agreeing teachers in any one terminology in the world. CVT is built on the principle that it is possible to classify all sounds that can be produced by the human voice into one of four vocal modes named Neutral, Curbing, Overdrive, and Edge. The CVT terminology and method is used by professional singers within all musical styles and has during the past 20 years proved to be easy to grasp both in practice as well as in research of audio perception, laryngostroboscopic imaging, acoustics, LTAS, and EGG.

The workshop focuses on working with CVT in practice and allows for some individual participants to sing and explore how CVT can help them solve their vocal issues in front of the audience. The audience is invited into the thinking that goes into teaching and using CVT, and by solving 3-4 issues on the spot it will be illustrated how CVT can be applied to a variety of different genres, styles, and vocal issues.

Cathrine Sadolin, Owner, Complete Vocal Institute, Cathrine@sadolin.net

Mathias Aaen Thuesen, PhD, MA CC, BA MMC, Industrial PostDoc, Complete Vocal Institute, Nottingham University Hospitals, +45 31 31 62 42, mathias@cvi.my

Getting High: Exploring Belt and Falsetto Options in the Male Voice

In the past decade, male singers on Broadway have produced sounds ranging from classical cover to rock wail, and everything in between. Each season brings varied, expansive vocal demands, and actors must be versatile enough to move authentically between musical styles. Increasingly, voice teachers are becoming more savvy at identifying and training the nuanced vocal colors required by female singers in musical theatre. This interest in belt and mix techniques for women has moved the field forward, but oftentimes the subtle differences in male musical theatre singing are left unexplored.

The goals of this workshop are to elucidate the varied vocal demands placed on male musical theatre singers and to provide methods for training these sounds in singers at all levels of training. The workshop will include:

- Examples of many sound qualities organized by character and show
- Functional and aesthetic definitions for “belt”, “mix”, and “falsetto”
- Training schema and vocal exercises for developing these qualities and moving seamlessly between them

The workshop will utilize two participants as models, but active participation will be encouraged by the audience. The methods proposed will be applicable to all levels of singers for both the development and maintenance of a flexible, compelling singing voice.

Jared Trudeau, MFA, BA, Assistant Professor of Voice, The Boston Conservatory, 8 The Fenway, Boston, MA 02215, (860) 428-3616, jtrudeau@bostonconservatory.edu

Finding the Selftone through Qi Gong

Discovery of the singer's selftone (most authentic voice) is the process of investigating the *most recursive musical notes* of one's own vocal extension through exercises of Qi Gong (meditation in movement). For that investigation, we propose a sequence of exercises of breathing, flow, warm up and postures from Qi Gong.

Selftone is the emotional and physiological thermometer of the singer. Finding the selftone is an important step in becoming aware of the resources available in the body and the voice. This awareness provides tools to meet the challenges and demands of using the voice most effectively.

Through the Qi Gong exercises and discovery of the selftone, a singer/actor is relaxed, flexible, centered and open to reveal the authentic voice, and align with the musical and textual characteristics.

The goal of this workshop is to introduce the concept of “selftone”, explore the steps to discover it through Qi Gong, and gain understanding in order to recognize and use inherent vocal potential.

Taís Daniela Leite Vieira, MSc, PhD Student, Singing Teacher, Arts Institute, Music Department, Federal Juiz de Fora University, Student-Campinas State University, Arts Institute, Music Department / Performance, São Paulo, Brazil, taisvieravox@gmail.com

Adriana Giarola Kayama, PhD, Assistant Professor, Campinas State University, São Paulo, Brazil, akayama@iar.unicamp.br

Angelo Fernandes, PhD, Assistant Professor, Campinas State University, São Paulo, Brazil, angelojfernandes@uol.com.br

Feminization and Masculinization of Singing Voices: Practical Tools to Shift Gender Perception

In recent years, the realms of voice training and voice care have rapidly begun to expand research, resources, and conversations to serve the needs of transgender and gender diverse singers. Voice training for transgender individuals requires a refined knowledge of the changes that occur both physically and physiologically during transition and demands the use of effective and appropriate language, as well as practical application of techniques that influence gender perception in voice.

Objective: To provide tools for training singers who are interested in shifting gender perception of their voice through methods in articulation and vowel modification.

Method: This workshop will review elements of gender perception in vocal timbre and articulatory patterns and present an interactive exploration of articulation and vowel modification to influence gender perception in singing voices.

Conclusion: As transgender individuals gain more visibility, we have a responsibility to prepare singing teachers and voice care teams to serve transgender communities and help them find their voice.

Liz Jackson Hearn (she/her/they/them), BA, MM, Owner and Voice Instructor, The Voice Lab, Inc;
Executive Director, ResonaTe Trans Voice Center, (630) 390-4857, info@thevoicelabinc.com

Brian Kremer (he/him), BFA, MM, Assistant Professor of Voice and Music Theatre, Elon University,
(267) 218-0515, bkremer@elon.edu

Functional Pedagogy: Addressing the Broad Spectrum of CCM

IT'S NOT ABOUT BELTING: Foundations for a New Pedagogy Addressing the Broad Spectrum of CCM

This workshop will demonstrate exercises to address the challenges presented to the modern professional vocalist in the context of the broadest spectrum of CCM. In particular, exercises addressing balanced registration, flow phonation and pitch accuracy amidst the differentiations of timber, sub-glottal pressure, glottal closure and even “noisy” phonation as heard in music on the radio. The use of the /i/ vowel in tracking the Second Harmonic through ascending/descending scale tones is demonstrated as a solution for overly pressed, twang phonation in the upper register. Also included are Lessac based exercises which comprise the kinosensic training of Resonant Voice Therapy for the speaking voice which generalize well for modern genres of commercial music. Also demonstrated will be exercises that address the absolute necessity of prosody, rhythm and the three elements of style; tools used to interpret the music of today: timbre, phrasing, melodic improvisation and vowel manipulation. A new look at the Fach system for modern music will be proposed as food for thought amongst participants.

Melissa Cross, BA, Principal, Melissa Cross Vocal Studio, 33 Marino Ave, Port Washington, New York 11050, (212) 736-3789, melisong@gmail.com