

A Comparison of Initial and Subsequent Follow up Stroboscopic Examinations in Singers

Objective: Previous studies have identified abnormal findings in up to 86.1% of singers on initial screening stroboscopic (SVL) examinations. No studies have compared the prevalence of abnormal findings in singers on their subsequent follow-up SVL. Our study evaluates the frequency of these findings in both the initial and subsequent examinations.

Method: Retrospective charts and SVL reports were reviewed on students from an elite opera conservatory from 1993-2012. Students had initial screening SVL. Any follow-up examinations were conducted for acute vocal complaints. Normal SVL was defined as an examination without structural or functional abnormalities, and reflux finding score ≤ 7 . Data were analyzed using the Chi-square test.

Results: For initial examinations (n = 73), 98.6% (including reflux) and 90.4% (excluding reflux) were abnormal. For follow-up examinations (n = 97), 97.9% (including reflux) and 93.8 % (excluding reflux) had abnormal findings, which included muscle tension dysphonia (44.3%), vocal fold (VF) masses (unilateral 23.7%, bilateral 20.6%), vascular abnormalities (unilateral 21.6%, bilateral 8.2%), sulcus (unilateral 16.5%, bilateral 3.1%), VF weakness (2.1–18.6 %), phase (35.8%) and amplitude (47.4%) asymmetries, and glottic insufficiency (40.6%). For follow-up examinations, significant increases in reflux laryngitis and unilateral VF tear were observed ($X^2=6.405$ and 7.996 , $P < 0.05$).

Conclusion: We found a higher prevalence of abnormal findings compared with previous studies, which we attributed to a more inclusive definition of abnormal pathologies, improvements in SVL technology, and possibly increased experience with SVL interpretation. This high prevalence of abnormal findings in asymptomatic singers further supports the importance of baseline examinations.

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Patient Experience with Laryngeal BOTOX for Spasmodic Dysphonia: An 18 Year Experience at the Cleveland Clinic Voice Center

Objective: This paper will present a review of the Cleveland Clinic experience in the treatment of Spasmodic Dysphonia with laryngeal Botox injections over an 18 year period. A statistical analysis of the information will be accomplished in order to inform the expectations of caregivers and patients relative to the treatment of Spasmodic Dysphonia and thereby improve patient's informed consent for participation.

Methods/Design: For each patient injection, identical information related to patient experience was obtained, including the presence, onset and duration of side effects (voice and swallowing), the onset of benefits, a rating of best perceived level of benefit, the onset of the decline in benefits, and the timing of reaching pre-treatment baseline. The dose of Botox, and the rationale for changes in dosage were recorded. The protocol for injection was consistent as well, including participation of a PhD SLP, an RN, and an MD laryngologist. The database will be developed from the above information and will be studied via descriptive statistics to obtain useful long term patience experience.

Results: A 5-year prior pilot study on some of this information was published in the 2010 Outcomes Book of the Cleveland Clinic Head & Neck Institute, and covered 80 patients with over 700 injections. Our patients experienced side effects less frequently and for a shorter duration than expected, and more patients than expected experienced benefits. The average duration of benefit seemed slightly shorter than expected but the range of durations of benefit experienced was broader than expected.

Conclusions: These pilot study results changed the counseling we offered prospective patients with spasmodic dysphonia. We anticipate that including all patients from an 18 year experience will further refine expectations and therefore patient counseling. The expanded data base will facilitate a study of dosing trends over time, and differences among injectors. This study will fill the need for long term objective documentation of patient experience relative to the treatment of Spasmodic Dysphonia with laryngeal Botox.

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Treatment of Vocal Tics with Botulinum Injection: A Study of Long Term Safety and Efficacy Beyond the Injection Site

Current literature supports the use of botulinum toxin injections as a treatment modality for Tourettes syndrome. It is proven effective at treating motor and vocal tics, as well as premonitory sensations. However, its safety for long-term use, nor its affect beyond the injection site has not been well documented. We report a case of a 39 year-old male with childhood onset of Tourettes, manifesting as vocal tics, in specific grunting and debilitating coprolalia, and motor tics such as neck torsion dystonia. His initial symptoms were severe, and accompanied by neck torsion dystonias making it impossible for him to stay still long enough to perform Botox injections in the office. The initial two injections were performed in the OR under general anesthesia. Following these two injections, the neck torsion abated in addition to the vocal tics, barking, grunting and coprolalia. Subsequent injections have been administered in the clinic under EMG guidance. He has been undergoing botox injections about every 2-3 months for more than 10 years with improvement in his symptoms and quality of life. Botox injection into the thyroarytenoid muscle not only treated his primary tics (vocal tics), but also secondary affects on his voice such as debilitating grunting, loud barking cough, coprolalia and other cervical spinal muscles. Thus, our report demonstrates botox injection is both effective and safe for long-term use, and can have beneficial affects beyond the injection site to cure secondary affects of a tic disorder.

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A New, Inexpensive and Non-Invasive Saliva Test for Reflux: Sensitivity and Specificity of a Rapid Pepsin Immunoassay

Background: Until now, there has been no inexpensive, non-invasive diagnostic for airway reflux (aka LPR or laryngopharyngeal reflux). The assay investigated herein is a lateral-flow device (similar in design to a pregnancy test) that is a highly-sensitive immunoassay for human pepsin, the primary enzyme of the stomach. (The in vitro sensitivity of the assay for pepsin 3b was 2 ug/ml.)

This rapid-detection, saliva (“spit”) test is performed by having the patient place a cotton-tipped applicator in the mouth and saturate it with saliva for a minute. The applicator is then placed in a buffer and then the lateral-flow device. The results are read in one hour. The purpose of this study was to determine the sensitivity, specificity, and reproducibility of the test in known airway (LPR) reflux patients and normal asymptomatic controls.

Materials & Methods: Patients with clinical LPR undergoing 24-hour pH monitoring were asked to perform the pepsin assay spit-test before their pH probes were removed. Subjects with positive pH studies were considered in the experimental group. For negative (normal) controls we used asymptomatic post-fundoplication (antireflux surgery) patients. In addition, reproducibility was assessed by asking pH positive patients to provide spit samples on two different days (before and after pH monitoring) and comparing the results.

Results: The sensitivity of the assay was 86% (190/220) and the specificity was 95% (38/40). The reproducibility was 98% (43/44).

Conclusions: The data suggest that the rapid, saliva, pepsin-detection test is an excellent screening diagnostic for airway (LPR) reflux.

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RFS Redux: Why Clinicians Should Use the Reflux Finding Score

Background: Airway reflux (aka LPR, laryngopharyngeal reflux) remains underdiagnosed and undertreated in part because many otolaryngologists are unfamiliar with the findings of reflux or incorrectly apply the reflux finding score (RFS). In fact, the larynx is an excellent barometer of the reflux system, and the RFS may be used as an important treatment outcomes measure, that is, normalization of the RFS should be the goal of antireflux treatment. The purpose of this paper is to present clear RFS scoring criteria as well as share sequential examination data in patients with LPR who were successfully treated.

Materials & Methods: The laryngeal findings of 25 consecutive patients with clinical and pH-documented LPR were examined and graded (using the RFS) sequentially over the course of treatment. The data were analyzed by comparing pre- and post-treatment RFSs with the reflux symptom index (RSI) for each study patient.

Results: The mean RFS before treatment was 14.2 and post treatment 4.5 ($P < 0.001$) and the correlation with RSI was excellent.

Conclusions: The data suggest that the RFS is an excellent measure of treatment success in patients with airway (LPR) reflux.

This presentation will include a detailed demonstration of the RFS findings.

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Laryngeal Hyper-Responsiveness – Multispecialty Collaboration Improves Diagnosis and Treatment

Laryngeal hyper-responsiveness is a condition that is characterized by a number of symptoms that can defy easy diagnosis. These can include episodes of severe shortness of breath, chronic refractory cough, chest and throat tightness, dramatic stridor, and hypersensitivity to strong odors. Relentless symptoms can persist for years, and frequent hospitalizations are common. Impact on quality of life is significant and can lead to substantial disability. Misdiagnoses are common, resulting in unnecessary medical interventions. Close collaboration between Otolaryngology, Speech Language Pathology, Pulmonary, Allergy and Gastroenterology have significantly improved effectiveness of clinical care by reducing the time from symptom onset to proper diagnosis, and improving the efficacy of treatment. This paper will highlight the Cleveland Clinic experience in creating a multispecialty center based on combined care and cooperation between specialties dedicated to treat patients with respiratory disorders of laryngeal etiology.

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Botox for Wrinkles in the Neck and Voice

Three Female singers had Botox injection in the neck for wrinkles.

They could not sing: for two months Case#1 ; five months Case #2 ; and six months Case #3

The authors did an EMG and found out a crico-thyroid deficiency in all of them.

Case #3 had also a paresis of the left vocal fold.

These cases show the importance of the Botox location for wrinkles in the neck in singers.

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Glutathione and the Voice: A Placebo Controlled Study

Intravenous glutathione supplementation in patients with acute and chronic vocal fold inflammation has shown promising results. Anecdotal benefits to the voice have been found in a broad range of performers with various types of vocal issues. Patients report increased vocal range, less laryngeal mucus, less vocal fatigue and reduced burning sensations. The purpose of this study was to see if the subjective vocal benefits experienced by patients receiving intravenous supplementation of GSH could be objectively measured in the vocal dynamics laboratory. Following IRB approval, 13 subjects were randomized into receiving IV GSH or placebo. Volunteers, with and without vocal symptoms, who were without structural laryngeal pathology served as their own controls for this study. After examination by an otolaryngologist including video laryngeal stroboscopy, the study participants underwent a complete vocal dynamics evaluation at the New York Eye and Ear Infirmary vocal dynamics laboratory. The following measures were completed: Voice Handicap Index/Singing VHI, Phonatory airflow, Mean peak pressure during phonation, Maximum phonation time, Voice Range, Profile/Phonetogram, Spectrogram, Perturbation factors, Physiological range, Intensity, and mean subglottal pressure. They were then reevaluated in the vocal dynamics laboratory 1 hour post injection of 2 grams IV GSH or placebo to measure any objective changes to the voice. No measurable difference was identified in subjects receiving IV GSH vs. placebo. This paper will discuss the study.

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Clinical Characteristics and the Management of Vocal Polyps with Underlying Sulcus Vocalis

Objective: This study aims to find a correlation between vocal fold polyps and sulcus vocalis and to investigate the character of such vocal fold polyps associated with sulcus vocalis and its management.

Study Design: Retrospective clinical research.

Methods: A retrospective review of 280 patients who have been admitted and operated under general anesthesia for vocal fold polyps at a tertiary care medical center from March 2009 to July 2012 was performed.

Results: The patients were classified into two groups. Group A (18 patients) was defined as patients who have been diagnosed with vocal polyps coexisting with sulcus vocalis. Group B (262 patients) was designated to the rest of the patients who have been solely diagnosed with vocal fold polyps. The prevalence of an underlying sulcus vocalis associated with vocal polyps in the studied population overall was 6.4% (18/280). Considering the recurrence rate of vocal fold polyps in each group, it was 16.7% (3 patients) in group A and 3.1% (8 patients) in group B. In general there was an improvement in the voice quality after the operation in both groups. The degree of improvement was less substantial in group A rather than group B. *Conclusion:* When dealing with patients who have been diagnosed as vocal fold polyps, the possibility of coexisting sulcus vocalis should always be considered, and if diagnosed simultaneously, management of vocal polyps and sulcus vocalis must be sought for a better voice outcome and to reduce the chance of recurrence of vocal polyps.

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Vocal Fold Vibration in Three Types of Vocal Pathologies Following Surgical Intervention

Only a paucity of data exists to describe the changes in the vibratory characteristics of the vocal folds following surgery. Both vocal fold scar and vocal fold paralysis pose difficulty in obtaining reliable acoustic analyses of the voice signal due to the severity of the dysphonia preoperatively. Therefore, we elected to examine vibratory symmetry and amplitude using high-speed videoendoscopy (HSV) and digital kymography, as HSV signals are not constrained by the acoustic properties. The specific purpose of this study was to examine vocal fold vibratory characteristics in three types of voice disorders prior to and following surgical intervention. HSV samples from three groups, scar, vocal fold paralysis, and mass-lesion were obtained. Digital kymography (DKG) was utilized to obtain direct cycle-to-cycle vibratory motion of the vocal folds sampled at three locations, mid-membranous portion of the vocal fold, anterior 1/3, and posterior 1/3 of the vocal fold. Kymographic waveform and DKG derived spectrum were utilized for obtaining objective measures consisting of symmetry, amplitude and frequency of harmonics, and vocal fold closure. Results demonstrated that all pathological groups presented with greater spectral vibratory power following phonosurgery. Specific vibratory changes were dependent on the vocal pathology. Mass-lesion subjects demonstrated improvements in symmetry following intervention. Vocal fold scar and paralysis subjects presented with improvements in closure and harmonic energies. High-speed analysis offers additional efficacy of vocal fold vibratory improvement beyond typical perceptual and acoustic methodology.

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Temporal Association between Reflux and Apnea Episodes in patients with OSA and LPR

Objectives: To determine if there is a temporal association between reflux and obstructive respiratory events in patients with LPR and OSA. *Methods/Design:* Following strict inclusion and exclusion criteria, 27 adults with clinically diagnosed LPR (Reflux Symptom Index ≥ 13 and Reflux Finding Score ≥ 7) underwent concomitant pH-impedance testing and full-night polysomnography. The number of obstructive respiratory events (apnea or hypopnea) that occurred 15, 30, and 45 minutes before and after each reflux episode were recorded and compared to the apnea hypopnea index (AHI) by using a synchronizer. *Results:* Twenty-seven patients were enrolled in the study, 14 males and 13 females, with a mean age of 51.7 years, and a mean body mass index (BMI) of 32.4 kg/m². Patients were sub-divided in 3 groups according to the presence of significant temporal association between reflux and respiratory events: Group I – 25.9% of patients presented a greater AHI before the reflux episodes when compared to the total AHI; Group II – 14.8% of patients presented a greater AHI after the reflux events when compared to the total AHI; and Group III- no temporal association. No statistically significant differences were observed between groups for demographic or reflux related variables, such as gender, age, RFS and RSI scores, physical-chemical characteristics of the refluxate, or association with classical GERD. The only statistically significant variable was BMI, which was found to be significantly higher in patients from Group II. Patients from Group I presented predominantly distal reflux episodes following the intensified respiratory events and patients from group II had more proximal reflux. *Conclusions:* A temporal association between reflux and obstructive respiratory events was found in 40.7% of patients with Laryngopharyngeal Reflux and OSA.

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Patient Satisfaction with Botulinum Toxin Injections for Adductor Spasmodic Dysphonia: Phase Three Scale Item Reduction

Objective: The development of a scale to determine patient satisfaction with the effectiveness of botulinum toxin injections (Botox™) may be a possible solution to the problem of disparate communication between clinicians and patients with adductor spasmodic dysphonia (ADSD). Previous studies have attempted to measure the effectiveness of Botox™ injections for ADSD, but none have been successful in assisting the patient and clinician in determining an optimal dosing schedule (Braden et al., 2010). The end goal is a patient-driven scale for use in determining the lived experience following Botox™ injections for patients with ADSD.

Methods/Analysis: The Q Methodology, a qualitative method of patient interview and analysis in scale development, was used to create a 36 item patient satisfaction survey (Finley et al, 2013). This study, phase three, utilized the 36 item survey that was collected in phases one and two. Twenty-five unique participants with ADSD and who had received at least 5 prior Botox™ injections were recruited. The participants were presented with the survey and utilized a 7 point Likert scale to measure the likelihood that each statement represented their lived experience with Botox™ injections. In keeping with qualitative methodology, after completing the questionnaire, participants were interviewed for their feedback regarding the statements. Statements deemed redundant or non-applicable were eliminated to create a scale of no more than 15 items thus reducing patient burden while maintaining a true representation of the lived experience.

Conclusions: This item reduction phase allowed for a further narrowing and focus of the scale items according to patient-driven feedback. Phase four will consist of completion of scale validity and, finally, test-retest reliability.

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Meige Syndrome and Voice

Objective: Meige syndrome is a segmentary cranial dystonia including blepharospasm and any other cervico-facial dystonic movement, sometimes spasmodic dysphonia. The objective of the study is to describe the characteristics of the disease and the response to treatment.

Methods: Retrospective study including all the patients presenting with primary Meige syndrome diagnosed in five years in our department. The variables studied were Voice Handicap Index (VHI-30), GRBAS scale, maximum phonation time, acoustic analysis, video endoscopy and laryngeal electromyography (LEMG). Treatment was evaluated by GRBAS scale and VHI.

Results: 7 patients were included. Mean age is 60 years old. Most prevalent dystonia was blepharospasm. All patients showed an adductor spasmodic dysphonia, confirmed by the presence of spastic recruitment pattern in LEMG. All patients received botulinum toxin injections in both intralaryngeal and affected facial muscles. Average VHI was 65/120 before-treatment and 12/120 after-treatment (82% of improvement). GRBAS improvement was quantified in 70%.

Conclusions: Meige syndrome is an unusual condition that has to be suspected in all patients with spasmodic dysphonia. Actually, most part of patients are evaluated first by neurologists who had to send the patient to the laryngologist in order to evaluate and to treat the voice disorder. That is why close collaboration with neurologists is essential. VHI and GRBAS scale are both good tools to evaluate treatment efficacy

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Does Gardasil Have a Role in the Treatment of Recurrent Respiratory Papilloma?

Objective: To explore the effect of the quadrivalent HPV vaccine, Gardasil, on the disease course of patients with recurrent respiratory papilloma (RRP).

Methods: Retrospective chart review of 88 RRP patients undergoing treatment from 2006 - 2012 was conducted. The clinical course of 21 patients receiving the 3 injection Gardasil series, 12 males and 9 females, age 4-73 years, was followed for 13 months to 7 years post vaccination.

Results: Remission occurred in 4 patients after vaccination (3 males, ages 4, 66 and 67, and 1 female, age 43) while undergoing their usual surgical treatments. Additionally, remission occurred after vaccination in 1 female, age 4, with laryngotracheal papilloma who also received cidofovir injections in addition to laser. Eight of 23 patients (6 males, 2 females) showed a decrease in disease severity and a prolongation of treatment interval from their baseline established with surgical excision plus/minus adjuvant therapy. Most notably, 5 male patients had 1-2 year hiatus of disease progression directly after their vaccine series. The sixth patient had transient complete resolution of his laryngeal papillomas and partial regression of his intraparenchymal pulmonary lesions after vaccination. Eight patients (3 male, 5 female) had no alteration in disease process by the vaccine.

The age/sex data of these patients was particularly interesting. Nine of 12 male patients (75%) had a positive response to Gardasil compared to 4 of 10 females (40%) and that response was much less pronounced compared to the male patients. Additionally, the females who responded were predominantly prepubescent or perimenopausal (ages 4, 29, 43, 73). All the female nonresponders were in full estrus (ages 22, 27, 29, 34, 37).

Conclusions: Gardasil vaccine can positively impact the severity of RRP and induce remission in some patients. The effect of the vaccine was much greater in males and in females in low estrogen states.

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Transnasal Injection Laryngoplasty

Objective: To describe and evaluate the role of transnasal fiberoptic injection laryngoplasty for the treatment of patients with glottic insufficiency.

Subjects and Method: The medical records and video-recordings of 16 patients who underwent fiberoptic injection laryngoplasty for the treatment of glottic insufficiency were reviewed. Outcome measures included perceptual evaluation using the GRBAS classification, laryngeal videostroboscopy and frame by frame analysis to assess the extent, shape and duration of glottic closure. Only nine patients with adequate recordings pre-operatively and 2-12 weeks post-operatively were included in this study. Demographic data included age, gender, symptoms, diagnosis, etiology, and amount injected.

Results: The mean age of the subjects was 66.2 years with seven males and two females. The most common symptoms were hoarseness 100% and aspiration 66.66%. The most common diagnosis was vocal cord paralysis with carcinoma and surgery being the most common etiologies. All patients underwent transnasal fiberoptic injection laryngoplasty with Hyaluronic acid as a filling material (0.2-0.8 ml). The procedure was well tolerated by all patients with improvement in the phonatory symptoms and aspiration in 66.66% and 50% of the cases. There was a significant decrease in the mean score of all the perceptual parameters with p values <0.05 . All subjects had glottal gap pre-operatively that was closed completely in 66.66% of the cases and reduced to less than 2 mm in 33.33%. There was a statistically significant increase in the mean closed quotient from 0.10 to 0.51 (p value <0.05).

Conclusion: Fiberoptic Injection laryngoplasty is a safe alternative procedure to transcutaneous and transoral injection laryngoplasty. It is well tolerated by patients with satisfactory results.

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The Aging Broadway Performer: Evaluation and Treatment

This presentation compares the “typical” adult Broadway performer with the aging, seasoned Broadway performer. A review of differences in presenting complaints and medical evaluation by the laryngologist are explored for the Industry and Broadway performers. The limitations of physiology and capacity of the aging larynx will be reviewed. Medical management, role demands, and theatre issues for the Broadway lead will be outlined using case studies across the age spectrum for the Broadway performer.

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Measuring Vocal Tract Agility from Videofiberscopic Data: The Human BeatBox Example

Objective: Videofiberscopic imaging with stroboscopy is a well-defined tool for assessing glottis behaviour. Scales have been developed to report efficiently muscle-mucosal relationship at the vocal fold and false vocal folds level, and their consequences on voicing and vocal timbre. However, speech and different voicing gestures for linguistic and artistic purposes involve more than the glottis and supra-glottis region; therefore, our study is three fold: i) we created a qualitative three-dimensional anatomical-dynamic visual scale OCM (Open, Close, Movement) to describe the vocal tract; ii) moreover, we developed Matlab software to quantify the changes in the two axes at the laryngeal and pharyngeal levels; iii) we illustrated our qualitative and quantitative scales on a special vocal technique called the Human *Beatbox*. The aim of this study was to quantify laryngo-pharyngeal mobility and adjustments for stylistic effects in this vocal technique.

Methods: The Human *beatbox* is the art of “reproducing all types of sounds with the entire vocal tract”. To understand how these “voice virtuosos” juggle with so many different sounds (instrumental, rhythmic and vocal ones), we have performed a descriptive analysis of three *beatboxers* by observing their vocal tract behaviour with fiberscopic imaging. The corpus was based on the production of three groups of sounds: the “bass sounds”, the “instrumental sounds” and the “electronic sounds”. First, we created the OCM scale (Open, Close, Movement) to describe the vocal tract in the antero-posterior (AP), transversal (T) and vertical (V) axes. Movement amplitude drives from 0 (rest position) to 3 (extreme position). Pharyngeal and laryngeal regions are observed and four levels are taken into account in the latest (glottis, supra-glottic, arytenoids, epiglottis). Second, we measured the size of the AP and T axis of the different regions and compared them in different sound sequences to follow the vocal tract movement.

Results: From an anatomical-dynamic point of view, *beatboxers* mobilise all the structures of their laryngo-pharynx separately. We could describe four types of laryngo-pharyngeal configuration and three dynamic elements. For example, our first results concerning the “percussion sounds” show that the width of the false vocal folds (Kick: 0,03; Snare: 0,07; Hihat: 0,08), makes the difference while the glottis is completely closed. There is nearly no movement at the ary-epiglottic level.

Conclusions: With this first quantified physiological study of the *Human Beatbox*, we have noted that these voice professionals have a well-developed laryngo-pharyngeal muscular system and are capable of imposing extreme configurations on their larynx. The measurement scale is a valuable tool to describe vocal tract agility and can be applied to describe physiological behaviour in different artistic or linguistic situations but can also be used to quantify pathological pharyngo-laryngeal movements and help to understand compensation strategies and guide the rehabilitation process.

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Contacting and De-contacting Vocal Folds' Speed Change During the Menstrual Cycle and Oral Contraceptive Use: A Double Blind Randomised Placebo-Controlled Trial

Objectives: Sex steroid hormonal variations during the menstrual cycle seem to cause variations of amplitude of vibration of the electrolaryngograph (ELG) waveform (Lx). These variations can be reduced when singers use a combined oral contraceptive pill (OCP) with antimineralocorticoid and antiandrogenic properties. This study attempts to test the hypothesis that OCP use avoids water retention and vocal haemorrhages on the vocal folds and, therefore, reduces differences in the speed between contacting and de-contacting phases of the vibratory cycle.

Methods: A double blind randomised placebo controlled trial was carried out to test this hypothesis. Nine classically trained healthy singers (mean age = 23.1 years, SD = 2.2; range = 21 to 27 years old) were asked to take an OCP and a matched placebo, randomly and double blinded allocated in the 6 months study. On the third month of placebo and third month of OCP use, voice recordings were carried out using a MBNM550E-L microphone from MBHO GmbH, a microphone preamplifier MIC•AMP•PAK 1TM, from Alice Broadcast, a two channel stereo digital audio tape-recorder (DAT) Sony TCD-D7 and a portable Electrolaryngograph (ELG) from Laryngograph. Singers were asked to sustain five different vowels on different pitches and comfortable loudness. A script in the costume made software *Sopran* (by Svante Granqvist) was used to carry out analyses of speed of contact and de-contacting of the Lx signal. Statistical analysis of variance (ANOVA) was carried out to assess whether differences were significant between phases of the menstrual cycle and between OCP and placebo use.

Results: Preliminary results suggest that OCP use may impact on differences between vowels and pitches concerning change of speed in the contacting and de-contacting phases of the vibratory cycle of the vocal folds.

Conclusions: ELG signal seems to be a good indicator of physiological events on the vocal folds related to hormonal variations.

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Clinical Care Pathways for Voice Disorders

Objective: Clinical care pathways use evidence-based algorithms that measure specific outcomes to improve patient care and cost effectiveness. We sought to create a clinical care pathway for diagnosis and treatment of voice disorders that includes services provided by the laryngologist, clinical vocologists and other ancillary services.

Methods: Applications of clinical pathways from other disciplines were investigated, along with defining general criteria necessary to construct a pathway. The various aspects of our model include evidence-based multidisciplinary management of voice disorders, treatment stages, goals of interventions, time frames between services, and points of measurement.

Results: After reviewing clinical pathways from other disciplines we determined that the nature of voice disorders requires a non-linear model for treatment and diagnosis. A business process management protocol is first introduced to define patient flow through their stages of treatment. Two protocols were then developed using typical voice disorders (benign lesions, unilateral vocal fold paralysis) to begin to test the pathway model. Specific points of measurement within this model were defined to allow for measuring outcomes at each stage of the treatment, overall time to resolution, and costs of treatment.

Conclusions: The use of a clinical care pathway for voice disorders will allow us to better serve people with voice disorders. Protocols can be refined, quality and patient satisfaction can be improved and burden to the health care systems has the potential to be reduced.

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Combining Touch and Non-touch Office Based Laser Techniques for Benign Vocal Fold Masses

Objective: Two hundred forty five cases of office based KTP laser treatments done between 2010 ad 2013 were reviewed for whether touch or non-touch techniques were used for treatment of keratosis, scar, papilloma, and polyps. Post operative videos of 50 cases where touch techniques were used was pulled for further analysis and compared with 50 cases where non-touch technique was used.

Material and Methods: Review of case controlled case series.

Results: Addition of the touch technique was used in patients with keratosis, papilloma, and polyps while non-touch technique was reserved for patients with varix, scar and Reinke's edema. Adding the touch technique has reduced the rate of failures of office based treatment of polyps and keratosis without an increase in the stiffness or scar.

Conclusion: Direct contact technique using the 600um fiber allows the surgeon to use thermal application to the lesion rather than pure photo-thermal effect. Fiber dissection can lift the offending lesion off the basement membrane, thereby increasing tissue clearance in selected lesions. More efficient clearance of lesions can be affected by combining contact and non-contact techniques using the KTP laser.

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Factors Influencing Botulinum Toxin Dose Instability in Spasmodic Dysphonia Patients

Objective: Many patients with spasmodic dysphonia see consistent effects from botulinum toxin (BTX) injections and return routinely for injections at the same dose. Others, however, can gradually develop resistance and require increasingly higher doses over time. Still others may require progressively lower doses. We sought to determine whether demographics (age, gender) or environmental factors (smoking) affect the long-term stability of BTX dosing in patients with adductor-type spasmodic dysphonia.

Methods: A retrospective review was conducted of all patients undergoing BTX injection for adductor spasmodic dysphonia. Dosage change, defined as whether there was any difference in total dosage used between two beneficial injections, was used as measure of dosing stability. Beneficial injections were indicated by a voice rating score of at least 3 out of 4 and any non-zero duration of improved voice. Patients who met these criteria were included in the analysis. Logistic regression analysis was performed to determine whether age, gender, smoking status, or duration of treatment correlated with odds of having a dosage change.

Results: A total of 211 patients were ultimately included. Age, gender, and smoking status were all found to have no correlative effect on dosing stability. The only factor that was predictive of dose stability was the number of previous injections at the same dose, as patients with 5 or greater injections at a given dose had greatly decreased odds of a change in dosage for the next injection (OR=0.59; 95%CI: 0.46-0.78).

Conclusions: Dosage of BTX injections for long-term treatment of spasmodic dysphonia has a significant propensity to remain stable over time. Factors such as age, gender, and smoking status do not appear to influence the dosage stability. These findings should allow for better patient counseling regarding expectations for their long-term treatment.

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Incidence of True Vocal Fold Pathology in Patients with Laryngopharyngeal Reflux Symptoms and the Absence of Dysphonia

Background: Patients referred to tertiary voice centers for voice complaints attributed to a diagnosis of laryngopharyngeal reflux (LPR) are often discovered to have concomitant true vocal fold (TVF) pathology beyond LPR. Recent evidence suggests treating TVF pathology that results in gross or subtle glottic insufficiency directly relieves symptoms previously attributed to LPR such as cough, mucus sensation and throat clearing. Laryngeal pathologies do not always manifest a complaint of dysphonia. As a result, the benefit of a medical speech evaluation is not always immediately recognized when there is no dysphonia complaint and presumably no indication for behavioral management. The goal of this study was to determine the prevalence of structural or neurologic true vocal fold pathology in the setting of patients with a normal VHI and an abnormal RSI on presentation who had one or more complaints other than dysphonia that are often attributable to LPR. A high incidence of concomitant TVF pathologies related to patients' complaints and amenable to voice therapy would support the need for medical speech evaluation in this population.

Methods: A retrospective review of a prospectively maintained database was performed. Patients with one or more presenting complaints attributable to LPR, other than dysphonia, with a VHI-10 less than 8 and an RSI greater than 13, were included. Patients were excluded if their sole presenting complaint and only post-visit diagnosis was cough or dysphagia. The recorded outcome measure was prevalence of concomitant structural or neurologic TVF pathology in this population without subjective dysphonia.

Results: 159 patients were identified who met criteria. 113 (71%) of these subjects were found to have a concomitant structural or neurologic diagnosis.

Conclusions: Given concomitant TVF pathology was present in 71% of patients who presented with typical LPR symptoms but without voice complaints, a medical speech evaluation is indicated in this population.

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Anxiety Levels in Patients Undergoing Otorhinolaryngological Operations at The Royal National Throat Nose and Ear Hospital

Purpose:

Pre-operative anxiety can cause significant patient distress, with cognitive, physiological and economic implications. This study assessed anxiety levels in patients before they underwent otorhinolaryngological procedures and evaluated ways in which such anxiety could be addressed.

Method:

An observational cross-sectional study was performed on patients undergoing elective otorhinolaryngological procedures at The Royal National Throat Nose and Ear Hospital (RNTNE). Anxiety levels were assessed using the Spielberger State-Trait Anxiety Inventory (STAI). Anxiety-reduction measures were assessed using the Service Improvements (SI) questionnaire.

Results:

53 patients participated - 24 females and 29 males, median age 44 years (range 19-76). The mean state-anxiety level was 36 (+/-12.1) and mean trait-anxiety level was 36 (+/-11.0). This supported the null hypothesis that there was not a significant rise in anxiety levels pre-operatively ($p=0.37$). There was no significant rise in pre-operative anxiety when patient gender and age were taken into account ($p=0.45$; $p=0.27$). Females had state and trait-anxiety levels that were significantly higher than males ($p=0.01$).

41 patients completed the SI questionnaire. 54% of patients favoured the introduction of an information leaflet and 22% wanted behavioural training. Up to 17% of patients wanted more information from the surgical team, particularly the operating surgeon. However, 12% of patients would have liked less information from the surgical team.

Conclusion:

Our patients did not have significant rises in their anxiety levels pre-operatively. While some patients would favour pre-operative interventions, others should be given the opportunity to decline this support.

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The Show Must go on...Singing with Organic Voice Lesions at High-Professional and Semi-Professional Singers on Stage

Stricken by sudden illness, the professional singer is under enormous time pressure, as the première sets him a precise deadline. In case of illness, a variety of individual factors arise. The decision to recast is made more difficult by responsibility towards the other members of the cast, anxiety on the part of the management, exertion of influence by the conductor and the director

Therefore the voice doctor has to avoid any unnecessary cancellations, involving for the singer the risk of losing a lot of money and even further contracts.

The authors will present 10 special cases of high- and semiprofessional singers where the organic voice disorders occur within the rehearsal period and will speak about the adequate management to avoid unnecessary cancellations

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Clinical and Electrophysiological Characteristics of Unilateral Vocal Fold Paralysis with Lower Cranial Nerve Palsy

Objectives: To investigate the clinical and electrophysiological characteristics of the patients with unilateral vocal fold paralysis combining with lower cranial nerve palsy.

Methods: Among the 307 cases of idiopathic unilateral vocal fold paralysis patients, 26 patients were eventually diagnosed with lower cranial nerve palsy after the examination of head and neck, radiology and electromyogram (EMG). The EMG characteristics of lower cranial nerves palsy and the clinical features were analyzed.

Results: The past primary diagnoses of the 26 patients were idiopathic vocal fold paralysis. Hoarseness and fatigue were the chief complaint, with the duration of 20 days~38 years (average 10.5 months). Twenty-one patients accompanied with chokes coughs. Nine patients were demonstrated abnormal cranial radiologic findings, including 4 cases of jugular foramen region lesions and 5 cases of other skull base lesions. Three patients were diagnosed with infectious lower cranial neuritis by the neurologist. One case undertook radiotherapy due to the tonsil malignant tumor 28 years ago. One case suffered after the measles 38 years before. Another 12 cases did not find the cause of disease. The head and neck examination and EMG showed that the vagus nerve of all the patients were impaired, vagus nerve combining with accessory nerve injured in 17 cases, vagus nerve combining with hypoglossal nerve injured in 2 cases, vagus nerve combining with accessory nerve and hypoglossal nerve injured in 7 cases.

Conclusions: Some patients with unknown etiologic unilateral vocal fold paralysis may combine with lower cranial nerve injury. Because of the insidious onset and long duration, they may easy to be missed or misdiagnosed as "idiopathic" vocal fold paralysis. Therefore, for the patients with clinical "idiopathic" vocal fold immobility, head neck and cranial nerve examinations, cranial radiology and EMG play important roles in identification of lower cranial nerve injury.

Funding sources: Programs of National Natural Science Foundation of China (81170901), Natural Science Foundation of Beijing (7132053) and Beijing Health Foundation of High-level Health Technical Personnel (2009-3-33).

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High Speed Video Laryngoscopy vs. Laryngeal Stroboscopy: On 122 Cases Does it Change the Management of the Patient?

The authors propose to analyze on 122 cases the interest of the high speed videolaryngoscopy vs. the laryngostoboscopy: the cases were as followed: 5 normal cases, 10 polyps; 10 polypoid cord; 10 Sulcus Vocalis; 10 cysts ; 10 Kissing nodules; 7 subepithelial hemorrhage ; 10 papilloma; 3 superior laryngeal paresis; 10 unilateral paresis on abduction; 10 post op for arytenoidectomy ;10 on suspicious lesions; ; 10 for scar after phonosurgery; 4 after cordectomy; 3 after injection of silicone.

After doing the video laryngoscopy for each case,

It was very interesting for cyst, Papilloma, and suspicious lesions

It was indispensable for a better management for: scar, sulcus Vocalis, post arytenoidectomy, and post cordectomy to evaluate the laryngeal compensation, to evaluate the impact of the asymmetrical vibration after silicone injection.

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Characterization of the Viscoelastic Properties of Perlane and Radiesse using the Rayleigh Wave Propagation Method

Objectives:

Perlane (hyaluronic acid) and Radiesse (calcium hydroxylapatite) are commercially available hydrogels commonly used for vocal fold injection. Human vocal folds oscillate at a fundamental frequency between 100-300Hz, with significant energy at frequencies up to around 3 KHz. Vocal fold oscillations are influenced by the mechanical (viscoelastic) properties of the vocal fold mucosa and underlying tissues.

The viscoelastic properties of injectable hydrogels, which are strongly dependent on frequency of vibration, are needed to predict their mechanical response in a variety of biological conditions. Although various injectable hydrogels have been investigated, the properties of Perlane and Radiesse have only been measured at frequencies below 10 and 200 Hz, respectively, using rheometry methods.

The main objective of this study was to characterize the viscoelastic properties of two commonly injected hydrogels (Perlane and Radiesse) between 40 and 4000 Hz using the Rayleigh wave propagation method.

Methods/Design:

Planar harmonic Rayleigh waves were produced on the surface of a sample composed of a substrate with known material properties coated with a thin layer of the hydrogel to be characterized. An inverse wave propagation problem was solved, yielding a complex nonlinear dispersion equation. The complex shear modulus, $\hat{G} = G' + jG''$, where G' and G'' are the elastic and viscous shear moduli of the hydrogel were calculated at 12 specific frequencies by numerical solution of the dispersion equation using measured Rayleigh wave speeds propagating on the sample surface.

Results:

As preliminary results, the elastic shear modulus of Perlane was 655 and 734 Pa at 40 and 60 Hz, respectively. The obtained viscous shear modulus was 207 and 245 Pa at 40 and 60 Hz, respectively. Viscoelastic properties of Perlane and Radiesse will be reported at frequencies up to 4 kHz.

Conclusions:

The suitability of Perlane and Radiesse as injectable hydrogels for human vocal folds will be discussed based on their viscoelastic properties.

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A Three-Dimensional Structural Model of Human Vocal Folds Based on Magnetic Resonance Images

Objectives: Research on creating three-dimensional (3D) models of human vocal folds are essential to advance the understanding of the structure-function relationship in normal and pathological voice production. High-resolution data on vocal fold geometry and morphology are required to make the models realistic and individual-specific for potential clinical applications. Magnetic resonance imaging (MRI) provides a non-ionizing and non-invasive approach to examine the vocal folds *in situ*, *in vivo*. In addition MRI could provide the data on the interior surface geometry and the interior microarchitecture of the vocal folds necessary for modeling, in which these structural features are impossible to be visualized using conventional laryngoscopy. The aim of the study was to develop a new MRI imaging and processing protocol for the creation of 3-D human vocal fold models.

Methods: MRI images of the vocal folds were obtained from an adult female (aged 36 years old) with no history of speech and voice disorders. A 3.0 Tesla MRI scanner (Trio, Siemens, Erlangen, Germany). The participant was placed in a supine position with a head and neck coil 8-channels. A 3D MR image 0.7mm isovoxel was acquired using SPACE optimized for laryngeal structures at calm respiration during 4 minutes. Median filtering technique was used to remove the noise of the MRI images. The post-processed MRI images were then processed using ITK-SNAP software for 3D reconstruction of the vocal folds. Laplacian smoothing method was applied on the reconstructed geometries to remove the artificial sharp edges. Regions of interest were specified and segmentations were performed both manually and automatically to enhance the reconstruction accuracy.

Results: The MRI images showed a clear contour of the vocal folds. The lamina propria (LP) and the thyroarytenoid muscles (TA) were able to be distinguished from the MRI images. Current imaging parameters were, however, failed to attain differentiated images of superficial LP from the intermediate and deep LP. Additional subject recruitment is undergoing and results will be available at the time of presentation.

Conclusion: High-resolution MRI images were obtained for 3D vocal fold reconstruction. The structural models can be coupled with finite element analysis for vocal fold oscillation in normal and pathological cases. The models can also be used as an experimental tool to evaluate how the material placement and properties of vocal fold injectables or implants affect vocal fold mechanics in voice restoration research.

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Acoustics and Aerodynamics Effects of Arytenoid Adduction with Thyroplasty in the Canine Larynx Model

Background: One area of current controversy is whether and when an arytenoid adduction (AA) should be done in addition to a Type I Thyroplasty (TT) for unilateral vocal fold paralysis (UVFP) with an anterior and posterior gap. Our previous work has shown intraglottal vortices form in a divergent glottal duct during the closing phase of vocal fold vibration and that increasing intraglottal vortices increases glottal efficiency, acoustic intensity, energy in the higher and greater speech intelligibility. The main purpose of this study is to determine if the intraglottal vortices are increased with TT + AA compared to TT alone.

Design: Type I Thyroplasty (TT) +/- an arytenoid adduction (AA) was performed in 2 excised canine larynges. UVFP with an anterior and a posterior gap was simulated. Measurements of the intraglottal flow fields and the medial glottal wall dynamics during phonation were taken using particle image velocimetry (PIV) in a coronal plane halfway between the vocal processes and the anterior commissure. Testing with and without AA was done at low and high subglottal pressures.

Results: Periodic vibration of the folds was observed in all cases. The vibrations were symmetric in phase, but asymmetric in amplitude. Increasing subglottal pressure or performing a TT + AA was associated with less amplitude asymmetry during vibration and increased intraglottal vortices. In addition, the medial surface of the paralyzed fold in the coronal plane was always straight to minimally divergent. The divergence of the normal fold increased as the subglottal pressure was increased or when the AA was added.

Conclusions:

With a posterior gap, AA plus medialization increased the intensity of the intraglottal vortices compared to medialization alone. The clinical significance of these findings will be further discussed

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Voice Characteristics of Individuals with Gastroesophageal Reflux Disease (GERD)

Background: GERD involves the retrograde flow of gastric contents into the esophagus whereas laryngopharyngeal reflux (LPR) affects the pharynx and larynx (extra-esophageal effects). Not all episodes of gastroesophageal reflux are associated with LPR and sometimes both GERD and LPR symptoms can be together. At least 4–10% of patients seeking help from ENT physicians are perceived as suffering from acid-based complaints.

Rationale: Several studies have focused on acoustic analysis of voice produced by subjects with GERD who report laryngeal symptoms, but no study has been reported with subjects with symptoms of GERD regardless of reported laryngeal symptoms. Hence, there is a need to know the strength of the relation between GERD and voice change.

Method: A multivalent descriptive study was run with 96 adult subjects who were divided into a control group (40 healthy individuals) and an experimental group (56 patients with GERD). They were subdivided into 11 groups based on age (young: 18-35; middle-aged: 36-55 years), gender (Male, Female), and type of GERD (erosive vs. nonerosive based on endoscopic examination), and GERD vs. Controls (there were no female patients with erosive GERD).

Results: The acoustic results using MDVP suggest that, in general, perturbation measures were higher (“worse”) for the patients with GERD than for the controls. These results differ, however, relative to the subgroup. Middle-aged-male GERD patients had significantly higher values for seven perturbation measures compared to controls (e.g., JITA, JITT, SHIM, etc.), whereas young-male GERD patients only differed on two measures. In contrast, no significant differences between GERD subgroups were found. Further details and implications will be given.

Conclusions: GERD patients even without voice complaints in general had elevated voice perturbation values compared to controls. In addition, the results suggest possible inadequate sphincteric pressures of the UES with age in those with GERD.

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Paradoxical Vocal Fold Motion: Epidemiological Presentation and Clinical Characterization

Background & Objectives: Paradoxical vocal fold motion (PVFM) is increasingly recognized as a disorder that can result in considerable patient distress and morbidity, yet the underlying nature of the disorder is not well understood and it remains misdiagnosed and subsequently inappropriately treated in clinical practice. The aim of this study was to enrich the scientific literature on PVFM through description of the demographic and clinical characteristics of patients referred to a multidisciplinary voice and swallowing clinic in a tertiary care facility.

Method: Retrospective analysis of outcomes data from the University of Wisconsin Voice and Swallowing database spanning admissions Oct 2006 - January 2012. Participants were identified using specific criteria, including ICD – 9 code 478.5, SLP and MD impressions at time of assessment.

Record of demographic information, prior, current and subsequent diagnoses and medications, comorbidities, presentation and quality of symptoms, other medical history, Voice Handicap Index (VHI), reflux symptom index (RSI), and the 7-item Generalized Anxiety Disorder Assessment (GAD-7) were collected for analysis.

Results: 96 cases met the inclusion and exclusion criteria. The majority of cases were female (n=70), non-smokers, aged between 30-69 years (range = 16-92 years) who were currently working full time. Presenting symptoms were most commonly tightness in the throat (52%) and chest (46%), with >20% of cases citing exacerbating factors of walking, cold air, stress and weekly exercise. Asthma history was positive in 65% of cases, with 61% currently taking asthma related medications. Of these, 83% reported that their current breathing problem differed from asthma. Other co-morbidities included allergies (50%), reflux (37%), anxiety (36%), dysphonia (12%) and dysphagia (7%). Anxiolytics (44%) and antireflux (43%) medications were common.

Elevated RSI scores were present in 60% of cases, while patient ratings of the VHI indicated minimal influence of voice problems on daily living in 77% of patients. Elevated voice handicap ratings were found to be significantly ($p<.02$) associated with moderate to severe anxiety scores (GAD-7) and reflux disease ($p<.001$).

Conclusion: This study highlights common presenting and clinical features associated with PVFM in individuals referred for voice and/or swallowing examination. These results are valuable for both future research and clinical applications.

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The Effect of Drinking High pH Water on Self-Reported Results from the Reflux Symptom Index and a Singer Specific Questionnaire

LPR is a major health issue and its symptoms can be debilitating for voice professionals. Common treatments include behavioral modification, pharmaceutical treatment and in some cases surgical intervention. Diet and lifestyle modifications are standard recommendations; however studies demonstrating consistent results from the dietary changes are limited. Results from pharmaceutical strategies are at best inconsistent and at worst problematic. According to Dr. Jamie Koufman, the acidification of the American diet has affected the prevalence of LPR. Her in vitro study and anecdotal evidence have suggested drinking high pH water as a safe, readily available low cost option (less than \$2.50/day) to denature pepsin present in the esophagus and alleviate LPR symptoms. To date no clinical studies on the efficacy of this treatment have been performed.

This study was designed to investigate the effects of drinking high pH water on LPR symptoms. Participants were recruited from the Winchester, Virginia area through snowball sampling. They were instructed to drink one liter of water with a minimum pH of 7.8 daily for one month and self-report the following each morning: 1) the Reflux Symptom Index (RSI, Belafsky et al, 2002); 2) singer-specific questions (SSQ) (Bell, 2013); and 3) a food journal. No lifestyle or dietary changes outside of drinking the high pH water were allowed for the purposes of the study.

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Evaluating the Quality and Readability of Thyroplasty Information on the Internet

Objectives/Hypothesis: To assess the quality and readability of thyroplasty information available on the Internet.

Study Design: Cross-sectional study.

Methods: We conducted a Google search for “thyroplasty treatment” and analyzed the first 50 websites using the DISCERN instrument, the Flesch Reading Ease score (FRES), and the Flesch-Kincaid Grade Level score (FKGL). DISCERN is a 16-item validated questionnaire used to assess the quality of written health information for patients. FRES and FKGL are commonly used instruments to assess readability of written information. We also further analyzed major versus minor and patient-targeted versus professional websites.

Results: Overall DISCERN score was 2.20 ± 0.60 . Overall FRES score was 29.68 ± 16.64 . Overall FKGL score was 13.07 ± 3.95 . We found significant differences between patient-targeted and professional websites on FRES (43.80 ± 2.78 and 18.58 ± 9.04 , respectively) and FKGL (11.46 ± 3.36 and 14.33 ± 4.30 , respectively) ($P < 0.00$ and $P = 0.01$, respectively). We also found significant differences between major and minor websites on DISCERN (2.35 ± 2.35 and 1.95 ± 0.61 , respectively), FRES (24.75 ± 14.61 and 37.71 ± 16.97 , respectively), and FKGL (14.19 ± 3.68 and 11.24 ± 3.77 , respectively) ($P = 0.03$, 0.01 , and 0.01 , respectively).

Conclusions: Thyroplasty information available online is not of high quality and is written at a level too difficult for the average American adult to read comfortably. Major websites have higher-quality information but are more difficult to read. Professional-targeted websites are also more difficult to read than patient-targeted websites.

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Higher Risk of Superficial Injection During Injection Laryngoplasty in Women

Purpose: To review our clinical experience with percutaneous injection laryngoplasty at a single institution over a three-year period, and to specifically assess the rate of unintentional injection into the superficial lamina propria (SLP) and compare with results found in the literature.

Materials and Methods: Medical records were retrospectively reviewed to identify patients who underwent office-based injection laryngoplasty (OBIL) over a three-year period. Video documentation and the written notes of the procedures were reviewed to determine the rate of inadvertent placement of injectate into the SLP. A literature review was performed to identify other reports of this complication and contributing factors.

Results: 113 consecutive patients were identified who underwent OBIL in the study period. Of these, 100 patients had adequate records and follow-up available for this review. All patients underwent injection augmentation with bovine collagen using a percutaneous trans-membrane or trans-cartilaginous technique. 96 had improvement in their vocal quality and/or effort. Four patients, who were all women, had unintentional injection into the SLP with resultant no change in voice or worsened voice. All superficially placed injectates were managed conservatively.

Conclusions: Injection into the SLP is a well-recognized possible complication of OBIL. Our results suggest that this complication occurs more often in women than in men, perhaps due to differing laryngeal anatomy and size.

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Office-Based Tracheoesophageal Puncture: Long-Term Experience and Updates in Techniques

Objectives: Tracheoesophageal Puncture (TEP) is an effective rehabilitation method for post-laryngectomy speech and has already been described as a procedure that is safely performed in the office. We review our long-term experience with office-based TEP over the past seven years in the largest cohort published to date.

Methods: A retrospective chart review was performed of all patients who underwent TEP by a single surgeon from 2005 through 2012, including office-based and operating room procedures. Indications for the chosen technique (office versus operating room) and surgical outcomes were evaluated.

Results: 59 patients underwent 72 TEP procedures, with 55 performed in the outpatient setting and 17 performed in the operating room, all without complication. The indications for performing TEP's in the operating room included 2 primary TEP's, 14 due to concomitant procedures requiring general anesthesia, and 1 due to failed attempt at office-based TEP. 19 patients with prior rotational or free flap reconstruction successfully underwent office-based TEP.

Conclusions: TEP in an office-based setting with immediate voice prosthesis placement continues to be a safe method of voice rehabilitation for post-laryngectomy patients, including those who have previously undergone free flap or rotational flap reconstruction. Office-based TEP is now our primary approach for post-laryngectomy voice rehabilitation.

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Laryngopharyngeal Reflux: Is There Evidence in the Larynx?

Laryngopharyngeal reflux has been described as the retrograde movement of gastric contents into the larynx, pharynx and upper aerodigestive tract (Belafsky, Postma, & Koufman, 2001). It is currently one of the most prevalent conditions associated with voice disorders being treated in voice care centers worldwide (Koufman, 1991). Often patients are empirically treated with antireflux medications based on symptoms and endoscopic findings alone and although these are useful diagnostic tools, they are subjective and can be heavily influenced by artifacts in instrumentation, such as lighting or evaluator's experience. More objective data is necessary in order to fully understand the relationship between patient symptoms and physical findings, to ascertain if reflux is truly playing a primary role in a patient's voice difficulty (Kelchner et al., 2007; Belafsky, Postma, & Koufman, 2001; Branski, Bhattacharyya, & Shapiro, 2002). Therefore, the purpose of this study is to understand the relationship between patients' perceived symptoms and evidence of acid exposure to the larynx. 71 patients (27 male and 44 female), ages 16 to 91 with perceived symptoms and tissue changes, were recruited from a local Otolaryngology office. The Reflux Symptom Index (Belafsky et. al, 2002), a 9 item questionnaire, was administered to determine patients' perceived symptoms followed by 24 hour pH monitoring with the Dx-pH Measurement System™ (Respiratory Technology Corporation) to determine pH levels in the pharynx, larynx and oral cavity. Data collection is complete; it is anticipated that data analysis will be complete by January, 2014. The results and discussion will focus on the relationship between the perceived symptoms and pH findings for this population as well as implications for medical and behavioral management.

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The Association of Maxillary Arch Dimensions with Voice Classification in African American Female Singers

Objective: To determine the association between maxillary arch dimensions and voice classification in female singers of multiple ethnicities

Methods/Design: Videostroboscopy, audio recordings, and dental casts were taken from five African-American females who are all classically trained singers. Voice classification was determined via acoustic analysis based on speaking fundamental frequency, spectral analysis, voice profile, and tessitura confirmation. Maxillary arch dimensions were measured from ten points on each cast to determine the depth, length, and width of the maxillary arch. Volume of the palatal vault was also determined. Correlation and discriminant analysis tests were performed on the data.

Results: No one individual dimension predicted voice classification in our study population, which is consistent with our prior work in Caucasian women, however taking multiple dimensions together may be more predictive.

Conclusions: This study builds upon previous work by the two senior authors looking at Caucasian women to now give a multi-ethnic perspective on the association of maxillary dental arch and voice classification. Though there may not be a correlation between individual palate dimensions and voice classification, the evidence suggests that the shape overall may be correlated with voice classification. Future directions would include studying additional ethnicities as well as studying male singers.

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Laryngeal Treatment for Unilateral Vocal Fold Paralysis

There are different laryngeal therapies used to improve the glottal closure and the quality of the voice in unilateral vocal fold paralysis patients. Surgical procedures and laryngeal rehabilitation are different treatments that can be combined in order to get the best result for the patient voice. In this workshop different laryngeal routines are analyzed. The different forces of the body are used for extralaryngeal compensation of the vocal folds. The corporal and effort routines are examined. A constant acoustical analysis is shown for the real measurement of the volume and quality of the pitch. Neck electrotherapy is presented as another therapeutic tool with the different voice treatments. Different corporal movements help the vocal exercises using the compensatory extralaryngeal and laryngeal muscles that are still functioning. The different exercises have to be practiced by the audience. The use of elastic bands with certain strengths help make the vocal folds effort stronger. The presentation for the workshop includes an analysis of different surgical treatments in combination with voice therapy techniques.

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Sulcus Vocalis (Type III/Ib): Prevalence and Stroboscopy Characteristics

Objectives: The reported prevalence of sulcus vocalis type III/Ib (SV) a pathologic groove in the vibratory margin of the vocal fold (VF), varies greatly in the literature with rates ranging from 0.4% to 48%. Difficulties in visualizing the defect and the wide variety of presentations have complicated the evaluation of SV. The objective of this study was to determine the prevalence of SV by reviewing stroboscopy examinations in subjects with and without dysphonia.

Study Design: Retrospective chart review

Methods: Charts and stroboscopy images were reviewed for subjects with dysphonia and without dysphonia and analyzed using standard statistical techniques.

Results: Stroboscopy images were reviewed for 95 non-dysphonia subjects (31 non-operative singers, 64 operative singers) and 100 dysphonia subjects. The prevalence of SV was not significantly different between the groups ($p=0.525$, 6.2% of all subjects, 8% of dysphonia subjects, 4.2% of non-dysphonia subjects). Abnormalities on examination were not significant in subjects with SV for either group: non-dysphonia and dysphonia groups (60.4%, 75% decreased right VF amplitude; 59.3%, 87.5% decreased left VF amplitude; 59.3%, 75% decreased right VF waveform; 58.2%, 87.5% decreased left VF waveform; 60.4%, 75% hypodynamic right VF vibration; 58.2%, 87.5% hypodynamic left VF vibration; and 38.5%, 50% glottic insufficiency).

Conclusions: We report an overall prevalence of SV type III/Ib at 6.2%, with no significant variations seen on stroboscopy between non-SV and SV subjects.

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Correlations Between Dynamic 3D Parameters and Acoustics in a Human Ex Vivo Model of Asymmetric Vocal Fold Vibration

Objective: To evaluate the relationship between 3D parameters of vocal fold surface motion and the resulting acoustic signal in an ex vivo model with induced left-right vocal fold vibratory asymmetry.

Methods: High-speed video through a surgical microscope was combined with a laser projection system during airflow-induced ex vivo human vocal fold phonation. The laser system projects a 20 x 20 grid of laser points on the vocal fold surface to enable semi-automatic processing of the high-speed frames using stereo-triangulation principles of the 3D coordinates of the laser grid. Arytenoid rotation was controlled with mechatronics to produce a range of left-right asymmetries through variations of vocal fold tension and position. The investigation was performed on a larynx that exhibited a glottal gap. The produced acoustic signal yielded voice quality-related measures such as jitter, shimmer, harmonics-to-noise ratio, and cepstral peak magnitude.

Results: Overall, 3D parameters describing the mucosal wave velocity, rather than amplitude, correlated significantly with the acoustic variations resulting from vocal fold vibratory asymmetry. Several statistically significant relationships were found between closing velocities of the vocal fold surface and acoustic parameters. In contrast, no correlations were found between opening velocities and acoustics measures. Only a few weak correlations were found between lateral vocal fold amplitude measures and acoustic parameters.

Conclusions: The correlations found between acoustics and vocal fold closing velocities agree with voice production theory stating that velocities during the closing phase of vocal fold vibration have more impact on the acoustic signal than vocal fold amplitudes. In particular, harmonic-to-noise ratio and cepstral peak magnitude of the acoustic signal strongly correlated to 3D dynamic measures of the mucosal wave. These initial findings support the continued combined investigation of 3D laryngeal imaging and acoustic analysis to aid in explaining changes in acoustic perturbation and sources of dysphonia.

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Applications of Infrared Transillumination Technique to Monitoring Voice and Speech Activities

Transillumination with near infrared (NIR) light is useful for various purposes to detect changes in light absorption by body tissues or organs. The NIR transillumination technique has many applications to monitoring voice and speech activities, and we have reported our previous attempt for non-invasive photoglottography with an external lighting and sensing technique (ePGG). The best range of NIR wavelength is thought to be 700 – 900 nm, where tissue components absorb light spectra at various degrees: The shorter waves are absorbed by muscles and vessels, and the longer waves by tissue water and fat, which results in both benefits and problems at sensing. In the case of ePGG, the cervical fat layer transmits NIR light efficiently, and it causes short-circuit light pathway to the detector and decreases the amplitude of ePGG signals. On the contrary, the fact that light absorption by tissues is dependent on the wavelength offers us a possibility of monitoring glottal vibration signals from the mucosal and muscular layers separately. Our observation with magnetic resonance imaging (MRI) of the neck tissue suggests possible improvements and further applications of NIR transillumination through identifying the regions and types of tissue components. The deep fat layer in the neck interconnects the locations of light entrance and detection, and this short-circuit pathway could be blocked by applying cancel pulses of the light. Since the bilateral fat layers are not jointed at the midline of the neck, monitoring the pharyngeal phase of water swallowing could be possible by placing the light source and detector on opposite sides. Our trials toward a few applications will be reported.

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Biological Response of Human Vocal Fold Fibroblasts to Phono-Mimetic Stimulation Using an Airflow-Induced Bioreactor

Objectives: Vocal folds undergo complex biomechanical stimulation during phonation which affects cell viability and functional response. The aim of the present study was to investigate human vocal fold fibroblasts response to phono-mimetic mechanical stimulation using an airflow-induced and self-oscillated vocal fold bioreactor.

Methods: An airflow-induced bioreactor was designed to mimic the complex dynamic biomechanical stimulations involved in human phonation. It was consisted of a pair of synthetic vocal fold replicas loaded to a custom-built bioreactor housed in a tissue-culture incubator. A cell-scaffold mixture consisting immortalized human vocal fold fibroblasts (I-HVFFs) solution (6×10^7 cell/ml), Hyaluronan 2%, Gelatin 1%, and crosslinker 2% with equal volume fractions was injected into the cavity of the replicas. Culture medium with 5% CO₂ was connected to the bioreactor with a perfusion rate of approximately 2 ml/ hour. Replicas were phonated by airflow for one hour a day over a period of 7 days. Supraglottal pressure was monitored using a sound level meter about 20 cm away from the replicas. The peak-to-peak amplitude of the subglottal pressure was about 1 KPa. The measured sound pressure level was 101 dB, with a magnitude of 3.17 Pa. The fundamental frequency of oscillations was around 100 Hz. A similar bioreactor without mechanical excitation was used as static positive control. The cell-scaffold mixture was harvested for cell viability tests and collagen type I immunohistochemical staining at Day 7. Culture medium was sampled daily for total protein measurement using bicinchoninic acid assays.

Results: The cell viability rate was 85% in the phonated samples which was comparable to the static control. Positive collagen type I staining was observed in vicinity of the cell membrane at Day 7. The level of collagen I was qualitatively greater in phonated samples than that of the static control.

Conclusion: Results suggested that I-HVFFs could survive and maintain cellular functions of protein production. Data support the proposed bioreactor as a viable and phono-mimetic cellular environment.

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Voice Source and Subglottal Pressure in Persian and Kurdish Singing

Objective

In search for timbral characteristics of traditional Persian and Kurdish singing styles, subglottal pressure (P_{sub}) and voice source are analysed in singers representing these traditions, thereby complementing a previous study of stylistic formant-to-harmonics relationships as well as melodic ornaments.

Methods

Audio and EGG signals were simultaneously recorded while the subjects sang excerpts from their traditional repertoires. For some of the songs P_{sub} was recorded as the oral pressure during the occlusion for the consonant /p/ while the subjects repeated the song, replacing each syllable of the lyrics with [pæ]. To detect any occurrence of breathy (leaking) phonation, some singers also sang short excerpts into a Rothenberg mask (Rothenberg 1973).

Results

Fundamental frequency F0 was measured from the EGG signal, and voice source parameters from inverse filtering of the audio signal by means of the custom made DeCap and S-naq software (Svante Granqvist). The relationships between P_{sub} and voice source parameters, e.g., NAQ, MFDR, Closed Quotient and H1-H2 are compared between the two singing traditions and with some Western classical as well as non-classical singing styles (Zannger Borch & Sundberg 2011; Sundberg, Thalén & Popeil 2010; Björkner, Sundberg & Alku 2006; Björkner 2008). The tendencies suggested by the previous study are now confirmed more clearly, and the data indicate high adduction and high P_{sub} as being characteristic for the eastern styles.

Conclusions

Pressed phonation seems to be characteristic in both Persian and Kurdish singing. This in combination with the strong second harmonic achieved by the formant tuning (as found in the previous study) seems to serve the aesthetic purpose of producing a stylistic jelly sound in the modal register of both male and female singers.

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Evoked Potentials during Voice Error Detection at Register Boundaries

Objective. Singing requires great skill and artistic talent, which often requires great effort to avoid vocal distortion when crossing register boundaries. With highly trained singers it is quite difficult to perceive register breaks, as they are trained to diminish their prominence. The purpose of this study was to examine neural mechanisms underlying voice error detection in singers at their register boundaries. We hypothesized that event-related potentials (ERPs), reflecting brain activity would be larger if the pitch of the voice was unexpectedly shifted toward the direction of register break rather than away from the direction of the register break.

Methods/Design. We used frequency-altered auditory feedback (AF) to deliver shifts in a singer's voice pitch a half-step above and below the speaker's register transitions. Eleven subjects with normal hearing and 5+ years of singing experience were recruited (5 males, 6 females; mean: 20.2 years). The singers sustained a musical note for 2-3 sec at a level that was close to the upper or lower boundary of a register. As the singers sustained the notes, they heard their voice over headphones, and the pitch of their voice was unexpectedly shifted (+ or – 400 cents, 100 ms) towards or away from the register. This procedure was repeated for 200 trials. Both the voice and 32-channel EEG signals were recorded.

Results and Conclusions. The N1 and P2 event related potential (ERP) amplitudes for three central electrodes (FCz, Cz, Fz) were computed from the EEGs of all participants. A multivariate analysis of variance with factors of shift direction (+400c, -400c) and register (low, high) showed significant differences in N1 and P2 amplitude for direction at the low register boundary but not the high boundary. These results might suggest increased neural activity when trying to control the voice when crossing the lower register boundary.

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Resonatory Contribution of Paranasal Sinuses to the Acoustical Properties of the Nasal Tract

Objective:

The significance of nasal resonance and antiresonance to voice production is a classical issue in vocal pedagogy and voice research. Due to the intricate anatomy of the sinonasal tract as well as the cyclically changing shape of its mucosa lining, this part of the vocal tract is not easily accessible for acoustical examination. Here we examine the resonatory influences of the paranasal sinuses with and without occlusion of sinus ostia under well-controlled ex vivo conditions in a cadaveric situs as well as in a 3D-epoxi-model of a human sinonasal tract.

Methods:

Nasal and paranasal cavities of a male thiel-embalmed cadaver as well as of an epoxi-mold derived from a CT-scan data of a male facial cranium were acoustically excited by a sine sweep (range 200-4000 Hz) with a hermetically sealed headphone in the epipharynx. As a baseline condition both middle meatus and sphenoidal ostia were blocked. For the blockage in the cadaver application of maltodextrin food thickener and its subsequent removal through targeted suction under endoscopic control was used. The paranasal cavities in the axially cut epoxy-mold were selectively occluded with wet cotton. A microphone placed close to the nostril picked up the acoustical response to the sine sweep and the effects of various blockages were analysed respectively. Each condition was measured twice.

Results/Conclusions:

Sine sweep excitation generated by an earphone, placed in the epipharynx of a 3D-epoxi-mold as well as in a cadaver, was found to produce reproducible response curves of the nasal tract including paranasal cavities. Also, acoustic effects following the successive opening of the middle meatus and the sphenoidal ostia could be measured,

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Cricothyroid Muscle Dominance and Thyroarytenoid Muscle Dominance in Vocal Register Control: Preliminary Results

The purpose of this study was to test the hypothesis that head and headmix registers use cricothyroid muscle dominant voicing, while chest and chestmix registers use thyroarytenoid muscle dominant voicing. Simultaneous recordings of thyroarytenoid (TA) and cricothyroid (CT) muscle activity and audio were obtained from two trained female singers and five untrained singers (4 female and 1 male) during the production of ascending pitch glides and a variety of mid-range and upper pitches in chest, chestmix, headmix, and head registers. Thyroarytenoid and cricothyroid muscle activity was normalized to a percent of mean maximum activity and CT:TA muscle activity ratios were calculated. Audio samples were assessed aurally to determine the point of register transition and then analyzed via Fast Fourier Transform to confirm the point of register transition by assessing for change in spectral slope at the moment of register transition. TA dominant phonation was only observed for chest, headmix and head register productions below 300 Hz. All phonation above 300 Hz, regardless of register, showed CT:TA muscle activity ratios that were CT dominant or close to 1, indicating nearly equal CT and TA muscle activity. Two subjects showed CT dominant phonation only for all vocal registers. Preliminary results do not support the assumption that all chest and chestmix phonation is produced with greater TA activity than CT activity or that all headmix and head phonation requires greater CT muscle activity than TA activity. The data indicate that pitch level may play a greater role in determining TA and CT muscle dominance than register.

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Vocal Fold Vibration in Unilateral Vocal Fold Paralysis: Videokymographic Analysis

Purpose: The study investigated vocal fold vibration in patients with unilateral vocal fold paralysis with the aim of answering the following questions: I) Does the paralyzed vocal fold tend to vibrate faster or slower than the healthy vocal fold? II) What are the most important features that distinguish the vibration of the paralyzed from the healthy vocal fold?

Method: A systematic protocol, which visually rates 33 vibratory features of the vocal folds using pictograms, was used to evaluate videokymographic images obtained from 46 patients diagnosed with unilateral vocal fold paralysis. The evaluation was done independently by four evaluators. Statistical analysis of the parameters was performed using the R GNU and G-power software.

Results: The results revealed a statistically significant tendency of the paralyzed vocal fold to vibrate with different frequency, amplitude and phase than the healthy vocal fold. However, there was no clear tendency of the paralyzed vocal fold to vibrate slower or faster than those of the healthy vocal fold – both of these possibilities were observed.

The most prominent features for distinguishing the paralyzed vocal fold from the healthy one (approaching but not reaching statistical significance) were a) the reduced sharpness of lateral peaks and b) increased amplitude of the paralyzed with respect to the healthy vocal fold.

Discussion and conclusion: The paralyzed vocal fold tends to behave differently in different patients. These intra-individual differences should be taken into account for diagnostic and therapeutic purposes. The data can also be used for refining the biomechanical models of the vocal folds in voice disorders.

The research has been supported in the Czech Republic by the European Social Fund Projects OP VK CZ.1.07/2.3.00/20.0057 and OP VK CZ.1.07/2.4.00/17.0009.

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Electroglottographic and Super High-Speed Video Investigation of Glottal Opening and Closing Events

Previous research has suggested that the peaks in the first derivative (dEGG) of the electroglottographic signal (EGG) are good approximate indicators of the events of glottal opening and closing. These findings were based on high-speed video (HSV) recordings with frame rates ten times lower than the sampling frequencies of the corresponding EGG data. The current study attempts to corroborate these previous findings, utilizing super-HSV recordings.

The HSV and EGG recordings (sampled at 27 kHz and 44 kHz, respectively) of excised canine larynx vocalization were synchronized by an external TTL signal to within 0.037 ms. Data were analyzed by means of EGG, dEGG, the glottal area waveform, digital kymograms, glottovibrograms, and the vocal fold contact length (VFCL), a new parameter representing the time-varying degree of “zippering” closure along the anterior-posterior (A-P) glottal axis.

The temporal offsets between glottal events (depicted in the HSV recordings) and dEGG peaks in the opening and closing phase of glottal vibration ranged from 0.02 to 0.61 ms, amounting to 0.24 – 10.88 % of the respective glottal cycle durations. All dEGG double peaks coincided with vibratory A-P phase differences. In two out of the three analyzed video sequences, peaks in the first derivative of the VFCL coincided with dEGG peaks, again co-occurring with A-P phase differences.

The findings suggest that dEGG peaks do not always coincide with the events of glottal closure and initial opening. Vocal fold contacting and de-contacting do not occur at infinitesimally small instants of time, but extend over a certain interval, particularly under the influence of A-P phase differences [1].

Acknowledgements: This research was supported by an ERC Advanced grant no. 230604 ‘SOMACCA’ (C.T.H.), a start-up grant from the University Vienna (W.T.F.), the European Social Fund Project OP VK CZ.1.07/2.3.00/20.0057 (J.G.S.) and by the DFG grant LO1413/2-2 (J.L.)

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Measuring Vocal Fold Contact Quotient

The Contact Quotient (CQ) is the percent of time in the glottal cycle that the vocal folds are in full or partial contact. This number tells a lot about the nature of the phonation. A CQ much greater than 50% may indicate a very efficient voice production and is found in some professional voice users. Alternately, a high value of CQ may indicate highly adducted vocal folds, or a 'pressed' voice. Conversely, a low value of CQ may indicate partially abducted vocal folds and a breathy voice production.

A number of methods for the visualization of vocal fold motion have been used for estimating the CQ, including measurements of the acoustic (microphone) signal, measurements of an electroglottograph (EGG) signal (nominally the vocal fold contact area) or its time-derivative, videokymographic images, and glottal airflow obtained by inverse filtering oral airflow. Some studies have combined two or more of these variables.

Since an electroglottograph (EGG) signal is a noninvasive response to vocal fold contact, it would seem that a usable CQ measure could be teased out of the EGG signal. However, the 3 or 4 dimensional nature of the vocal fold contact pattern sometimes makes the instants of initial vocal fold contact and final vocal fold loss of contact difficult to determine unambiguously.

Presented here is a method for estimating CQ that combines an EGG and an inverse filtered microphone signal. Software will be demonstrated that includes correction for EGG and microphone low frequency phase distortion, EGG-microphone time synchronization, and semi-automatic inverse filtering using filter parameter presets that make the method user-friendly and intuitive.

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An Examination of the Relationship Between Electroglottographic (EGG) Contact Quotient, EGG Decontacting Phase Profile, and Acoustical Spectral Moments

Objectives: To date, only a few studies have examined the possible relationship between electroglottographic (EGG) data and spectral characteristics of the voice. This study examined the possible association between EGG signal data (contact quotient and decontacting phase profile) and spectral moments (spectral mean, spectral standard deviation, spectral skewness, and spectral kurtosis). Furthermore, the possible effects of gender on these measurements were analyzed.

Methods: Sustained vowel /a/ productions were obtained from forty-eight normophonic individuals (24 males and 24 females). The central one-second portions of the acoustic vowel samples were analyzed for spectral moments (spectral mean, spectral mean standard deviation, spectral skewness, spectral kurtosis), and the electroglottographic signal was analyzed for contact quotient (CQ_{EGG}), fundamental frequency (F_0), and decontacting phase profile.

Results: Significant relationships between the CQ_{EGG} and spectral skewness and kurtosis were observed across all participants, though further analyses indicated that these relationships were significant only in the female speakers. In addition, subjects who had concave-down ("knee") vs. concave-up decontacting phase profiles ("no knee") were observed to have significantly lower spectral means and greater spectral standard deviations. Finally, a significant main effect of gender was observed, with females having significantly greater spectral standard deviations than males.

Discussion: This study determined that the relative duration of vocal fold contact (measured by the CQ_{EGG}) is significantly related to certain spectral characteristics of the acoustic voice signal (specifically, spectral skewness and kurtosis). Possible relationships between underlying phonatory physiology and the spectral characteristics of the voice will be discussed. In addition, the possible effect(s) of extraneous factors such as F_0 , sampling frequency, and CQ_{EGG} computation method on the possible relationship between CQ_{EGG} and spectral moments analyses will also be considered.

Acknowledgement: This research has been co-financed by the European Social Fund and the state budget of the Czech Republic, project no. CZ.1.07/2.3.00/30.0004 "POST-UP" (author CTH).

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Intelligibility of Sung Vowels: The Effect of Consonantal Context and Vowel Onset

Background: Studies addressing the identification of sung vowels concern mainly the effect of the fundamental frequency and conclude that correct vowel identification decreases with increasing pitch. The impact of consonant environment on the intelligibility of the vowels in singing was studied only in one experiment with the results showing positive effect similar to that reported for speech in an earlier study. However, the data on singing are not as transparent as the authors suggest, since the conditions were not strictly controlled and the tendencies were only clear above the fundamental of F5.

Objectives: The aim of the present study is to redesign the above mentioned experiment with some modifications to test whether the phonetic context and the onset of the vowel uttered in isolation have a positive effect on vowel identification.

Methods: For this purpose, a vowel identification test (including 22 listeners) was carried out. The stimuli consisted of 3 Hungarian vowels /a: i: u:/ in 3 conditions (in /bVb/ context, in isolation and with eliminated onset) at 7 different fundamental frequencies (F3, B3, F4, B4, F5, B5, and in speech). The stimuli were produced by one professional soprano singer.

Results: The results show that consonant context does not seem to specify vowel identity in singing as clearly as it has been demonstrated for spoken utterances. The effect of vowel onset is not proven either.

Conclusions: As an explanation, the reduction of the consonants and the under sampling of the formant transitions are assumed.

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Amplitude of Vibration in Normal Voice: A Preliminary Quantitative Study

Study Objective: The purpose of this study was to establish preliminary, quantitative data on amplitude of vibration during videostroboscopic assessment of voice in healthy speakers with normal voice characteristics. Amplitude of vocal fold vibration is a core physiological parameter used in diagnosing voice disorders, yet quantitative data are lacking to guide the determination of what constitutes normal vibratory amplitude. Prior studies involving the assessment of vibratory amplitude have often incorporated ratings of normality or abnormality that are based on qualitative benchmarks.

Methods/Study Design: Fourteen participants were assessed during sustained vowel production using rigid and flexible endoscopy with stroboscopy. Still images were extracted from digital recordings of a sustained /i/ produced at a comfortable pitch and loudness, and produced at a 5 dB increase from comfortable loudness, with control of F0 to be +/- 15% of each participant's average conversational F0 level. Glottal length, glottal width, glottal area and true vocal fold width were measured from still frames representing the maximum open phase of the vibratory cycle. For each image, glottal width and length were normalized to glottal area to control for anatomical and magnification differences across participants. Glottal width as a ratio of true vocal fold width was also computed for comparison to prior studies.

Results: Mean values and standard deviations were computed for the normalized measures. Preliminary analysis with repeated measures ANOVAs and follow-up contrasts indicated significant differences in normalized vibratory amplitude between endoscopic instrumentation methods (rigid versus flexible), but not between speaking conditions (comfortable loudness versus +5 dB).

Conclusions: These preliminary quantitative data may be helpful in determining normality or abnormality of vocal fold vibration. Initial analyses indicate that laryngeal imaging method may produce differing representations of vocal fold amplitude within a participant.

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Testing a New Method in Voice Dosimetry Utilizing an Unfiltered Accelerometer Signal: Protocols and Preliminary Data

Previous vocal dose studies have analyzed the duration, intensity, and frequency (in Hz) of voice use among various populations through ambulatory monitoring. Another line of studies has analyzed the pre- and post- acoustic effects of vocal loading on voice quality. Yet no studies to date have incorporated the simultaneous ambulatory acquisition of vocal dose and voice quality measures such as long-term average spectrum (LTAS), alpha ratio, shimmer, jitter, and harmonic-to-noise ratio so that these measures could be directly compared for the same voicing period. Further, few studies have utilized the unprocessed signal of a contact neck accelerometer to acquire these voice quality measures without the potential contamination of other, surrounding sounds. Such data could be helpful in developing a greater understanding of voice use and why certain individuals might experience more decline in vocal function than others with a similar vocal dose.

The purpose of this study was to examine the effectiveness of a new method for voice dosimetry using an unfiltered accelerometer signal. The Sonovox AB VoxLogTM portable voice analyzer collar, which houses a contact accelerometer transducer, was connected to a standard commercial digital recorder for extended periods of ambulatory monitoring. Protocols for the analysis of this unfiltered accelerometer signal, including vocal dose and voice quality data, were developed using standard software available for a laptop computer. For comparison, acquired data were compared to data simultaneously acquired by an acoustic neck microphone (also housed in the VoxLog collar), a head-mounted microphone, and a KayPentax Ambulatory Phonation Monitor. Benefits and limitations of this new, budget friendly system were discussed.

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Extensive Unified-Domain Simulation of the Human Voice: Overview and Status Report of the EUNISON Project

Physically, voice involves vibrating, deforming, colliding elastic solids; complex interactions between laminar and turbulent airflow; and sound waves resonating in a contorting duct. Typically, these mechanisms have hitherto been studied one at a time, using disparate tools and often drastic approximations, for each of the sub-problems. Recent advances in numerical modeling techniques suggest the possibility of simulating the combined biomechanics, aerodynamics and acoustics in a unified numerical domain. Although the logistical and computational demands remain formidable, these are more an obstacle of scale than of principle. The EUNISON project aims at developing an extendable voice simulation platform which to an unprecedented degree is based on first principles of physics. Seven research groups across Europe collaborate in this venture, with access to massively parallel computers. Throughout, numerical models are validated against physical replicas. The goal is to simulate and render, in three dimensions plus time, the physics of the voice, including its acoustic output. Control data for the simulation will represent at different levels the geometry, muscle activations, or strings of phonemes. Furthermore, the intention is to make the platform operable remotely and open to future incremental refinements by others. If achieved, such a tool could bring applied research and education much closer to reality. An overview and a brief progress report after the first of three project years will be given. The work package leaders are Sten Ternström (project coordinator), Oriol Guasch (scientific coordinator), Johan Hoffman, Stefan Becker, Xavier Pelorson, Ramon Codina, Olov Engwall and Francesc Alías. (EU FP7 FET-Open Project 308874, 2013-2016, www.eunison.eu)

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Objective Voice Assessment: The Diplophonia Diagram

Objective: Diplophonia is a common symptom in disordered voice. It is characterized by the presence of two pitches in the voice sound. The assessment of diplophonia in disordered voice is necessary for indicating treatment of voice disorders. Perceptual-auditive expert ratings are an established approach for determining diplophonia, but involve a great amount of subjectivity. Aim of the study is to introduce the Diplophonia Diagram, which is an objective voice assessment procedure.

Methods/Design: Sixty subjects (twenty diplophonic patients, twenty hoarse patients without diplophonia and twenty healthy probands) were recruited. Three independent expert raters auditively assessed all audio recordings on the presence of diplophonia. According to the expert ratings, the audio and video material has been assigned to one of the groups 1) diplophonia, 2) hoarseness without diplophonia and 3) euphonia. The glottal area waveform (GAW) has been extracted for all LHSVs. In a computer routine, the GAW has been consecutively modelled by 1) one oscillator and 2) two oscillators. We hypothesized that two oscillators representing the double pitch phenomenon are needed for modelling diplophonic voice.

Results: The Diplophonia Diagram is a two-dimensional scatter chart that relates the quantitative accuracy of the one oscillator model (x-axis) and the two-oscillator model (y-axis). Each measurement (i.e., a phonation segment) is represented by a circle on the chart. Phonation segments from different groups (i.e., diplophonia, hoarseness without diplophonia, euphonia) discriminate well on the chart, and form clusters of similar voice qualities.

Conclusions: It is shown that the Diplophonia Diagram produces results that are meaningful and important for determining diplophonia. The rationale of the test is the detection of spatially distinct glottal oscillators that cause two pitches to be perceived. We suggest using the Diplophonia Diagram for examining pathologic voice, whenever the auditory perception of two distinct pitches is subject to doubt.

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Multiple Channel Speech System of Resonance Cavity: A New Way to Explore and Measure the Human Voice Resonance

Objective: Resonance cavities are very important for human voice in daily life, but there is very limited way to measure the function. So we developed the Multiple Channel Speech System of Resonance Cavity (MCSS), hoped to remedy the limitation. By study the correlation of same singer's voice in different times and the differences of different singers' voice in same time, to discuss the reliability and validity of the MCSS.

Method: Examined the acoustic energy contribution in resonance cavity of a baritone and a soprano during singing, by means of the MCSS, compared the differences of the energy distribution of the cephalic, laryngeal, thoracic resonance cavity to the peroral acoustic signal in each frequency partition at the same tone. All the subjects were professional singers and accepted 7 years professional training at least, the respiratory disease, neurological disorder, and auditory disorder were excluded. They were asked to sing /a/ and /i/ from low to high pitch 3 times, each tone was sustained over 10s. The MCSS were comprised by three surface vibration sensors, a microphone, an external receiver, and the accompanying computer software. The sensors were placed on the forehead (channel 4, CH4), the laminae thyroid cartilage (channel 3, CH3), and the sternal manubrium (channel 1, CH1), the microphone was place 15cm away from the mouth (channel 2, CH2), collected the acoustic signal. All the signals were calculated by the software, revealed as percentage presented the energy distribution in each frequency partition, and generated a visual energy percentage graph. The data were analyzed by the Pearson correlation coefficients (Retest method).

Results: The mean Pearson correlation coefficient between each time singing, the baritone were 0.987 ± 0.009 ($0.970 \sim 0.996$, /a/), 0.984 ± 0.009 ($0.967 \sim 0.997$, /i/), the soprano were 0.963 ± 0.024 ($0.917 \sim 0.992$, /a/), 0.979 ± 0.010 ($0.968 \sim 0.996$), the correlations were significant at 0.01 level. There is remarkable difference between singers and different singings. The tendency of the energy contribution changes are list as statistic graph by the end of the abstract.

Conclusion: The high correlation coefficient between each time singing and the difference between singers and different singings, reveal the great reliability and validity of MCSS, it's a feasible method to evaluate the function of resonance cavity. And there are different resonance usage according to the different gender, singing methods, and tones. The cephalic resonance cavity are more sensitive for high pitch singing, and the thoracic resonance cavity are more sensitive for low pitch.

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Automated Electroglottographic Shape Analysis: A Pilot Study

Objectives: Until now electroglottography (EGG) has been widely used in the clinic and in voice research. Its main quantitative parameters include: contact quotient, open quotient, and F0 extraction. Titze in 1990 described four distinct electroglottographic signal shapes which are used during voice assessment. However, little has been said about the possibility of quantifying the EGG shape. Many publications refer to the knee at the beginning of the closing phase or during the opening phase. However, to our knowledge, there are no quantitative nor objective ways to describe these types of events. Our goal is to propose an automated method to extract clinically relevant events in EGG waves and to classify EGG signal shape.

Methods: We conducted a retrospective study of patients evaluated for dysphonia at a private voice center, where electroglottographic measurements are routinely performed. Twenty-five samples of sound with an EGG waveform found to be consistent with “peak-skewing” by a PhD voice pathologist(CJM) were selected. Based on the waves' mathematical properties, we developed a tool in order to automatically extract relevant clinical information from the EGG signal. The events (knees) within the signal are quantified and reported by this tool. Blind to the automatic output, two medical voice specialists will manually evaluate the signals, (by sight). Correlation between the manual and automated methods will be determined. Correlation between EGG quantification and pathology will also be evaluated.

Results: We expect to find high correlation between the manual and automated analysis methods, and contribute, in that way, with a complimentary descriptive method of electroglottograms.

Conclusions: Automatic quantification of the EGG signal is possible and may help propose lines of research related to vocal fold pathology diagnosis and EGG signal shape.

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Voice Lab: Nuts and Bolts – Instrumentation for Clinically Relevant Voice Measures

Rationale: For evidence-based practice and healthcare reform, it is important to provide consistent objective documentation of voice disorders identified via diagnostic evaluation and treatment outcomes. However, the many available measurement systems make choosing the optimal instrumentation difficult for clinicians attempting to make practice decisions. Common voice measures come from laryngeal endoscopy, acoustic analysis, aerodynamic analysis, and auditory perceptual judgments, and are used in evaluations, treatment, and documentation. In addition, new instruments are in development and growing in popularity such as respiratory trainers, device apps, and amplification devices. Choosing the best options for a clinical practice can be overwhelming.

Goal: The goal of this session is to help provide clarity and information to clinicians so they can make the best decision for their practice and patients. We will speak about the variety of products available to measure laryngeal structure and function from endoscopy, voice quality from acoustic analysis, respiratory support from aerodynamic analysis and respiratory trainers, and treatment compliance from mobile apps. Products will be compared relative to function, cost, reimbursement, and clinical relevance.

The discussants and their topics are: Linda Carroll – Introduction. Ronald Scherer – overview and measurement concerns. Heather Bonilha - laryngeal endoscopy. Wendy LeBorgne - acoustic analysis and amplification systems. Susan Baker Brehm - aerodynamic assessment and respiratory trainers. Eva van Leer - use of apps for treatment compliance. Sarah Schneider - conclusions.

Outcomes: Attendees will be able to (1) explain the rationale behind using measurement systems for documenting voice disorders, (2) describe pros and cons of different measurement systems for measuring laryngeal structure and function from endoscopy, voice quality from acoustic analysis, respiratory support from aerodynamic analysis and respiratory trainers, and treatment compliance from mobile apps, and (3) list possible measurement concerns to be aware of when using measurement systems for documenting voice disorders.

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Psychosocial Distress in Patients Presenting With Voice Concerns

Objectives: To characterize the prevalence of psychosocial distress (depression, anxiety, somatization, and stress) in a consecutive sample of patients presenting with voice concerns.

Study Design: Cross-sectional study.

Methods: New patients presenting to a multidisciplinary voice clinic with voice concerns were invited to participate. Respondents (n = 197) completed the Brief Symptom Inventory 18 item scale (BSI-18), the 4-item Perceived Stress Scale (PSS-4), and the Voice Handicap Index 10 item scale (VHI-10). Qualitative analysis was performed of responses to an open-ended question about challenges associated with a voice problem.

Results: Approximately one-third (32%) of patients met strict case criteria for depression, anxiety, and/or somatic concerns based on the BSI-18. The majority of these patients had no prior diagnosis of depression or anxiety, and degree of distress was not predicted by type of voice-related diagnosis. Perceived stress was elevated among female patients ($p=0.02$). As expected, scores on the VHI-10 were indicative of concurrent voice-related handicap (mean 19.5, standard deviation 9.4). In qualitative analysis of responses regarding challenges associated with a voice problem, 19 themes were identified (e.g., threat to occupational functioning).

Conclusions: These findings identify a high prevalence of multiple types of distress among patients with voice disorders, representing a potential opportunity to provide more comprehensive care to this patient population.

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Visualizing Voice Dynamics with Phasegrams

“Normal” voice production is characterized by (nearly) periodic vocal fold vibration. The deviation from periodicity by introducing subharmonic or irregular oscillations is either inside (as, e.g., in the case of some singing styles or in certain mammalian vocalizations) or outside the voice’s normal range of operation (in the case of most voice pathologies). In order to assess these different oscillatory states, a novel tool for visualization and analysis of voice dynamics “on the way to chaos” is introduced: the phasegram.

Phasegrams combine the advantages of sliding-window analysis (such as the spectrogram) with well-established visualization techniques from the domain of non-linear dynamics. In a phasegram, time is mapped onto the x-axis, and various vibratory regimes, such as periodic oscillation, subharmonics or chaos, are identified within the generated graph by the number and stability of horizontal lines.

A phasegram can be interpreted as a bifurcation diagram in time. In contrast to other analysis techniques, it can be automatically constructed from time-series data alone: no additional system parameter needs to be known. Phasegrams show great potential for signal classification and can act as the quantitative basis for further analysis of oscillating systems in many scientific fields, such as physics (particularly acoustics), biology or medicine. The phasegram’s usefulness for voice analysis will be demonstrated by analyzing electroglottographic (EGG) signals of excised larynx experiments and singing and pathologic voice production.

Acknowledgements: This research was supported by an ERC Advanced grant no. 230604 ‘SOMACCA’, a start-up grant from the University Vienna (W.T.F.) and by the European Social Fund Project OP VK CZ.1.07/2.3.00/20.0057 (J.G.S.).

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Tracking Age-Related Voice Characteristics for more than Forty Years

Age-related structural and functional changes to the aerodigestive tract can affect breathing, swallowing, and voice. Not only can these changes shape an individual's quality of life, but they can ultimately be life-threatening. This presentation will present the results of a unique longitudinal study of voice changes in several individuals spanning an average of more than 40 years each. Changes in speech fundamental frequency, speech breathing, and voice bifurcations are tracked. Many of these changes begin between the ages of 68-74, indicating a fundamental change in the body's maintenance of the voice mechanism. For example, the instabilities appear to be related to specific vowel production, which may indicate a relation between the vocal source and the vocal tract. Next, passages from these longitudinal recordings were played for listeners, who were asked to give direct estimation of ages. . Listeners were able to accurately predict the talkers age within 5 years, comparable to previous age approximation studies using cross-sectional recordings. While previous studies of vocal aging exist, little exists when it comes to longitudinal samples of individual aging. How and where a talker is on the aging curve may assist both vocal trainers and clinicians in adjusting treatment plans.

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Stabilizing Acoustic Measures Using a Short Warm-Up Task

Many voice clinicians collect acoustic measures as a part of their diagnostic evaluation. These metrics include perturbation measures (e.g. jitter, shimmer), average F0, long-term average spectrum, cepstral peak prominence, etc. While these metrics are frequently collected, their reliability has been questionable due to the high degree of variability depending on acoustic environmental noise and behavioral elements that are outside of the clinicians' control. This study investigated the degree that variability could be mitigated by [1] using an accelerometer-based transducer to limit the microphone and noise influence; and [2] performing a short (one to two minutes) vocal warm-up task prior to collecting acoustic measures. Three subjects collected acoustic measures three times per day for six days, for a total of 18 recordings. At each recording session, the subject recorded three sustained /a/ vowels and read the Rainbow Passage. At nine of the sessions (alternating each day and from session to session), the subjects then performed a 1-minute warm-up task consisting of straw phonation exercises, and then repeated the acoustic measures. At the other nine sessions, subjects remained silent for one minute before repeating the acoustic measures. The variability across the measures from calculating metrics from the accelerometer signal was compared to the same metrics from the same tasks that were recorded with a microphone. Additionally, the change in variability or stability of the measures due to a short warm-up was also compared. The implications on clinical adoption of these techniques in both clinical economy and assessment effectiveness will be discussed.

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Comparison of Quantification Methods in Measurement of Respiratory Glottal Configuration

Introduction: Quantification methods for respiratory glottal configuration are needed for objective diagnostic analysis of laryngeal breathing disorders (e.g. PVFMD). However, the accuracy of image geometry can be influenced by the angle and distance of the endoscope in relation to the glottal plane. This methodological study investigated the margin of error present in these endoscopic variations to systematically account for these errors clinically, as well as to determine the most accurate metric method.

Methods: 18 ex-vivo canine larynges were measured manually with four metric methods: glottal area (GA), anterior-glottal angle (AGA), left-posterior-glottal angle (LPGA), and right-posterior-glottal angle (RPGA). A digital image of each larynx was taken under 27 counterbalanced condition combinations: distances (10mm, 20mm, 40mm), anterior-posterior (AP) angles (0°, 10°, 25°), and lateral angles (0°, 10°, 25°), with the lumen and the marginal edge of the superior vocal fold (SVF) landmarks as sub-conditions. The actual laryngeal measurements were compared to measurements of the digital images of each corresponding larynx, and a percentage error was calculated.

Results: Measurements were highly reliable between raters across the 4 metric methods for both physical and image measurements (ICC=0.866-0.989). Percent error and variability of error were lowest for lumen sub-condition and RPGA metric method (M=11.69, SE=1.54). The lowest incidence of error occurred in the lumen sub-condition and LPGA metric method (78% of images had less than 15% error). The greatest percentage of error occurred when the camera angle deviated 10° and 25° in the AP direction, with the least amount of error occurring when the AP angle was 0° within the 27 condition combinations.

Conclusion: Image measurement is most accurate with the lumen landmark and posterior angles, and when the AP camera angle is centered at the glottal plane. Distance of scope and lateral angle deviations have less impact on accuracy of laryngeal image measurements.

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Can Listeners Hear Who is Flat? The Role of Spectral Centroid

Objective/Hypothesis: Research has shown that stimuli with greater energy in higher harmonics can shift pitch perception upwards and that when the frequency difference of two stimuli is less than 2%, spectral centroid change is the primary predictor of perceived pitch change. This study seeks to answer the question, “Does the spectral centroid difference between sopranos and mezzo-sopranos affect the perception of pitch accuracy of these two voice categories?”

Study Design: Repeated measures factorial design.

Methods: For the pitches, A3, C4, B4, and F5, 3 source signals were synthesized with mean fundamental frequencies that varied by 0%, +2%, and -2% using a frequency vibrato rate of 5.6 Hz and a frequency vibrato extent of 50 cents. Each of the three source signals were filtered using 2 formant patterns, a lower formant pattern typical of a mezzo-soprano (pattern A) and a higher formant pattern typical of a soprano (pattern B) for the vowel /a/. For each pitch, the 6 stimuli were combined into all possible pairs. Using a scroll bar, the listener’s task is to indicate the degree to which the first stimulus in the pair was flatter or sharper than the second.

Results: It is anticipated that the differences in spectral centroid between the pattern A and pattern B stimuli will result in subtle differences in perceived pitch.

Conclusion: Models of pitch perception suggest that spectral pitch processing is utilized when pitch differences are less than 2%. If this is true, then it is possible that the lower spectral centroids of mezzo-sopranos compared to sopranos might result in the perception of lower pitch for mezzo-sopranos than for sopranos.

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Multi-dimensional Analysis on the Effect of Vocal Function Exercises on Aged Voice

Objectives: Voice is an important tool for communication and also essential to maintain quality of life. Unfortunately, for many older adults, the ability to use their voice declines with age. Aged-related change of voice is characterized as weak harsh, and breathy voice. This change is caused by histologic alteration of the lamina propria of the vocal fold mucosa as well as atrophy of the thyroarytenoid muscle. Several therapeutic strategies involving injection laryngoplasty and laryngeal framework surgery have been attempted to improve aged voice, but the effects were limited. The effectiveness of Vocal Function Exercises (VFE) for age related vocal fold atrophy has only been evaluated in two published studies. These results suggest that VFE may produce significant auditory perceptual and functional improvements in aged voice. The present study aims to determine the efficacy of VFE in the treatment of presbyphonia using multi-dimensional analysis.

Methods: Fourteen elderly patients with presbyphonia aged 64 to 81 years ($M=77.86$) underwent approximately 10weeks course of voice therapy mainly using VFE. GRBAS, stroboscopic examinations, aerodynamic assessment, acoustic analysis and Voice handicap index (VHI) -10 were performed at pre and post voice therapy. Normalized mucosal wave amplitude (NMWA) and Normalized glottal gap (NGG) were measured by image analysis on the stroboscopic examinations.

Results: After the treatment, all patients showed improvement of voice. Significant improvements were shown in GRBAS, maximum phonation time, pitch perturbation quotient (PPQ; jitter), NMWA, NGG and VHI-10.

Conclusions: The data suggests that VFE produces significant improvement on subjective, objective and patient-self evaluation, and deserves further attention as a treatment for the elderly patients with presbyphonia.

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The Prevalence of Voice Disorders in 9-1-1 Emergency Telecommunicators

Objective: Professional voice users rely on their voice to perform their job competently (Roy et al, 2004). Without a functional voice job performance, communication, and employment status are at risk (Williams, 2003). One profession that relies on a functional and pleasant vocal quality is dispatching for 9-1-1 emergency services. According to Michael Wallach, president of the national organization 911Lifeline, 9-1-1 emergency telecommunicators (dispatchers) not only rely on their voice for their profession, they use their voice heavily throughout their work shifts (personal communication, September 19, 2012). This increased voice use places them at risk for voice disorders. Despite the colloquial understanding that a clear, calm, pleasant voice quality would be necessary in situations of emergency, there is little research investigating the prevalence of voice disorders in this high-risk, public service population.

Methods/Design: The present study is a national survey, on vocal load, prevalence of hallmark symptoms of a voice disorder (e.g. hoarseness, coughing), past or present diagnosis/ treatment of a voice disorder, voice symptom's impact on work, and other relevant demographic information. This web-based survey will reach approximately 15,000 9-1-1 emergency telecommunicators through their professional organization. To date there are 135 respondents. In addition, the same survey will be sent to a control population, those who serve as emergency responders but do not rely on their voice extensively (e.g. firefighters, paramedics, police).

Results: Epidemiological analysis from the sample size will be presented with information on the prevalence of voice disorders, symptoms of a voice problem, and the impact on employment is indeed present in this population.

Conclusions: The information gained from this study is the first step in understanding the nature of voice problems in this population and will inform voice professionals on how to evaluate, treat, and ultimately prevent this problem in this population.

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Anti-Inflammatory and Wound Healing Effect of Acupuncture in Treating Phonotraumatic Vocal Fold Pathologies

Background: Acupuncture has been shown to be effective in bringing about improvements in benign vocal lesions and vocal function (Yiu et al., 2006). The underlying biological mechanism of acupuncture in the treatment of benign vocal pathologies is not fully understood yet. The improvement is, however, not a result of stress reduction that is often attributed to acupuncture (Kwong & Yiu, 2010).

Objective: This study set out to investigate whether acupuncture would influence the anti-inflammatory process in vocal fold lesion healing.

Methodology: Secretions from the vocal fold surfaces of 17 subjects with phonotraumatic lesions were collected before and after a 30-minute session of genuine (N=9) or sham (N= 8) acupuncture procedures, and again 24 hours after baseline. Genuine acupuncture involved needling at voice-related acupoints Renyin (St9), Lianquan (Ren23), Lieque (Lu7), Hegu (Li4) and Zhaohai (Ki6), while the sham acupuncture used a procedure in which subjects were made to believe that they received needles at these acupoints but in reality the needles did not penetrate the skin. Protein levels of pro-inflammatory cytokine interleukin (IL)-1 β and anti-inflammatory cytokine IL-10 were measured in these secretion samples using enzyme-linked immunosorbent assay (ELISA).

Results: Pro-inflammatory IL-1 β concentrations increased significantly over time in the sham acupuncture group (Friedman's 2-way ANOVA=7.6, df=2, p=0.02) while anti-inflammatory cytokine IL-10 concentrations increased significantly after treatment in the genuine acupuncture group (Friedman's 2-way ANOVA=6, df=2, p=0.05). The anti-inflammatory effect following one session of acupuncture was, however, only short-lived; IL10 concentrations returned to at the 24-hour follow-up time point.

Conclusion: Results suggested that genuine acupuncture, when compared with sham acupuncture, enhanced anti-inflammatory responses in subjects with phonotraumatic vocal fold lesions.

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Prevalence of and Risk Factors for Chronic Hoarseness in Australian Group Fitness Instructors

Objective: To (1) determine the prevalence of chronic hoarseness experienced by group fitness instructors (GFIs), and (2) determine a set of factors that can reliably be used to predict GFIs at risk of developing chronic hoarseness.

Methods: A total of 361 GFIs (81 males, 280 females), aged between 18 and 67 years currently active in the Australian fitness industry completed a 65-item self-completion questionnaire distributed via SurveyMonkey. Demographic, lifestyle and voice use variables thought to influence vocal health and voice production in the GFI population were examined using univariate and multivariate regression modelling to develop prognostic criteria for GFIs at risk of developing chronic hoarseness.

Results: The prevalence of self-reported chronic hoarseness within the cohort of GFIs was 38% (n = 142). Regression modeling revealed a core set of statistically significant parameters which showed moderate sensitivity (65.60%) and strong specificity (82.35%) for detection of risk for chronic hoarseness. These include: increasing age, partial voice loss while instructing, partial voice loss after instructing, and using vocal volume louder than the normal speaking voice whilst instructing.

Conclusion: The results of this study confirm that chronic hoarseness represents a significant occupational hazard for GFIs. The risk factors identified by the present study should be considered in the development of voice education packages tailored to GFIs in order to investigate the preventive potential of such information.

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Speech Characteristics in Future Professional Voice Users

Purpose: The purpose of this study was to investigate the vocal and articulation characteristics in future professional voice users (students speech language pathology).

Methods: The data of 600 bachelor students (first year) with a mean age of 18 years were analyzed regarding the perceptual (consensus) evaluation of the voice quality (using the GRBAS scale), vocal pitch and intensity and the articulation of all the Dutch vowels and Dutch consonants.

Results: A perceptual voice disorder (with a mean GRBASI of G 0.32 R 0.45 B0.16 A 0.03 S 0.14) was observed in 27% (161/600) of the subjects. In 8.5 % (51/600) of the subjects a pitch related problem or an intensity related (17%, 103/600) vocal problem was present. The most prominent articulation disorders were decreased jaw movement during the articulation of the /aa/, an open articulation of the /e/, and addental or interdental articulation of the alveolar sounds.

Conclusion: The use of a very detailed screenings protocol focused on vocal and articulation characteristics in future professional voice users starting the master program of logopedic and audiology sciences is needed for several reasons: 1. To diagnose the presence of vocal and articulation disorders 2. to increase the self- identification of these disorders and 3. To start an appropriate rehabilitation program

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A Survey of Equipment in the Singing Voice Studio and Its Perceived Effectiveness by Vocologists and Singers

Speech pathologists have long used technology for the clinical measurement of the speaking voice, but current research shows that singers may require a select set of measurements that differ from those used for standard voice services. Recent studies also have shown that vocal pedagogues and voice students are becoming more accepting of technology in the studio. As a result, the equipment and technology utilized in singing voice studios by clinical vocologists (speech-language pathologists) and performing vocologists (vocal pedagogues) are changing. While guides exist regarding equipment and technology necessary for developing a voice laboratory and private voice studio, there are no data documenting the current implementation of these items and their perceived effectiveness in evaluations, therapy and lessons.

This study documents the results of a survey distributed to clinical and performing vocologists working in diverse academic and private settings in the US to determine current trends in equipment used in voice laboratories and studios. The survey also addresses the perceived clinical effectiveness of these items. A second survey was distributed to US vocalists to gain information regarding their attitudes regarding the effectiveness of equipment used in the singing voice laboratory and studio. The results of the study will serve to determine: 1) any discrepancies between perceived effectiveness of equipment used in the vocal studio by vocologists and voice students, 2) how vocologists are outfitting their studios, 3) the items perceived to be most effective in a studio, and 4) differences between clinical and performing vocologists' studios. Furthermore, the data collected in this study will provide a basis for further research regarding these issues as the field develops.

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Examination of the Cepstral Spectral Index of Dysphonia in Children with Bilateral Vocal Fold Lesions Following Voice Therapy

Objective: The objective of this study is to examine the use of the Cepstral Spectral Index of Dysphonia (CSID) in documenting treatment outcomes in children with bilateral vocal fold lesions. The CSID is a quantitative value of dysphonia (scale is 0 -100) and can be utilized to analyze continuous speech samples.

Methods/Design: Recordings of sentences elicited from the Consensus Auditory Perceptual Evaluation of Voice (CAPE-V) were obtained from 8 children with a mean age of 7.38 years (SD = 1.69; females=4; males=4). The children from whom the samples were obtained are included in a larger study examining outcomes of behavioral voice therapy in children with bilateral vocal fold lesions. Children in the study complete a minimum of 8 weeks of therapy focusing on vocal hygiene, vocal function exercises, and resonance therapy. Data collection for this study is anticipated to end in 6 months and the total number of children who will have completed voice therapy is expected to be between 20 and 25.

Results: The Analysis of Dysphonia in Speech and Voice (ADSV; KayPENTAX) software was utilized for the initial analysis of the recorded sentences. The CSID value from this software was generated for the *easy onset sentence* and *all voiced sentence* from the CAPE-V. The average *easy onset sentence* CSID values were 29.152 pre-therapy and 28.734 post-therapy. The average for *all voiced sentences* CSID values were 25.565 pre-therapy and 20.811 post-therapy.

Conclusions: The initial findings of this study show a trend for decreasing CSID values following therapy aimed at improving voice quality, particularly for the *all voice sentence*. Additional examination of this data which will include a sample of 20-25 children, will explore correlations of the CSID value with expert CAPE-V perceptual ratings of the selected sentences, as well as correlations with changes observed during laryngostroboscopic evaluations pre- and post-therapy.

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The Effect of Telepractice on Television Reporters

Objective: To analyze the effect of virtual speech and voice training (telepractice) on television reporters' speech.

Method: This retrospective study used the patient records of 16 television reporters from a broadcast television network undergoing oral communication training, with focus on voice and speech. The reporters were assigned to two groups, depending on the type of therapy received: the in-person group; and the virtual group, whose members received speech and voice training virtually via the internet. Two reporting stories were prepared for each professional, one before and one following the training. The stories were randomized and assigned to the professional, for a total of 16 pairs of reporting stories. Three speech language pathologists blinded as to the state of speech language therapy judged the data (the television report). The judges employed an auditory-perceptual and a visual-perceptual assessment protocol and a further evaluation to analyze each professional's performance and to assess how natural the reported appeared/sounded.

Results: According to the judges' assessment, both groups showed improvement after the training. In terms of the score from the auditory-perceptual and visual-perceptual assessment, there was significant difference in moments assessed for six parameters in the virtual group (posture, gestures, expressions, vocal quality, pauses and emphasis) and for one parameter in the in-person group (pitch). According to the judges, 61.53% of the reporters in both groups better engaged the viewer in the story following speech therapy, and 69.23% conversed better with the viewer and reported the story in a more natural manner.

Conclusion: This preliminary study shows that both in-person training and virtual speech and voice training improve the vocal and communication performance of television reporters, confirming the results and feasibility of providing speech therapy over the internet (virtual speech monitoring). Improvement was most notable among interpreting parameters, primarily with the virtual group.

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Behavioral Treatment of Muscle Tension Voice Disorders: Exploring the Evidence

Objective: A systematic review of the scientific support behind behavioral therapy for the treatment of adults with muscle tension voice disorders (MTVD). Three questions were investigated: (1) is behavioral therapy effective? (2) is there support to show that one /some methods of therapy are more effective than another/others? (3) if positive effects are shown, what are the ‘active ingredients’ (variables responsible for treatment effects) of voice therapy?

Methods/Design: A systematic search of 11 electronic databases was conducted to obtain peer reviewed articles, conferences proceedings and theses from the years 1990-2013 of all levels of experimental design and case series. Additional papers were identified from reference lists. Inclusion and exclusion criteria were applied to the publications to determine eligible papers which were then appraised according to predetermined variables of interest. Methodological quality rating scales and a confidence in diagnostic scale were used to support the literature evaluation.

Results: Six papers met the inclusion criteria, representing two randomised controlled trials, two non-randomised controlled trials, a case series and a single subject experimental design. Significant improvement on at least one outcome measure was reported for seven out of eight treatment groups. No study examined voice techniques in isolation. Methodological qualities of research were varied, reporting of therapy procedures was limited, outcome measures were used inconsistently and confidence in the accuracy of participant diagnosis in five papers was low.

Conclusion: Findings indicated that there is currently no clear evidence regarding what specific ‘active ingredients’ are responsible for therapy effects with most component parts of treatment based on opinion rather than experimental evidence. Results suggest that voice therapy has the potential to become a proven method of effective treatment for MTVD; however, there is an obvious need for high quality and experimentally controlled research to expand the evidence base for the behavioral treatment of MTVD.

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Common Practices of Australian Speech-Language Pathologists in the Management of Paediatric Vocal Health

Objective: This study aimed to determine the common approaches taken by Australian speech language pathologists (SLPs) in the management of paediatric voice caseloads.

Methods & Results: Forty-eight Australian SLPs with a current paediatric voice caseload completed an online questionnaire containing 38-items related to assessment, treatment and discharge procedures used in managing a paediatric voice caseload. Paediatric voice comprised between 1-100% of the respondents' caseloads ($M = 8.27\%$, $SD = 17.71$). Eight respondents (16.6%) considered themselves to be a voice specialist. Perceptual ratings of voice disorders were used more frequently than instrumental assessment tools throughout the management process. Respondents considered instrumental assessment by an Ear Nose and Throat (ENT) specialist to be important however reported barriers related to ENT service constraints (e.g., ENT availability and long waiting lists) and the associated cost to the client. A range of direct and indirect voice therapy approaches (often in combination) were employed by the respondents, usually determined by client specific factors. Respondents reported that it was more common for patients to be formally discharged ($M = 42.32\%$; $SD = 41.1$) than to self-discharge ($M = 24.71\%$; $SD = 31.78$). The most commonly used outcome measures were clinician judgement, pre/post voice recording comparison, and review of results from a follow-up ENT assessment. Quality of life scales were rarely used as outcome measures. The majority of clinicians (56.25%, $n = 27/48$) indicated that they did not feel confident when managing children with voice disorders, and would welcome further training in the area.

Conclusion: This investigation captured current practice of Australian SLPs managing paediatric voice caseloads. This data allows for comparison with management approaches in other countries. The findings highlight a need for further training in this area, particularly to enhance translation of recent research evidence into clinical practice.

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Relationship between SPL and Subglottal Pressure in Untrained Voices

Vocal loudness is strongly dependent on subglottal pressure. The relation between them has been analyzed in several investigations, all showing a linear relationship between the SPL and the log of the pressure. For example, Schutte (1980) analyzed the relation in 21 female and 24 male subjects who produced a great number of samples at different degrees of vocal loudness and at the subjects' preferred pitch. Pressure was measured by means of an esophageal balloon. Tanaka and Gould (1982) analyzed 10 subjects each producing vowels at three loudness levels at comfortable pitch. Pressure data were obtained from a plethysmograph, with the subject sitting in an airtight box. Pressed phonation is characterized by a high subglottal pressure producing a comparatively low SPL, so the pressure – SPL relationship would be affected by glottal adduction and possibly also by F0. Therefore normative data from healthy voices should be of interest.

In the present study 15 female and 15 male normal voices were asked to produce diminuendo and crescendo sequences of the syllable /pae/ at four pitches, equidistantly spaced within an octave. A total of 106 sequences were recorded. Trendlines were used to approximate the relation between SPL and the log of subglottal pressure. The resulting regression equations were used to calculate the average SPL increase for doubling of pressure and the SPL produced by a pressure of 10 cm H₂O. The results showed an average correlation coefficient of 0.835 and 0.826 for female and male subjects. A doubled pressure produced an SPL increase of 10.9 dB (SD 4.1) and 9.2 dB (SD 3.4) for the female and the male voices. On average, a subglottal pressure of 10 cm H₂O produced an SPL @ 0.3 m of 77.7 (SD 5.1) and 79.9 dB (SD 4.3) for the female and the male voices. These data are about 4 dB lower than those reported in previous studies. The difference, which would be due to the relationship between F0 and Psub, suggests that F0 should be taken into account when comparing relationships between SPL and Psub.

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Prospective Study of Treatment of Voice Problems in Teachers: Preliminary Results

Purpose: To assess the value of a novel web-based voice hygiene education (VH) versus voice hygiene + voice production training (VH+VP) for the treatment of voice problems in teachers.

Methods: $N=108$ student and professional teachers in the US and Hong Kong, who self-identified as having a voice problem were enrolled in a prospective therapy program, and received either a personalized VH intervention; VH+VP interventions (similar to Lessac-Madsen Resonant Voice Therapy), or no intervention. The VH and VH+VP groups received one intervention face-to-face, during a single day, followed by a four-week internet monitoring period with personalized feedback. One year later, participants received a web-based booster of their assigned intervention, followed by an internet monitoring period. Follow-up measures were collected 1, 3, 12, and 24 months after their first intervention date. The VHI served as the primary outcome measure.

Results: Considering the greatest change from baseline in VHI scores across all follow-up time-points, all groups showed some evidence of improvement over time. For the greatest change parameter, the VH+VP group showed the most improvement ($M = -11$, $SE = 3$), followed by the VH ($M = -8$, $SE = 5$) and the control group ($M = -2$, $SE = 2$), $p < .05$ for all comparisons. All three groups showed improvement in VHI at all follow-up time-points (1 mo, 3 mo, 12 mo, 24 mo). The VH+VP group saw the biggest improvement (largest VHI decreases) starting at 12 mo, and this trend continued through the 24 mo mark.

Conclusions: Preliminary results indicate that a significant decrease in self-perceived voice handicap occurs following a personalized voice hygiene program combined with voice production training in teachers with voice problems. Results were consistent across institutions. Results indicate that a unique voice training program combining live and web-based interventions may be beneficial for teachers with voice problems.

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Acoustic Analysis of Four Common Voice Diagnoses: Moving Towards Disorder-Specific Assessment

Purpose: (1) assess treatment success via time- and frequency-based voice laboratory measurements pre-post an intervention in patients with four common voice problems; and (2) determine if outcome sensitivity of certain voice laboratory measures varies with disorder type.

Methods: $N=40$ patients with single voice disorder diagnosis: primary muscle tension dysphonia (MTD), benign vocal fold lesions, vocal fold atrophy, unilateral vocal fold paralysis (UVFP), underwent baseline testing, a single intervention-type (phonosurgery/therapy), and follow-up at uniform time-points. Time- and frequency-based acoustic measures, and patient-perceptual analysis (VHI-10), from $n=10$ patients per diagnosis group were analyzed pre-post treatment.

Results: Clinically meaningful improvements are reported. Patients with MTD improved in VHI-10, low/high spectral ratio standard deviation (L/HRatio-SD) and CSID speech. Patients with lesions improved in VHI-10, cepstral peak prominence (CPP) vowel, CPP speech, and CSID speech. Patients with atrophy improved in CPP vowel, but improved the least in CSID and L/HRatio-SD. Patients with UVFP improved in VHI-10 and CSID, L/HRatio-SD CPP speech and CPP vowel. The majority of patients in each group reported a percentage improvement following intervention. No group demonstrated change in noise to harmonic ratio or L/HRatio following intervention.

Conclusions: For all groups, treatment was successful in improving patient-perception of voice handicap and acoustic voice parameters. Time-based measures alone do not appear to be as robust when compared to frequency-based analysis. Frequency based measure (CSID) response reflected change in voice handicap (VHI-10), a well-established voice treatment outcome measure. CSID speech and CPP vowel appear to be the most robust for assessing change in all groups, including atrophy. L/HRatio-SD demonstrated increased vocal stability in MTD/paralysis patients, least in atrophy patients. This study was the first to demonstrate sensitivity of CPP for detecting change in response to treatment.

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Efficacy of Cool-Down Exercises in the Practice Regimen of Elite Singers

Objectives: Cool-down exercises are routinely prescribed for singers, yet little data exist regarding their efficacy. The purpose of the present study was to compare recovery methods by measuring phonation threshold pressure (PTP), acoustic measures (accuracy of tone production, duration of staccato notes and duration of intervals between notes), perceived phonatory effort (PPE), and Singing Voice Handicap Index (SVHI) following rigorous voice use.

Methods: Data were collected on separate occasions after 10-minutes each of cool-down exercises, complete voice rest, and conversation immediately following 50-minute voice lessons, and again 12-24 hours later. Participants included elite singers (7 women, 2 men) enrolled in the graduate program at the University of Cincinnati's College-Conservatory of Music.

Results: Statistical analyses yielded variable results regarding the effects of cool downs on vocal function. Statistical significance was noted in the following: PTP estimates after cool-downs were significantly higher at the 80% level of the pitch range. Statistically significant correlations between PTP estimates and PPE scores were found when comparing levels of the participants' pitch ranges (10%, 20%, 80%). Staccato notes and duration between them were significantly shorter after the conversation condition as compared to voice rest and 12-24 hours after voice rest, respectively. Statistical significance was noted in comparison of mean SVHI scores 12-24 hours after cool-downs and baselines.

Conclusions: The relationship between vocal cool downs and their aerodynamic and acoustic effects remains unclear. The perceived benefit of vocal cool downs was most apparent 12-24 hours later. Cool-down exercises may be most beneficial as they foster optimum, resonant voice use which may carry over into conversational speech.

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Effect of Water Resistance Therapy on Vocal Fold Vibration: A High Speed Registration Study

This study aimed to observe the effect of tube phonation into the water on vocal fold vibration. Two male and two female volunteer subjects went through a laryngeal high speed camera registration. Participants phonated a sustained vowel-like sound into a flexible plastic tube (45 cm in length, 2 cm in inner diameter) with the outer end submerged into the water. Two test sequences were performed: 1) phonation pre, during and post tube submerged 5 cm into the water, tube phonation lasting for *five minutes*, and 2) phonation during tube submerged 5 cm, 10 cm, and 18 cm into water, each condition lasting for 5 *seconds*. Sequences of the vocal fold vibration in pre and post tube samples were obtained via a rigid endoscope attached into a plastic mouth piece. The flexible tube was also attached to the same mouth piece. Analysis of video samples was carried out with phonovibrograph. Closed quotient (CQ), closing quotient, amplitude quotient, amplitude-to-length ratio (ALR), maximum area declination rate (MADR) and various frequency and amplitude perturbation values were calculated from all samples. Results from the first test sequence showed a decrease in the frequency perturbation values during and after phonation into a tube submerged 5 cm into water. F0 showed individual but small variation. Results from the second test sequence (during 5, 10 and 18 cm under the water), demonstrated that in most cases CQ, MADR and ALR decreased during phonation into 5 cm water, while in some cases the opposite results were observed when having the tube deeper in water. The results suggest that phonation into a tube in 5 cm water has a stabilizing effect on phonation, and it does not seem to be likely that collision force during the exercise would increase substantially. When using higher water resistance this may not be excluded.

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Vertical Laryngeal Position, Laryngeal Compression and Pharyngeal Constriction During Eight Different Semi-Occluded Vocal Tract Postures

High vertical laryngeal position (VLP), pharyngeal constriction, and laryngeal compression are common features associated with hyperfunctional voice disorders. The present study aimed to observe the effect on these variables of different semi-occluded vocal tract postures in 28 subjects diagnosed with hyperfunctional dysphonia. During observation with flexible endoscope, each participant was asked to produce eight different semi-occluded exercises: lip trills, hand-over-mouth technique, phonation into four different tubes, and tube phonation into water using two different depth levels. Participants were required to produce each exercise at three loudness levels: habitual, soft, and loud. To determine the VLP, anterior-to-posterior (A-P) compression, and pharyngeal width, a human evaluation test with three blinded laryngologists was conducted. Judges rated the three endoscopic variables using a five-point Likert scale. An intraclass correlation coefficient to assess intrarater and interrater agreement was performed. A multivariate linear regression model considering VLP, pharyngeal width, and A-P laryngeal compression as outcomes and phonatory tasks and intensity levels as predictive variables were carried out. Correlation analysis between variables was also conducted. Results indicate that all variables differ significantly. Therefore, VLP, A-P constriction, and pharyngeal width changed differently throughout the eight semioccluded postures. All semioccluded techniques produced a lower VLP, narrower aryepiglottic opening, and a wider pharynx than resting position. More prominent changes were obtained with a tube into the water and narrow tube into the air. VLP significantly correlated with pharyngeal width and A-P laryngeal compression. Moreover, pharyngeal width significantly correlated with A-P laryngeal compression. VLP, A-P laryngeal compression, and pharyngeal width can be modified by semi-occluded vocal tract exercises in subjects diagnosed with nonorganic hyperfunctional dysphonia.

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Interactive Web Portal Use to Promote Self-Management and Progress in Therapy: A Tool for Children with Voice Disorders

Objective: To report interim data regarding participant and clinician use of an interactive practice portal designed to facilitate parent and child self- management of a (pediatric) voice disorder. The Web portal (www.myvoicecare.org) was constructed as part of a larger funded study that is investigating the feasibility of using telehealth to deliver care to children with voice disorders. Components of the portal's functionality include a public-facing home page with instructions/basic *therapeutic* information; file management modules that are used by both the *clinician and participants* to upload audio/video files and complete questionnaires, and the ability to export all participation data for purposes of analysis.

Methods: The Web portal is designed to deliver daily individual secure practice "sessions" consisting of a mix of informational and interactive content. At the end of each weekly synchronous session, the voice clinician uploads modified verbal/audio-video and visual materials to serve as guides for practice throughout the next week. The participant is instructed to practice their assignments 5/7 days per week for 8 weeks. These daily practice sessions last approximately 10-15 minutes. Via the portal, the investigators are able to track progress in therapy, compliance, technology stability, satisfaction and cost for the participant and the clinician.

Results: Forthcoming-The Web portal construction has just been completed and is now live for participant enrollment. Data for 5 participants who have completed their 8 week study enrollment will be reported. Data for up to 200 practice sessions (across 5 participants) will be summarized and analyzed. Categories of data include patterns of use, satisfaction, technology stability and compliance. Compliance will be measured in part by monitoring participant access to the Web portal and data completion.

Conclusions: Long-term we aim to prove that this model of service delivery can be standardized and used to consistently deliver a high level of care, evaluate treatment outcomes and reduce the chronic nature of childhood voice disorders.

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DigitalVHI – a Multi-Lingual Freeware Software Application to Capture Voice Handicap Index Data

The voice handicap index (VHI) is a questionnaire to quantify the functional, physical and emotional impacts of a voice disorder on a patient's quality of life [1]. The VHI has been used in numerous studies as an indicator for finding evidence of voice disorders, and as a retrospective test of the outcome of clinical interventions.

Despite the widespread use of the tool, to the best of our knowledge, there does not seem to be any computer software available to facilitate the computer-aided capture of VHI data. Such software is needed to store the questionnaire results electronically, to automatically calculate the final scores as well as to facilitate handling the data for clinical studies.

Here, we introduce DigitalVHI, a freeware open source software application to capture Voice Handicap Index data [2]. Both a Mac OS X and a Microsoft Windows version, as well as the original Python source code are available for download at <http://www.christian-herbst.org/DigitalVHI/>

DigitalVHI consists of a simple user interface, which has successfully been tested over a period of two years in the voice clinic led by author JV. The final result of each questionnaire data acquisition is saved as a PDF file, and the collected data is appended to a file in CSV format (data can then be imported to OpenOffice, Microsoft Excel, R, SPSS, etc., for further processing). To maximize data security of sensitive patient data, no internet connection is required to run the software. The DigitalVHI user interface (including all questionnaire data) can be easily translated to any language by creating additional language packs.

Acknowledgement: This project has been co-financed by the European Social Fund and the state budget of the Czech Republic within the project no. CZ.1.07/2.3.00/30.0004 "POST-UP" (CH, JGS) and the projects no. CZ.1.07/2.4.00/17.0009 and CZ 1.07/2.3.00/20.0057 (JV, JGS).

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Estimated Subglottic Pressure Evaluation According to Vocal Pathology. Study on 418 Patients

Estimated subglottic pressure (ESGP) is part of the aerodynamic measurements included in the vocal profile. It is an indication of vocal effort and can guide the therapist in his clinical approach.

We aim to examine the clinical interest of the ESGP by observing its values according to voice pathology, age, gender and sound pressure level. We also examine the relationships between PSGE, DSI and VHI.

Method: The study includes 418 patients (M:118/W:300). Each patient's file consists of VLS, acoustic, aerodynamic and perceptual measures. The ESGP was collected through the Phonatory Aerodynamic System Model 6600 (KayPentax). Patients produced 3 sequences of / ipipi / at low (IL), conversational (IC) and high (IH) intensity. Patients were grouped according to the ENT's diagnosis.

Results: Patients without vocal lesions (MTD) had a significantly lower ESGP compared to patients with nodules, polyps, inflammation, edema (IL, IC), cysts (IC) or scar (IC). Patients with vocal fold atrophy had a lower ESGP than those suffering from nodules and polyps at conversational and high intensity, but were not differentiated at low intensity. Amongst patients without lesions (MTD), a positive correlation appeared between ESGP and intensity; which was not the case for patients with lesions. At high intensity, men had a significantly higher ESGP than women. At low intensity, we noted a positive correlation between the VHI scores and ESGP levels. At low and conversational intensity, we observed a negative correlation between DSI and ESGP scores.

Conclusion: This study highlights the importance of considering ESGP in the vocal profile. As expected, patients with vocal pathology produce high ESGP. However, the correlations between intensity and ESGP vary depending on the patient's pathology. In addition, ESGP values allow the clinician to distinguish MTD and healthy patients and thus could help the therapist in his clinical approach.

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The Effectiveness of the Comprehensive Voice Rehabilitation Program Compared with the Vocal Function Exercises Method in Behavioral Dysphonia: a Randomized Blinded Clinical Trial

Objective: To evaluate the effectiveness of the Comprehensive Voice Rehabilitation Program (CVRP) compared to Vocal Function Exercises (VFE) to treat functional dysphonia.

Methods: 80 voice professionals with more than six months with voice complaints and functional dysphonia diagnostic were randomized into two equally sized voice treatment groups: CVRP and VFE. The volunteers were submitted through a program consisting of three evaluations and six voice treatment sessions by two trained SLPs. The evaluations were conducted before speech therapy, at the end of the treatment and one month following the treatment sessions. The outcomes evaluated were the scores obtained according to the Voice-Related Quality Of Life Index (VRQOL), the Voice Handicap Index (VHI), a perceptual evaluation of the subject's voice and a visual examination of the larynx. Otorhinolaryngology and speech therapy evaluations were blinded.

Results: The randomization process produced comparable groups in terms of age, gender, signs and symptoms. Both groups produced positive effects in average after treatments. The CVRP effect size was 1.09 for the VRQOL, 1.17 for the VHI, 0.79 for perceptual evaluation of the voice and 1.01 for visual examination of the larynx. The VFE effect size was 0.86 for the VRQOL, 0.62 for the VHI, 0.48 for the perceptual evaluation of voice and 0.51 for the visual examination of the larynx. Ten percent of patients were lost over the course of the study.

Conclusion: The CVRP was as effective as VFE in a comparison of continuous data. According to a categorical analysis, the probability of a patient improving on account of treatment under the CVRP was similar than on account of treatment using VFE.

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Development of The Voice Catastrophization Index Submission of an Oral Presentation or Poster Presentation in the Category of Speech-Language Pathology

Objective: Catastrophization is a form of cognitive distortion which causes an exaggerated negative mental set to arise during painful experiences. Pain catastrophization is well documented in the pain literature. Only one study has been done to define the extent of catastrophization experienced by patients with voice disorders. The Voice Catastrophization Index (VCI) has been validated in normal populations as well as dysphonic populations. This study is designed to investigate test re-test reliability of the VCI, as well as sensitivity to change following treatment.

Method: The VCI was developed based on the Pain Catastrophization Scale (PCS). The VCI was validated on a population of 120 patients who presented to an otolaryngology clinic. In the present study, test re-test reliability and sensitivity to change of the VCI is investigated.

Results: There was a significant difference between control and disordered groups on VCI ($t=5.020$, $p<.05$). The VCI demonstrates excellent internal consistency overall (Chronbach's Alpha = .970). We hypothesize that the VCI will continue to be elevated in patients whose clinician rated level of dysphonia is discrepant to the patient's reported impact on their quality of life. Furthermore, we hypothesize that voice catastrophization will be lower in patients following treatment for dysphonia and remain relatively constant in patients who receive no treatment.

Conclusion: With this information, we hope to be able to better treat voice disorders by developing an explanatory model for the discrepancy between perceptual voice evaluation and VRQOL differences and perhaps use voice catastrophization as a predictor for success in therapy.

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Intensity of Vocal Deviation in Visual Analog Scale for Elderly Adults

Objective: To determine the cut-off values of the different degrees of vocal deviation in the visual analog scale (VAS) for elderly adults based on the ratings of the numerical scale (NS).

Method: 142 voice sample (plus 10% of repetition for reliability analysis) from elderly adults with and without vocal complaints, mean age of 69 years old, 82 women and 60 men. The auditory-perceptual evaluation was performed by 3 speech language pathologists in two sessions. The task was to rate the overall severity of vocal deviation from a connected speech sample (counting numbers from 1 to 10). In the first evaluation session, the judges performed a perceptual assessment with the 100mm VAS and, in the second one the same judges employed the NS. ROC Curve was used to establish the discrimination power of the measure (sensitivity, specificity and efficiency).

Results: There was high level of agreement interjudges in both scales: 87% in VAS and 89% in NS. The concordance intrajudge ranged from 94 to 95% in VAS and from 70 to 94% in NS. The cut-off values obtained were 35,6mm, 51,1mm e 74,3mm, with 4 distribution ranges: 0 – 35,6 for normal variation of voice quality (0 or 1 NS); 35,7 – 51,1 for mild to moderate deviation (1 or 2 NS); 51,2 – 74,3 for moderate deviation (2 NS); and 74,4 – 100mm for severe deviation (3 NS).

Conclusion: The cut-off values of the different degrees of vocal deviation in the VAS for elderly were obtained and may be an interesting tool in vocal screening.

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Laryngeal Subvocalization During Non-Vocal Linguistic Tasks

Introduction: Some investigators seek to investigate the “stress response” of the intrinsic laryngeal muscles (ILMs) via electromyography. When ILM activity increases in the face of a stressor, a logical assumption is that the observed muscle activation is part of a laryngeal stress response. However, when the stress-inducing condition is nonverbal yet involves linguistic elements—for instance, in a speech *preparation* task—the phenomenon of “subvocalization” should be considered as a competing theory. Evidence of subvocalization (also referred to as “silent speech”) has been reported in supraglottic speech muscles, and at the simplest level involves low-grade muscle activity during reading or other forms of mental activity. The aim of the present study is to identify whether a similar phenomenon occurs at the level of the ILMs, in which case appropriate baseline tasks should be designed to control for the confound of laryngeal subvocalization in future studies.

Methods: 40 vocally healthy adult females underwent fine wire electromyography of the following ILMs: unilateral posterior cricoarytenoid, bilateral thyroarytenoid/lateral cricoarytenoid muscle complex, and bilateral cricothyroid. Participants then engaged in two 3-min tasks, with task order counterbalanced across participants. During the “at-rest baseline” condition (BLrest) participants rested quietly while watching a video of emotionally neutral stimuli. During the “subvocalization baseline” condition (BLsubvoc) participants engaged in a non-stressful nonverbal task that involved imagining themselves speaking.

Results: Data analysis is ongoing at this time. Based on preliminary examination, raw waveforms are consistent with previous findings of studies reporting that some individuals engage in subvocalizing behaviors, whereas others do not.

Conclusions: The present study is the first to examine the phenomenon of subvocalization at the level of the larynx. These findings have theoretical and methodological implications for experiments (both laryngoscopic and electromyographic) that seek to examine the laryngeal stress response via tasks that involve linguistic elements.

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Intrinsic Laryngeal Muscle Response to Psychological Stress: Psychological and Cardiovascular Predictors

Introduction: Stress impacts the voice. Part of this effect may occur in the intrinsic laryngeal muscles (ILMs). Treatment of certain voice disorders is predicated on the belief that ILMs are a target of stress-induced voice changes, specifically vis-à-vis increased muscle tension. Within that context, some propose that personality traits like Stress Reactivity may impact one's predisposition to certain voice disorders. Moreover, consideration of autonomic nervous system contributions is warranted. Thus, a second factor in ILM stress response may be the strength of the parasympathetic nervous (rest-and-digest) system.

Methods: 40 vocally healthy adult females were subjected to a stress-inducing speech preparation task. Measurements of heart rate, blood pressure, and trapezius muscle (positive control site) activity were obtained before and during stressor exposure to confirm physiological stress response. Additionally, fine wire electromyography of the following ILMs was performed: unilateral posterior cricoarytenoid, bilateral thyroarytenoid, and bilateral cricothyroid. Surface electromyography of the tibialis muscle was performed as a negative control.

Results: Quantitative data analysis is currently ongoing, but initial inspection of raw waveforms supports the hypothesis that the ILMs and trapezius significantly increase in activity during stress compared to baseline, and the tibialis does not. Measures of personality and parasympathetic nervous system "tone" will be examined for their ability to predict ILM activity. Specifically, Trait Stress Reactivity scores will serve as the first predictor variable. The second variable, respiratory sinus arrhythmia, is considered a strong indicator of the strength or tone of the parasympathetic nervous system.

Conclusions: The present study will characterize the ILM response to psychological stress, and may further elucidate the contributing roles of trait Stress Reactivity and autonomic function in laryngeal muscle tension. This study will prepare a platform for future studies on individuals with common and somewhat poorly understood disorders often thought linked to stress, such as muscle tension dysphonia.

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Common Mechanical Manifestations of Cricothyroid Configuration in Injured Voice of Professional Voice Users

Introduction: Observation of extra-laryngeal muscular manifestations during a vocal task could be used as a method of assessment. External laryngeal hyper activation may lead to cricolarynghyoid (CTH) deviations from the mid line (an imaginary line from chin to sternum) even in anatomic position.

Method: 46 professional voice users with common complaint of loss of pitch range, decrease in fundamental frequency level and strain during high pitch tones were assessed regarding to symmetry or asymmetry of CTH complex, bilaterally. A method of assessment consisted of placing therapist's hands on lateral sides of patient's CTH complex, were used. In this method therapist stands behind the patient and manual assessment were performed by bilateral synchronized palpation of paralaryngeal structures.

Results: There were 34 of 46 patients with palpable CTH asymmetry. It was declared that deviations were related to specific muscular spasms in results of vocal misuse/abuse. More common signs included cricothyroid visor asymmetry and hyoid and thyroid inclination.

Conclusion: A mechanical approach of assessment is useful to unfold hidden aspects of phonatory insufficiency. This aspect is useful particularly for professional voice users with high vocal demands and subsequent hypertonus extralaryngeal system.

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Predictive Model for Vital Capacity Assessment: Portuguese Sample

Breathing ensures the necessary ventilation for human survival and provides the aerodynamic energy which associated with biomechanical energy produces vocal fold vibration and sound amplification for spoken and sung voice. This study obtained normative data of the Portuguese population on vital capacity (VC) taking into account gender, age, height, weight, smoking habits, spirometer's type (manual and digital) and nasal occlusion. This measure is a reference to assure the respiratory power supply adequacy for voice production. 175 portuguese subjects (91 males 10 – 53 yrs, and 84 females 11 – 50 yrs) participated. VC was measured three times, in standing position, with or without nasal spring, and with manual and digital spirometers. Means and standard deviations, *t-test*, *One-Way ANOVA* and multiple means comparison were analyzed. VC: 1) was significantly higher in male than in females ($p = .000$), 2) increased significantly and directly with age until [20-30[and inversely after [30-40[yrs ($p = .000$), 3) increased significantly and directly with height ($p = .000$), 4) increased significantly and directly with weight until [70-90[Kg for females and [90-110[Kg for males and inversely after these marks ($p = .000$), 5) was significantly and inversely proportional to the duration of smoking habit ($p = .000$), 6) was significantly higher with the digital rather than with manual spirometer ($p = .002$) and 7) was significantly higher with nasal occlusion rather than without ($p = .015$). Lastly, since the above results were “so clean”, a mathematical predictive model of VC was proposed for each gender based on the studied factors.

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Defining common ground: A case study investigation of how musical training of pitch-, loudness-, and temporal-pattern discrimination affects the determination of lexical stress.

Despite a growing understanding of the cognitive associations between music and language, several important issues remain; chief among them is the identification of specific practical skills that musicians might utilize in the execution of language tasks relating to prosody. The successful identification of such skills could have profound theoretical and practical implications regarding the shared cognitive resources of music and language. This case study will seek to determine if the development of pitch-, loudness-, and temporal-pattern discrimination can be measured and shown to be in relationship with prosody discrimination performance in a manner similar to past studies that have used more general descriptions of musical skill. Vocalise-based training designed to foster the development of one's sense of musical pitch, loudness, and rhythm will be used as a means to isolate, manipulate, and measure these variables. Lexical stress discrimination testing will be administered concurrently to determine whether music-language correlations can be observed. Implications of study findings as they relate to previously documented correlations between music experience and language skills, as well as possible clinical and educational applications, will be discussed.

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Long-term Effects of Voice Therapy in Patients with Unilateral Vocal Fold Paralysis

Objectives: To measure the effectiveness of voice therapy and the long-term outcome in patients with unilateral vocal fold paralysis (UVFP). Clinical situation is also described in a small group of patients with UVFP who have not received any speech therapy.

Methods: 105 patients that met diagnostic criteria for UVFP during the period 2009-2012 were reviewed. All subjects were evaluated following standardized methods for functional evaluations including ratings of perceptual quality of voice productions, acoustic and aerodynamic analysis of vocal function, videostroboscopy, videofibroscope and Voice Handicap Index (VHI-10). Clinical follow-up included pre-voice therapy evaluation, short-term and long-term post-therapy evaluation. Voice therapy included a total of 15 sessions of 30 minutes twice weekly. Aim was to improve glottal closure without causing supraglottic hyperfunction. A non-treated group of patients with UVFP was included and after evaluation, treatment was offered if indicated. Local ethic committee approved this study.

Results: Of 105 patients: 9 died, 5 had bilateral paralysis. Of 91 patients with UVFP, 60 patients were treated (group A) and 30 did not receive any specific therapy (group B) due to mild symptoms, distance from hospital, old age or additional pathologies. Mean age (y) was 53 (SD13,44) for group A (64% female) and 64 (SD14,25) for group B (55% females). Etiologies in group A vs. B: post-thyroid surgery (65% and 55%), idiopathic (20% vs. 35%), neoplastic (4% vs. 7%) and others (10% vs. 3%). In respect to the group A, pretreatment VHI-10 mean score was 24 (SD 7) and after treatment was 14 (SD 10, $p=0.06$); median Jitter Absolute before treatment was 306 and after treatment was 116 ($p=0.000$).

Conclusions: Detailed clinical evaluation of long-term follow-up in both groups is on record. Preliminary results of this study will be presented and discussed.

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Neuro-Muscular Taping and Speech–Language Pathology Uses

Neuro-muscular taping is a technique of facilitation/inhibition of neuromuscular activation and lymphatic, vascular and structural support that promotes the activation of self-healing processes of the body. By applying an external tape to the skin it will create concentric or eccentric action on the body inducing a proprioceptive stimulation of the autonomic nervous system. This particular method of taping focuses on the eccentric contraction. The NMT acts on several different levels including sensory, muscular, lymphatic and articular. The NMT produces a lengthening stimulus on both the skin and subcutaneous layers. This eccentric action on the skin and muscle results in decompression and dilation of blood flow. The neuromuscular taping transmits exteroceptive and proprioceptive stimuli to the CNS, trigger reflex muscle responses. Through exteroceptive stimulation, the taping reduces blood and lymph stasis, improves local microcirculation and favors the absorption of edema. It improves circulation and fluid absorption while reducing subcutaneous pressure. This method of taping is used in conjunction with current therapeutic methods as well as alone.

In Italy in 2003, David Blow created the NeuroMuscular Taping Institute headquartered in Rome and New York City. This taping therapy is used widely in Italy and other European countries.

Speech–Language Pathology uses have not been studied. The theory of eccentric taping may be applied to many neurological and non-neurological deficits in the medical speech pathology realm.

A preliminary study examined six patients; 3 with Dysphagia and 3 with Muscle Tension Dysphonia. Each patient's history of disease was recorded. The patients with dysphagia all presented with Parkinson's disease &/or Parkinson-like syndrome. The patients with MTD exhibited normal vocal folds and no anatomical masses.

Method: Using the Pratt software system, all patients were recorded phonating the vowel /ah/ for at least 5 seconds. Each patient participated in a video-stroboscopic evaluation of the vocal folds before application of the tape. The tape was placed along the digastric muscle in 1 cm strips, 5 in total from the tip of the jaw line and in a downward motion. Tape was also placed posteriorly along the scaleneus muscles in 1.25 cm strips, 4 in total. The tape was worn for 10 minutes. Thereafter the phonation and stroboscopic evaluation were repeated. Preliminary findings showed a reduction in the amount of saliva in the pyriform sinus, decreasing jitter and shimmer and increasing pitch.

In conclusion, Neuromuscular Taping concept is a biomechanical therapy, using decompressed and compressive stimuli to obtain effects on the musculoskeletal, vascular, lymphatic and neurological systems. As the tapes form wrinkles, lifting the skin, they facilitate venous and lymphatic drainage, improve blood circulation, and relieve pain.

Continued research is warranted to evaluate further the effects of these positive changes upon muscle function as it relates to speech, voice and swallowing disorders.

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Survey of Speech, Audiology and ENT Services in Africa

Objective: SLP, AUD, and ENT services are available to the vast majority of Americans and people of developed countries; however that is not the case in most African nations. This survey study will attempt to determine the state of speech, audiological and ENT services in Africa relative to MDG, GHI, CDC and WHO health standards and goals for the developing world and to gauge progress made since a similar survey study was completed in 2009 (Fagan, J, & Jacobs, M.). Survey questions request information such as the number of health providers, services offered, number of training facilities, available equipment and governing bodies.

Methods/Design: Observational Survey Study will be distributed by e-mail to noted participants in the study conducted by Fagan and Jacobs, organizations and groups that provide services in the field of ENT, AUD and SLP in Africa and organizations that have statistics on the available services in this field on the continent of Africa.

Results: Results pending however it is hypothesized that the services and service providers available to African nations are seriously deficient, resulting in less than ideal health service availability to those in need. There has likely been an increase in the number of services and providers available since the 2009 study by Fagan and Jacobs however it will likely be an insufficient trajectory to meet the Millennium Development Goals by 2015.

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Speech Intensity and Phonation Energy of Mandarin Broadcasters

Introduction: The present study aimed to compare the speech intensity and its associated phonation energy (skin vibration on the neck) using accelerometers during voice production between broadcasting students and individuals with no broadcasting training.

Method: Thirty two broadcasting students (17 males and 15 females, mean age = 21 years), with a minimum of three years of professional broadcasting training, were recruited to participate in the study. Each participant produced the vowel /a/ (in natural, broadcasting, and loud mode), which was recorded with a digital audio recorder, together with the skin vibration signals using an accelerometer placed around the thyroid cartilage area. Thirty seven university students (16 males and 21 females, mean age = 22.3 years) with no experience in broadcasting were recruited as control subjects to perform the same voice production task (in natural and loud mode) for comparison.

Results: The broadcasting students' voices had a significantly higher equivalent sound level (SPLeq) than non-broadcaster participants, in both natural voice ($p < 0.001$) and in loud voice ($p < 0.001$). The male broadcasters hadn't a significant higher skin accelerometer level (SAL) than non-broadcasters, which suggested that they didn't input a higher phonation energy when having a higher acoustic output (speech intensity) than non-broadcasters, while the female broadcasters used a higher input. Both male and female broadcasters had a significantly higher ratio of acoustic output to skin vibration on neck (SPLeq/SAL) than non-broadcasters (male: 3.22~3.71 dB higher, $p < 0.001$; female: 3.19~3.63 dB higher, $p < 0.001$).

Conclusion/Discussion: The significant higher ratio SPLeq/SAL indicated that the broadcasting students were more efficient in voice production (lower effort in vocal fold vibration with a higher acoustic output). The influence of the different vowels (formants) on the voice source energy will also be discussed.

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Fear of Public Speaking in Teachers

Purpose: To investigate being afraid of public speaking and its symptoms on voice and speech of teachers.

Methods: 129 teachers (119 women and 20 man), age average of 40 years old, without voice and speech complaints. Self-evaluation of a public speaking scale were performed (SSPS), with 10 questions that vary from 0 to 5 points and two subscales: positive and negative. A specific protocol was developed for this research and had questions about experiences, anxiety situations, anxiety and voice and speech symptoms while talking in public.

Results: the SSPS averages were: 41 for total scale score, 19 for the positive subscale and 21 for the negative indicating that teachers have worst self evaluation. Besides classes, they have also refereed experiences on: meetings (n=85), paper presentations (n=68), workshops (n=36), social and cultural events (n=31). The most challenging public speech situations were: being under evaluation (n=61), feeling insecure about the theme (n=59), being recorded (n=47) and express own opinion (n=35). The less refereed situation was eating in public (n=3). The main anxiety manifestations are: palpitation (n=41), voice tremor (n=39), using too much gestures (n=34), sweating (n=33) and the least referred were abdominal discomfort. They did not feel any voice difference while talking in public (n=40) and a minority have indicated high pitch levels (n=7). The most speech symptom were high voice rates (n=55) and the less refereed were reduced loudness (n=9).

Conclusions: Teachers have a lot of public speaking activities what requires intense voice loudness and an efficient communication. They have a huge communication responsibilities and feel anxiety social symptoms resulting on a negative self perception.

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Fado's Vocology: Education, Health and Performance Development of Fado Singers, Singing Teachers and Health Care Providers

Fado is a Portuguese musical genre, classified as a World's Intangible Cultural Heritage by UNESCO on 2011. Fado's voice is audio-perceptually characterized by a low pitch, hoarse, and strained quality. A previous pilot study sketched the acoustic and phonatory profile of Fado's singing voice, with fifteen Fado singers (Mendes, Rodrigues & Guerreiro, 2013). The present research aims to analyse the same voice acoustic parameters on 384 Fado singers, with three action lines: 1) Pedagogic – to educate Fado singing teachers and singers about their artistic skills development; 2) Clinical – to educate clinicians providing advanced voice contents on young and adult therapeutic intervention; 3) Scientific – to promote scientific knowledge on acoustic, articulatory and perceptive phonetics applied to speech and singing voice production and perception. 384 Fado singers will perform spoken and singing phonatory tasks. Spoken tasks include reading aloud, vowel sustaining, maximum phonation time (MPT) and s/z ratio. Singing tasks consisted of maximum phonational frequency range (MPFR) and vowel sustaining at “Parabéns” (*Happy Birthday*) and “Nem às Paredes Confesso” (Fado). Results of 31/384 subjects for spoken measures revealed that MPT and s/z ratio were near the physiological threshold. Fundamental frequency was higher than non-singers and lower than Western Classical singers. Jitter and shimmer means were higher compared to non-singers. Harmonic-to-noise ratio (HNR) was similar to non-singers. For singing voice, jitter was higher compared to Western Classical singers and lower than in Pop singers. Shimmer was lower than Pop singers and higher than Western Classical singers. HNR was similar to Western Classical singers. Both male and female had lower MPFR compared to Western Classical singers. Fado singers produced vibrato, but singer's formant was rarely identified. Until June 2014, acoustic data collection of 384 subjects will be completed and will be correlated with audio-perceptual data for inferential purposes.

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Efficacy of Voice Therapy in Unilateral Vocal Fold Paralysis and Risk Factor for the Therapy Failure

Introduction: The unilateral vocal fold paralysis (UVFP) may present different degrees of clinical symptoms as dysphonia, dysphagia, fatigue and/or difficulty to breath or cough. Although voice therapy has been considered the first treatment option for patients with laryngeal paralysis, especially due to its noninvasive nature, studies that evaluate effectiveness are rare, and until now, researches on risk factors for voice rehabilitation failure were not found.

Purpose: to evaluate the voice therapy effectiveness in the short, medium and long-term in patients with UVFP and determine the risk factors for voice rehabilitation failure. **Subjects-Methods:** 61 patients affected by UVFP were enrolled in a prospective study from April 2010 to August 2011. Forty three patients finished the voice rehabilitation treatment. After voice therapy, UVFP persisted in 28/43 (65.2 %). Each subject had voice therapy with an experienced speech/language pathologist twice a week. A multidimensional assessment protocol was used pre-treatment and in three different times after voice treatment initiation: short-term (1-3 months), medium-term (4-6 months) and long-term (12 months); it included videoendoscopy, the maximum phonation time (MPT), the GIBBAS scale, acoustic voice analysis, and the Voice Handicap Index (VHI).

Results: The multiple comparisons for GRBASI scale and VHI revealed statistically significant differences, except between medium and long term ($p < 0.005$). The data suggest that there is vocal improvement over time with stabilization results after 6 months (medium term). From the 28 patients with permanent UVFP, 18 (69.2%) reached complete glottal closure following vocal therapy ($p = 0.001$). The logistic regression method indicated that the Jitter entered the final model as a risk factor for partial improvement. For every unit of increased jitter, there was an increase of 0.1% (1.001) of the patient chance for partial improvement, which means an increase on no full improvement chance during rehabilitation.

Conclusions: vocal rehabilitation improves perceptual and acoustic voice parameters and voice handicap index, besides favor glottal closure in patients with UVFP. The results were also permanent during the period of 1 year. The jitter value, when elevated, is a risk factor for the voice therapy success.

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Speech Characteristics One Year After First Belgian Facial Transplantation by Vascularized Composite Tissue Allotransplantation

Purpose: Facial transplantation has progressed over the past 8 years. We did the first Belgian facial transplantation by vascularized composite tissue allotransplantation and report the 1-year follow-up regarding speech (voice, resonance and articulation) and oromyofunctional behavior.

Methods: The recipient, a 56-year-old man had his face severely injured due to a ballistic injury. In January 2012 in a 20-hours surgical procedure, a digitally planned facial composite tissue allotransplantation was performed consisting of a large amount of bone together with the soft tissue of the entire lower 2/3rd of the face. Speech intelligibility, voice (consensus perceptual analysis, Dysphonia Severity Index), resonance (consensus perceptual evaluation, nasometry) articulation (phonetic inventory, phonetic analysis) and oromyofunctional behavior (consensus oromyofunctional assessment) were measured 12 months after the transplantation using objective and subjective assessment techniques.

Results: No intraoperative surgical complications occurred and the postoperative course was uneventful. Survival of the graft was complete, the bony structures – both maxillae and part of the left mandible- and mucosal lining of the nasal cavities and hard palate could all be vascularized by connecting only the facial vessels. Twelve months after transplantation the vocal characteristics are normal, speech intelligibility is normal in words, but slightly impaired in sentences due to moderate hypernasality. Two articulation disorders and lip incompetence are present. Facial emotional readability was present but decreased.

Conclusions: The 12-month functional outcome proves the feasibility of facial reconstruction by vascularized composite tissue allotransplantation.

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The use of Sound Pressure Level (SPL) meter apps in the clinical setting

The purpose of this study is to compare sound pressure level (SPL) readings between a standard SPL meter and SPL meter-iPhone-apps.

Methods: Devices used were a RadioShack SPL meter and an iPhone 5. Three SPL meter-apps were obtained from the iTunes store, identified here as app1, app2, app3. This study was conducted in two parts: 1. Measuring pure tones in a sound proof booth (125, 250, 500, 1000, 2000, 4000, and 8000Hz at the following sound levels: 60, 70, 80, 90, and 100dB SPL) and 2. Measuring human voices. Participants were 20 vocally healthy adults, 7 males, 13 females, mean age of 36.1 years. The speech task was a sustained vowel “ah” at a comfortable pitch for approximately 10 seconds at three different intensities: Soft, habitual, and loud - with a device-to-mouth distance of 50cm. Microphones of both devices were lined up at an equal distance from the participant’s mouth. Recordings were simultaneously captured.

Results: Pure tone readings between the standard SPL meter and the three iPhone apps revealed no significant differences for all sound pressures (app1 -60 p=0.470; 70 p=0.287; 80 p=0.289; 90 p=0.140, 100 p=0.217/app2 -60 p=0.315; 70 p=0.276; 80 p=0.350; 90 p=0.183; 100 p=0.461/ app3 -60 p=0.232; 70 p=0.262; 80 p=0.267; 90 p=0.228, 100 p=0.404). Comparison of readings between devices with human subjects also revealed no significant differences with the three apps for all sound pressures, except for app 3 soft phonation (app1-soft p=0.064; habitual p=0.204; loud p=0.432/app2-soft p=0.067; habitual p=0.174; loud p=0.241/ app3-soft p=0.021; habitual p=0.170; loud p=0.087).

Conclusion: The SPL meter iPhone apps yielded similar results as the standard SPL. SPL meter-apps may be used with confidence in the clinical setting. They have a potential benefit of clinical use because they are cost and time efficient, technologically advanced and stimulating for patients and clinicians.

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Cross-Cultural Adaptation, Validation and Cutoff Value of the Italian Version of the Voice Activity and Participation Profile – VAPP

Objective: The purpose of the study was to perform the validation of the Italian version of the VAPP and also to identify characteristics of efficacy and cutoff value for the total score that discriminates dysphonic from vocally healthy individuals. **Methods:** The translation and cultural adaptation was performed in accordance to the Scientific Advisory Committee of the Medical Outcomes Trust as presented previously in this symposium. The final adapted version was administered to 149 people, 108 with vocal complaint and 131 without vocal complaint, 141 female, 98 male, mean age of 45.8 years. The questionnaire was administered twice to 48 patients with vocal complaint to determine reliability. 50 patients underwent voice therapy to determine responsiveness to treatment. **Results:** Construct validity was determined by the comparison of the scores of the groups with and without voice problem (Job: $p<0.001$, self-perceived severity: $p<0.001$, daily communication: $p<0.001$, social communication: $p<0.001$, emotion: $p<0.001$, Total: $p<0.001$). Content validity was demonstrated by significant moderate to strong correlation coefficients between the Italian VAPP, VHI and vocal self-assessment. Internal consistency was determined with high Alpha coefficient ($p=0.989$) and reproducibility also with high Intraclass Correlation Coefficients (Job:0.967, self-perceived severity:0.979, daily communication:0.990, social communication:0.950, emotion:0.976, Total:0.993). Responsiveness to treatment was determined by significant changes between results pre and post-treatment (self-assessment $p<0.001$, job $p<0.001$, daily communication $p<0.001$, social communication $p=0.005$, emotion $p<0.001$, Total $p<0.001$). The cutoff value that reached the highest sensitivity (84%) and specificity (100%) was 37.45 points. **Conclusion:** The Italian version of the VAPP is valid, sensible to changes and can be an important instrument to compose the assessment of the Italian population of dysphonic patients. The cutoff value that discriminates individuals with dysphonia from vocally healthy ones was 37.45 points for its total score.

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Surgical and Behavioral Management of Children with Complex Upper Airway Disorders and/or Mass Lesions

Objective: The purpose of this presentation is to describe children with complex upper airway disorders and/or mass lesions, presenting three cases with descriptions of their pre/post voice evaluations and course of management.

Methods: The three cases in this presentation are from our Voice Database Registry and Vocal Nodules Study at Cincinnati Children's Hospital Medical Center. Background information will be provided regarding complex upper airway disorders and vocal fold mass lesions in children. Specific history information will be given for each case, as well as pre/post evaluation measures of parent-reported voice handicap, acoustic/aerodynamic parameters, perceptual voice ratings, and laryngeal findings. A detailed course of management (surgical, behavioral, or combination) will be described. Video samples demonstrating behavioral techniques typically used with adults, but adapted for children, will be shown. The children in these samples range in age from 2 to 6 years. Techniques will include adaptations of Vocal Function Exercises, Resonance Therapy, Accent Method, lip buzzes, flow phonation, and healthy shouting.

Results: Case 1: This pediatric case will be an individual with a medically complex history related to intubation with upper airway obstruction (vocal fold paralysis). A combined management approach (surgical and behavioral) will be described.

Case 2: This pediatric case will be an individual with a mass lesion (recurrent respiratory papillomatosis). A combined management approach (surgical and behavioral) will be described.

Case 3: This pediatric case will be an individual with a benign mass lesion (bilateral vocal fold nodules). A behavioral management approach will be described.

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The Association of Formant Modulation with Oropharyngeal Vocal Tract Tremor

Objective: This study aims to compare tremor observed in the oropharyngeal vocal tract structures with associated acoustic measures. It is hypothesized that visible oropharyngeal vocal tract oscillation results in modulation of formants 1 and 2.

Methods/Design: This is a retrospective convenience sample analysis of 12 individuals diagnosed with vocal tremor. Nasoendoscopic (NE) recordings were judged by 3 speech-language pathology voice experts. Recordings of sustained phonation of /i/ at varied pitch and loudness levels and connected speech samples were rated for presence/absence and degree of oscillation observed in the pharyngeal walls, base of tongue, and laryngeal vertical movement. The order of NE recordings presented to each judge was randomized differently and 25% of the recordings were presented twice to assess intra- and inter-rater reliability. Audio recordings of matching speech stimuli were acoustically analyzed to determine modulation rate and magnitude for fundamental frequency (F0), intensity (I), and formants 1 and 2 using the Praat software.

Conclusions: Data collection will be completed by December 1st, 2013, at which time statistical analysis will be completed to test hypothesized associations between vocal tract oscillations and predicted acoustic modulations.

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Linguistic and Cultural Adaptation of the Vocal Fatigue Handicap Questionnaire (VFHQ) into English

The VFHQ, originally developed in Italian, is a self-assessment tool used to measure individuals' vocal fatigue. Based on the fact that cultural/linguistic adaptation is an essential step of validating a protocol in another language, the purpose was to linguistically and culturally adapt the VFHQ into English. Methods: The adaptation was performed in accordance to the Scientific Advisory Committee of the Medical Outcomes Trust. Two independent translations were performed by two bilingual speech-language pathologists aware of the purpose of this project. The back translation was performed by a bilingual English teacher, who had not participated in the previous step. A committee composed by three SLP specializing in voice and one laryngologist compared the forward and backward translations, to assess for any discrepancies. This draft was discussed with 5 patients for terms and suggestions. The committee further revised the instrument three times, until a final version was produced. A "not applicable" option was included to each item and was administered to 18 individuals with voice problems, 6 males and 12 females, aged between 18 to 84 years, mean age 47.2. Two patients chose the "not applicable" option for item 7 of the third subscale, because the word "dull" was unclear. Therefore, the item was adjusted to "dull/less-vibrant". Afterwards, all items were relevant, as no further patients chose "not applicable". The *VFHQ* kept the same name and structure as the original version. Conclusion: The cultural equivalence of the English *VFHQ* was demonstrated. The *VFHQ* validation is currently in process.

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The Effect of Levels and Types of Experience on Judgment of Synthesized Voice Quality

Objectives/Hypothesis: The purpose of this study was to determine the effect of level and type of experience on the judgment of voice quality and to examine the correlation among acoustical measurements and perceptions of voice quality.

Study Design: This was a within-subjects group design.

Method: Speech-language pathologists, singing voice teachers, speech-language pathology graduate students with and without experience with a voice client, graduate students who have completed a voice pedagogy course, and inexperienced listeners rated stimuli with systematically altered measurements of jitter, shimmer, and noise-to-harmonics ratio (NHR) on a visual analog scale ranging from mild to severe for overall severity, roughness, breathiness, strain, and pitch.

Results: Results showed that type of experience had an impact on judgments of voice quality more than level of experience. Also, jitter/shimmer combination stimuli and shimmer only stimuli frequently correlated with ratings of overall severity, roughness, and strain and NHR stimuli correlated with ratings of breathiness across all groups. Only inexperienced listeners, singing voice teachers, and their students had significant correlations for ratings of pitch with jitter/shimmer combination stimuli having the highest correlations.

Conclusion: The conclusion was that level and type of experience affect judgments of voice quality.

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Outcome of Preventive Voice Care Program on Voice Quality, Vocal Function, and Communication Function for School Teachers

Objectives. The purpose of the study is to investigate outcome of preventive voice care program on voice quality, vocal function, and communication function for school teachers.

Methods. A prospective controlled study was designed. The subjects were 41 new teachers without voice problems in primary and middle schools of Taipei County. Sixteen were allocated vocal training (VT) group, and 25 were placebo (PL) group. Subjects in VT group received preventive voice care program for 2.5 months, which included vocal hygiene education and resonant voice therapy. Subject in PL group received neck massage at the same period. All subjects received auditory perceptual judgment, vocal function, communication function, and self report measurements pre, post 2 weeks and post 1 year's training. Two-way ANOVA repeated measurement and paired-t test were used for statistical analysis.

Results. In auditory perceptual judgment, the severity of glottal fry for VT group was significantly reduced post 2 weeks' training; whereas the severity of roughness for PL group was significantly increased post 1 year's training. In acoustic measurement of /a/, no significant difference was found in jitter%, shimmer dB, and NHR for either group. However, in reading, VT group showed significantly increased mean speaking Fo and the highest speaking Fo post 2 weeks' training. VT group also showed significantly increased mean speaking intensity, the highest speaking intensity, and the lowest speaking intensity post 1 year's training. In Voice Handicap Index, the score of physical, functional, and total scales for VT group were significantly decreased post 2 weeks and 1 year's training. No significant difference was found for PL group post training.

Conclusions. Teachers' preventive voice care program has positive and maintenance effects on voice quality, vocal function, and communication function for school teachers in Taipei County. This program is suggested for new teachers to maintain their vocal health during career.

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Factors Affecting the Relationship between H1 Dominance and Perception of Voice Quality

Objective: For better understanding and application of the acoustic markers of breathiness, this study manipulated the energy of the first harmonic (H1) of vowels acoustically and employed a direct magnitude method to investigate the effect of this manipulation on the perception of voice quality.

Methods: Participants were 10 female and 10 male normal-hearing adults. Participants listened to a 500-ms long vowel stimulus and assigned the degree of breathiness they perceived the stimulus to be by marking on a 10-cm long line, with one end labelled as “not breathy” and the other as “very breathy”.

The stimuli included the original and processed signals of a vowel segmented from sustained vowels (/i/ and /a/). Twelve signal conditions were employed to increase or decrease the H1 amplitude of the original signals in six 2-dB increments. Voices with the lowest, median, and highest amplitude difference between the first two harmonics (H1-H2) were selected for the female and male voices in recordings obtained from normal speakers and voice patients respectively. A five-way (3 vowels X 2 speaker genders X 3 H1-H2 levels X 13 signal conditions X 2 listener genders) Mixed Model Analysis of variance (ANOVA) was conducted on the breathiness scores for normal speakers and voice patients separately.

Results: The ANOVA results showed significant findings for various main and interaction effects, such as a significant speaker gender by signal condition by vowel interaction effect on the perception of breathiness [$F(12, 96) = 1.95, p = 0.038$] for normal voice. An increase of H1-H2 through signal manipulation led to an increase of perceived breathiness only when performed on the vowel /i/ produced by female normal speakers.

Conclusions: The relationship between H1 dominance and perceived breathiness was non-linear. Factors found to disrupt the linear relationship included speaker gender, vowel type, and the extent of H1 dominance.

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Does Knowledge of Diagnosis Affect Inexperienced Listeners' Judgments of Spasmodic Dysphonia?

Objectives: Adductor spasmodic dysphonia (ADSD) is a laryngeal dystonia characterized by an effortful voice quality in purposeful speech. Beyond changes in voice, one study showed that unfamiliar communication partners perceive ADSD speakers as significantly older, less confident, and more tearful than control speakers. To address communication breakdowns, one strategy that ADSD speakers often employ includes disclosure of their condition (i.e., I have a voice problem called spasmodic dysphonia). Yet, it is unknown whether knowledge of a diagnostic condition negatively or positively affects listeners' perceptions about that speaker. The purpose of this study is to determine whether knowledge of diagnosis affects inexperienced listeners' judgments of perceived effort, confidence, and tearfulness in speakers with ADSD when compared to controls.

Study Design: Experimental.

Methods: Twenty speakers with ADSD and 20 age- and sex-matched controls provided speech recordings of the Rainbow Passage. Thirty inexperienced listeners were randomly assigned to two groups. Group 1 evaluated speech samples without diagnostic information; Group 2 was provided with diagnostic information (no vocal complaints vs. voice problem called ADSD) for each speaker. Listeners evaluated speech samples for speech effort, confidence, and tearfulness using 100 mm visual analog scales.

Results: Data collection is ongoing; listeners in Group 1 have completed the task. Group means of listeners' judgments will be calculated across conditions. A series of 2 x 2 ANOVAs will be completed to determine whether there is an effect of group (ADSD vs. control) or condition (no knowledge vs. knowledge) on listeners' judgments. It is hypothesized that knowledge of diagnosis may bias listeners' judgments positively for controls, and negatively for ADSD speakers (i.e., known as an expectancy effect).

Conclusions: Results will reveal whether inexperienced listeners' judgments may be affected by knowledge of a person's condition, as in a disclosure scenario. Results have implications for counselling individuals with ADSD.

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Stroboscopy in the Peer Reviewed Literature: Terminology and Reliability Issues

Laryngeal endoscopy with stroboscopy is the only widely used clinical assessment that provides a direct view of laryngeal pathophysiology allowing for accurate diagnosis and assessment of treatment outcomes. Despite this, there is a critical lack of standardization when reporting results from this assessment. There is also a well-known issue with rater reliability. The lack of standardization and poor rater reliability prohibit the comparison of results across research studies, creating an apples to oranges situation and reducing the ability to use such studies for evidence-based practice. We sought to determine the extent of the terminology (standardization) and rater reliability issues in the peer-review literature by undertaking a systematic literature review.

Two journal databases (Pubmed and Cochrane) were systematically searched to identify all English language studies where stroboscopy was used as an outcome measure for assessing the effect of voice treatment. We extracted the terms/parameters reported from the stroboscopy assessments and the information provided about the raters (number of raters, profession and rater reliability results).

Of the 662 articles reviewed, 73 articles met our inclusion criteria. From the 73 studies, 208 unique terms were identified to report the results of the stroboscopic assessment. The frequency of the use of these terms was between 1 and 27 with a median of 1. Of the 73 studies only 50% reported the number of raters of those 22% used only one rater. Less than half described the profession of the raters. Only 12% of studies provided rater reliability results: 5 provided both inter- and intra-rater reliability, 2 provided only intra-rater reliability and 1 provided only inter-rater reliability.

We strongly encourage the development of systematic reporting of stroboscopy results and journal authors, reviewers and editors to support and enforce this reporting.

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Does Knowledge of the Experimental Hypothesis Bias PTP Analysis?

Objective: Phonation Threshold Pressure (PTP) is a common voice measure that estimates the lung pressure required to initiate and sustain vocal fold vibration. However, PTP data collection and analysis are vulnerable to bias resulting from investigator knowledge of the hypothesis. Double blinding is used to reduce bias but may not be feasible in all studies. The purpose of this study was to determine whether investigator knowledge of the experimental hypothesis biases PTP data analysis.

Methods: PTP data from 6 subjects at two different time points were analyzed by two investigators. These investigators were trained in PTP analysis simultaneously by the senior author and were not involved in data collection. PTP data were renamed and copied to two identical datasets. Dataset 1 was labeled 'blinded'. Investigators were not informed of the hypothesis or subject characteristics. Dataset 2 was labeled 'unblinded'. Investigators were provided a hypothesis and expectations for PTP change. Both investigators analyzed both datasets and intraclass coefficients (ICCs) were computed.

Results: Absolute ICCs for inter-rater reliability were excellent at 0.76 and 0.78 for blinded and unblinded datasets, respectively. Absolute ICCs for intra-rater reliability were excellent at 0.92 for investigator 1 and 0.96 for investigator 2.

Conclusions: The excellent reliability suggests a high coherence for blinded and unblinded datasets within and between investigators. These results do not invalidate the importance of double blinding but suggest that knowledge of experimental hypothesis may not necessarily bias PTP data analysis when completed by trained investigators.

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Telepractice in Speech Language Therapy: Virtual Speech Language Therapy in Brazil

Objective: To describe the practice of virtual speech language therapy in Brazil.

Method: A nationally distributed online questionnaire containing thirteen closed questions related to the SLP intervention. The questionnaire was nationally distributed via the Brazilian Council of SLP and Audiology.

Results: Data was collected from 302 questionnaires. 20.27% of the professionals work virtually with speech problems, 17.57% with voice disorders, 16.22% with orofacial myology, 13.51% with educational SLP, 9.46% with dysphagia and public health. According to the survey, merely 4.04% provide online therapy with certain regularity; 79.29% of respondents do not offer virtual therapy, and 16.67% have provided virtual therapy a few times. 68.19% of SLP use the telephone for online sessions, 63.64% provide asynchronous care via e-mail, 16.67% provided realtime therapy via videoconference, with Skype the program most frequently used for consultations (78.57%). Voice, orofacial myology, language, dysphagia and audiology are the specialties that most frequently used virtual therapy with certain regularity, accounting for more than 78% of the cases. 73.33% of the professionals surveyed report occasional difficulties or technical limitations to guiding exercises virtually. The majority (86.67%) responded that virtual sessions lasted an average of 30 minutes, and the amount charged and frequency of virtual sessions differed from in-person sessions for 81.48% and 74.07% of the respondents.

Conclusion: This preliminary research shows that virtual therapy is still a timid practice in Brazil and voice patients appear to benefit the most, when the face-to-face sessions cannot be used. There is a need to develop better controlled procedures and the data of this research work as the basis for a more detailed survey instrument for wide application.

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Pain in Voice-Overs

Objective: Identify the occurrence of physical pain, proximal and distal in relation to the larynx, in voice-overs from the advertising field and compare the results with the general population. Methods: The participants were 85 volunteers, 35 of whom are professional voice-overs, 8 women and 27 men, active members of *Clube da Voz* (Voice Club), and 50 participants from the general population, 12 women and 38 men. They answered a self-evaluation questionnaire on the occurrence of vocal problems and of 13 types of physical pain, proximal (TMA, tongue, throat, neck, nape, shoulders, and pain while speaking) and distal (head, back, chest, arms, hands, and ears) to the larynx. As to the Statistical Analysis, the Test of Equality of Two Proportions was applied, with a significance level of 0.05 (5%). Results: The levels showed by the general population were higher than the ones showed by the voice-overs in all regions, except for the throat. The regions of higher occurrence amongst the voice-overs were throat (45.7%), back (37.1%), and shoulders (31.7%). As to the general population, there were higher occurrences on the back region (42%), shoulders (42%), and head / neck (40%). Conclusions: The group of voice-overs in advertising showed fewer occurrences of pain than the general population, what suggests a probable protective role of the type of voice usage in this professional category. The types of pain participants referred to the most were in the throat, back, and shoulders.

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Stages of Adherence to Voice Treatment in Patients with Dysphonia Secondary to Cancer

Aim: The aim of the present study was to investigate the motivational stages of patients with dysphonia due to cancer undergoing voice treatment.

Method: This was a prospective cohort and descriptive study including adults patients diagnosed with dysphonia due to cancer or its treatment. We administered the questionnaire of University of Rhode Island Change Assessment adapted to the area of voice (URICA-Voice) to consecutive patients scheduled to undergo voice therapy.

Results: A total of 46 patients were evaluated and they were 63.4% female and 36.6 male, aged between 27 and 83 years; 22.5 % were alcoholics and 24.3% were smokers. Most of these patients had dysphonia due to treatment of tumor in the larynx (36.5%) and thyroid (36.5%). The URICA-Voice questionnaire showed that 26% of patients were in the action stage (n=12) , 19.5 % in contemplation (n=9), 32.6 % in maintenance (n=15) and 21.7% in the pre-contemplation (n=10) stage. These data seem to be different from previous publications with functional dysphonia.

Conclusion: Most patients with dysphonia secondary to cancer are in motivational stages that may be favorable to therapy outcomes. More studies are necessary to understand the relationship between etiology of the dysphonia and adherence stages to voice therapy.

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Effects of Intensive Voice Treatment on Voice Quality Measures in Persons with Parkinson's Disease

Objective: Several studies have reported positive effects of intensive voice treatment on the vocal loudness of patients with Parkinson's disease; however, relatively few studies have examined the effects of such treatment on vocal quality. The purpose of this investigation was to examine the effects of an intensive voice treatment on voice quality measures in persons with Parkinson's Disease.

Methods/Design: Eight individuals diagnosed with idiopathic Parkinson's disease agreed to participate in this study. Participants received 16 one-hour sessions of LSVT LOUD therapy over a four week period. Participants were assessed before, during and immediately after treatment using a variety of objective and subjective measures. Objective measures of voice quality included the phonation quotient, measures for sustained vowels and sentences from the Analysis of Dysphonia in Speech and Voice, and measures of jitter, shimmer and noise to harmonics ratio from the Multidimensional Voice Program. Subjective measures included ratings by participants, significant others and the examining speech-language pathologist on the Perceptual Rating Form from the LSVT LOUD assessment protocol.

Results and Conclusions: Analysis of results indicated significant, positive changes in objective voice quality measures assessed in this study. While perceptual ratings generally suggested improved voice quality, raters varied somewhat in terms of their perceptions of the magnitude of such changes. Overall, participants demonstrated improved vocal quality as well as increased vocal loudness following the LSVT LOUD treatment program. Further investigation of voice quality changes in patients with Parkinson's disease is warranted.

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A New Perceptual Parameter to Evaluate the Sound Source of Tracheoesophageal Voice with Videofluoroscopy

The sound source of tracheoesophageal (TE) voice, the pharyngoesophageal segment (PES), can be optimally studied by videofluoroscopy (VF). Traditionally, these VF studies include perceptual analyses and objective measurements, like PES length, PES anteroposterior distance and minimum neoglottic distance. This last measurement hardly reflect the extension of the contact between prominence and the anterior wall, so we propose a new qualitative analysis during phonation, the grade of contact between prominence and its anterior wall, classifying it as mild, moderate and intense. Objective: To study the relation between PES configuration and TE voice and speech quality. Methods: TE voice and speech of 30 laryngectomized patients was evaluated by auditory perceptual analyses of voice and temporal speech aspects and by visual inspection of a narrow-band spectrogram, defining the signal typing as I, II, III or IV. The evaluation of VF recording consisted of visual perceptual parameters, especially the degree of contact between the PES prominence and its anterior wall, and quantitative measures of PES, like PES length and anteroposterior distance, during phonation and swallowing, in lateral view. Results: The best TE speakers had moderate contact between the prominence of PES and its anterior wall, shorter PE segments, in addition to longer anteroposterior distance, rough voice and more harmonic acoustic signal typing (Type I-II). Patients with intense contact of the prominence had a hyperfunctional voice quality and the worst articulation. Patients with absent/mild contact of the prominence had longer PE segments and shorter anteroposterior distance, the voice quality was very rough with low pitch and the acoustic signal typing was characterized by absence of harmonics (type IV). Conclusions: The degree of contact of the PES prominence with the anterior wall has a direct relation with the TE voice quality. Videofluoroscopic findings highly correlated with the quality of tracheoesophageal speech.

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Differences in Acoustic and Nasal Characteristics of the Speech between Normal Hearing Children of Deaf Parents and of Normal Parents

Objective: This two-year longitudinal study focuses on the acoustic-phonetic characteristics of the vowels, stop consonants, and nasality of normal hearing children of deaf parents (CODAs) and normal hearing parents (NORMALs). This might reveal how the speech of deaf parents affects their children's speech sounds.

Methods: Twelve CODAs and 12 NORMALs aged 3 to 4 were included in this study and the same children were examined again one year later. In the 1st year, the first formants (F1) and second formants (F2) of the vowels /i, u, a, ɪ, e, ɔ, ə/ and vowel triangle area were analyzed. The voice onset times (VOTs) and closure durations of 9 Korean stops (k, k^{*}, k^h, t, t^{*}, t^h, p, p^{*}, and p^h) in the C_{stop}V and VC_{stop}V between two groups were compared. In addition, nasalance scores were examined in each sentence composed with high pressure, low pressure, nasal, and oral consonants. These same procedures as above were conducted in the 2nd year.

Results: The VOTs of all stops in C_{stop}V were found to be substantially longer in CODAs than in NORMALs in the 1st year-study, but not to be meaningfully different between two groups except for /t^{*}/ from the consecutive 2nd year-study. The VOTs of the lax consonants in VC_{stop}V were significantly longer in CODAs than in NORMALs in the 1st year-study, but there were no differences between two groups in all stops in the 2nd year-study. The closure durations in all stops were not different between two groups in both 1st and 2nd year-study. Nasalance score in the sentence composed of nasal consonants was significantly lower in CODAs than in NORMALs in the 1st year-study, however, there were no differences between two groups in all sentences in the 2nd year-study.

Conclusion: CODAs were shown to make a normal development of speech sound acquisition with aging because their chances for being exposed to other speech environments were increased with aging even though they were mainly affected by their parents' speech environments in infant periods.

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Vocal Characteristics of the Voice Disordered Adolescent Performer

Objective:

This case study will explore the voice characteristics and voice care histories of adolescent performers who seek treatment for a suspected voice disorder prior. For this cohort, participation in activities such as choirs, theatrical performances and solo work place greater demands on their voices outside of typical vocal usage. Few studies to date have explored how childhood singing experiences contribute to the development of a voice disorder during adolescence and young adulthood. This case study series will describe the vocal behaviors and care practices of 5 pediatric performers with a complaint of a voice disorder and undergo a voice evaluation. Intervention plans base on the evaluations will be described.

Methods:

The study will include a retrospective analysis of voice evaluation results including acoustic, aerodynamic, perceptual and handicapping characteristics of 5 treatment seeking children who have a history of engaging in vocal performance. Moreover, information related to patterns of voice care and voice use information will be taken from patient history. Inclusion criteria include a history of vocal performance and seeking treatment for a perceived voice disorder. Data will be collected from the voice database at The Center for Pediatric Voice Disorders at Cincinnati Children's Hospital.

Results: Pending: Descriptive statistics will be summarized.

Conclusion:

Knowledge of the vocal lives of childhood performers is limited as is their transition through puberty. Gaining a greater understanding of the vocal parameters of in children and adolescent vocal performers with voice disorders will inform intervention and help in developing strategies for prevention.

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Effects of Vocal Demands on Voice Performance of Student Singers

Objective: This study was designed to examine the effects of cumulative vocal demands on voice quality in music students majoring in singing, in controlled and natural environments, in order to understand specific needs and professional and student singers.

Method: Eight university music students majoring in singing and enrolled in a vocal pedagogy course, with ages ranging from 22-34 years and reporting a healthy voice history, participated in this study. Four participants were female and four were male, all of them native English speakers, with similar voice training experience and academic background. Acoustic and aerodynamic voice parameters captured across an academic semester were analyzed. The equipment used for monitoring vocal behavior consisted of the Computerized Speech Lab (CSL), the Phonatory Aerodynamic System (PAS), and the Ambulatory Phonation Monitor (APM), computer-based systems for assessment of voice. Self-reported data regarding voice usage was also collected.

Results: In this study, comparisons of voice parameters of student singers repeatedly measured in controlled and natural settings throughout an extended period of time did not lead to statistically significant differences. Complementary self-reported information provided further insight into voice usage among student singers, signaling understanding of the voice mechanism and the need of its preservation.

Conclusions: The results of this essentially negative study suggest that specific voice training may be effective in controlling unwanted variations in voice quality that can result from cumulative demands presented during a typical academic semester. Discrepancies from results of the present study and past research using individuals with no previous voice training may imply that formal voice training is supportive to voice stability and quality. In this study, all participants were particularly aware of vocal hygiene at the time of the study, due to enrollment in a course that focused on same.

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Vocal Health Discussion in Online Forums

Background: When an individual finds that they are having trouble with their voice, where do they turn? Over 24,000 people have joined online forums that include vocal health and voice problems as a discussion topic area. Patients can turn to voice care professionals for treatment of their voice problems, but reasons for why and how patients turn to online forums are unknown. Researchers studying online forums designed for patients with diseases such as diabetes, cancer, and HIV have found that patients found peers' knowledge useful in getting social support: both informational and emotional.

Objective: The purpose of the study is to understand the type of social support for voice disorders and vocal health being exchanged in online forums to inform clinical practice.

Methods: Using structured keyword search, we identified 15 publicly-available online forums that discuss both voice problems and professional voice. Among these forums, we identified six forums that had discussion topics on vocal health and voice problems. We used open coding analysis to identify common themes of peer-patient discussion topics related to vocal health.

Results: Preliminary results indicate that individuals with untreated as well as treated vocal problems sought advice and support from peers. Individuals also talk about a variety of voice-related issues ranging from vocal hygiene tips to encouraging other members to seek the aid of voice care professionals. Our results provide insights for clinicians on clinician-patient relationship and giving additional supportive resources to patients.

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Acoustic Analysis and High-Speed Kymography: Identify Effects of Vocal Exercises

Purpose: to identify immediate effects of voiced vibration and vocal fry in the healthy subjects, by use of acoustic analysis and High-Speed kymography. Method: thirty healthy volunteers, 12 men and 18 women (19-45 years-old) without vocal or laryngeal problems participated in this study. We performed voice recordings and high-speed videolaryngoscopies before and after voiced vibrations or vocal fry exercises. Voice recordings were sampled at 44.100 frames/second and jitter and shimmer were extracted. High-speed videolaryngoscopy recordings were sampled at 4000 frames/second and the images were processed to get high-speed kymography. High-speed kymography images were created by capture and juxtapose the laryngeal images. The closed (CPh), open (OPh), closing (cPh) and opening (oPh) phases were extracted in milliseconds. We calculated 3 coefficients: open (OQ), closing (CQ) and velocity (SQ). The data was compared using paired t and Mann-Whitney tests, at 0.05 significance level. Results: after voiced vibration exercise there were a decrease of jitter in men ($p=0.018$) and a decrease of the jitter and shimmer in women ($p<0.01$ to both). The female vocal folds showed a decrease of CPh ($p=0.046$) and cPh ($p=0.026$), an increase OPh ($p=0.05$) and to OQ ($p=0.049$), a decrease to CQ ($p=0.029$). The male vocal folds showed a decrease to SQ ($p=0.048$). After vocal fry exercise we observed a decrease of jitter ($p<0.01$) in female voices and cPh ($p=0.026$) in male vocal folds. There was an increase of CQ ($p=0.04$) in female vocal folds. Conclusion: the voiced vibration shows more positive immediate effects in vocal quality and vocal folds than vocal fry, mainly in women. Other researches with larger number of male subjects will be needed to corroborate the results this study.

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Voice Analysis at Different Levels of Breath Support

The quality of voice produced depends on the physiology of voice production. Voice production is directly influenced by the extent of breath support which includes subglottal pressure, glottal compression, and glottal flow. Voice measures vary with changes in any of these measures. This study will report the effect of breath support on acoustic, aerodynamic, and kinematic aspects of voice production.

Objectives: To assess voice measures at different levels of breath support in subjects with normal voice. Measures from clinical voice analysis will be compared with patients exhibiting voice problems.

Methods: Subjects, both patients and healthy individuals were asked to demonstrate voice tasks at different levels of breath support, low, appropriate, and high. Acoustic, aerodynamic, and kinematic aspects of voice were recorded using multi-signal acquisition systems routinely used for clinical analysis and research. Voice measures obtained were compared within subjects and between the two groups.

Results: Differences in voice measures were seen at different levels of support. A comparison between healthy individuals and patients will be made during presentation.

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Dysphonia in Children and Teens with Auditory Processing Disorder: Confounding Factors

Introduction: Vocal alterations in children and teens vary from 4.4 to 30.3%. It has been suggested a relationship between changes in auditory perception and the presence of voice disorders. Objective: To investigate the occurrence of vocal alterations in children and teens with (central) auditory processing disorders - (C)APD, indicating possible confounding factors in the analysis. Method: 60 subjects, 48 males and 12 females, mean age 10 years (7 to 16), who sought rehabilitation for (C)APD, without previous intervention. After recording voices in situations of connected speech and emission of the vowel "é", three voice specialists performed a perceptual analysis, classifying the voice quality as adapted or deviated (step 1), which yielded an 88% of deviated samples, a higher percentage than shown at the pediatric/juvenile voice disorders literature. The possible confounding factors were investigated, and a new analysis was performed (step 2), identifying the individuals whose voices had characteristics of mutational disorders, by reconsidering the classification according to the expected voices for children and teens according to their age. For this phase, vowels and connected speech were analyzed separately (step 3). Results: In step 1, 53 subjects (88%) were identified as dysphonic and 7 subjects (12%) as adapted. In step 2, altered voices dropped to 64%, as the ones in the mutational period with their expected characteristics were considered (slightly hoarse, weak, unstable, with fluctuations, bitonality), thus identifying 24% with the voice expected for this specific period. In step 3, in which vowel and speech were analyzed separately: 46,7% of vowels samples were considered altered but this percentage dropped to 6% for connected speech. Conclusion: The occurrence of voice disorders in children and teens with (C)APD is relevant, being more noticeable in the analysis of the vowel, than of the connected speech. Instabilities related to vocal mutation may overestimate the voice problem.

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Comparison between Transcutaneous Electrical Nerve Stimulation (TENS) and Laryngeal Manual Therapy (LMT) in Dysphonic Women

Objective: To compare the effects of TENS and LMT application in muscle pain intensity, voice quality and Voice-Related Quality of Life (V-RQOL) measure in dysphonic women.

Methods: Twenty female individuals aged between 18 and 45 years with muscle tension dysphonia were analyzed. After informed consent, the participants reported musculoskeletal pain by means of a visual analog scale, completed the V-RQOL questionnaire and voice recording was performed (prolonged vowel /a/). They were divided into two groups: G1 (10 individuals) received TENS and G2 (10 individuals) received LMT application. Both techniques were applied for 20 minutes, 12 sessions, twice a week. For the TENS application the individuals remained lying in supine position, with bilateral electrodes on the trapezius muscle – superior fibers and submandibular area (frequency of 10 Hz, high intensity). During the LMT session, the volunteer was seated on an upright chair with a straight, low back with the clinician standing behind. The LMT consisted of massage on the sternocleidomastoid muscle, larynx and kneading of the supralaryngeal area. The evaluation procedures were repeated after the 12 sessions. The perceptual analysis evaluated: dysphonia, roughness, breathiness, strain and instability comparing voice quality before and after TENS or LMT application in double blind. Data were analyzed using the Wilcoxon and sign tests ($p \leq 0.05$).

Results: After TENS pain intensity reduced in the front of the neck ($p=0.017$), shoulders ($p=0.027$), upper back ($p=0.043$). After LMT pain reduction was observed in posterior neck region ($p=0.019$). Improvement in vocal strain ($p=0.031$) was observed after TENS. Improvement of an individual domain for the R-QVV in physical score was reported after LMT ($p=0.050$).

Conclusion: TENS application allowed broader effect in reducing musculoskeletal pain intensity and improvement in women's vocal strain by muscle tension dysphonia when compared to LMT. However, the effects of LMT treatment on V-RQOL were better.

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Speech Intelligibility in Individuals Hydrated and Non-Hydrated Before and After Continuous Speech

The present study aims to investigate the vocal quality before and after continuous use of the voice in the conditions of hydration and dehydration through auditory perceptual evaluation. We evaluated the voices of 13 male volunteers from the database of the study "The influence of systemic hydration in vocal quality", aged between 18 and 40 years and a mean age of 21.31 (SD 2.10 years), all in good general health and Brazilian Portuguese speakers. All participants recorded their voices in two hydration states: hydrated and dehydrated. Voice recordings were performed before and after continuous use of voice (reading aloud in normal tone and intensity for 30 minutes to an excerpt from the book *Assassinatos na academia brasileira de letras*, written by Jô Soares - Publisher's Company Letters) in a quiet room of the Laboratory program Graduate Interdisciplinary Bioengineering/USP. The perceptual evaluation of the voices in this study was performed in order to investigate the influence of hydration status in continuous use of voice. Therefore, we used a visual analogue scale (VAS), for evaluating the vowel /a/ and count from 1 to 10, before and after the reading aloud in both hydration conditions. The VAS data were compared by paired *t* test. We performed the analysis of variance for repeated measures on criteria of two factors alone (hydrated and dehydrated) and two factors of time (before and after the reading) with a significance value less than 0.05. Significant reduction of tension in the voices hydrated before use continuous voice. The other results did not show significant changes in both the hydrated and dehydrated conditions, such as before and after continuous use of voice.

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Acoustic Comparisons of Vowels in Males and Females

Objective: Acoustic measurements of voice have been increasingly used in clinical and research efforts to analyze the voice and account for vocal mechanism conditions. Acoustic vocal parameters are typically measured from steady phonation of sustained vowels, because they elicit a stationary process in vocal fold vibration with low requirement of articulatory gestures. Stable vowel sounds constitute the ideal acoustic material for voice quality assessment, avoiding confounds that may result from effects of interactions between the larynx and the vocal tract. However, there is inconsistency in the literature as to which vowels are most stable with regard to objective acoustic measurements. The objective of this study was to examine the stability of individual vowel sounds during speech production by comparing acoustic characteristics of vowel production in males and females.

Method: Twenty college students with age ranging from 19 to 35 years participated in this study. All of them were native English speakers who self-reported normal voice; 10 were males and 10 were females. All data was collected in a quiet environment using the Computerized Speech Lab (CSL), a computer-based system designed to measure characteristics of voice. A systematic methodology of data collection was organized, in an effort to establish a research protocol based on relevant literature.

Results: Overall comparisons revealed that vowel sounds had a significant effect on all acoustic measures assessed. Speech sounds classified as back vowels demonstrated less perturbation and noise in the acoustic signal. These results are comparable to past research findings involving female participants.

Conclusions: Speech sounds classified as back vowels exhibited less variability and noise in this study. Based on these results, back vowels of the English language should be used in acoustic tasks, due to higher voice stability in their acoustic signal. Complementary results indicated an effect of noise in gender comparisons using vowel sounds.

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Validation of the Taiwan-Mandarin Version Pediatric Voice Handicap Index

Objective: To develop an outcome measurement questionnaire in Taiwanese-Mandarin for the assessment of quality of life among the dysphonic pediatric patients.

Methods/Design: Pediatric Voice Handicap Index (pVHI) was translated into Taiwanese-Mandarin. The pVHI questionnaires were applied to thirty age- and gender-paired subjects. They were referred to the disordered-voice and the normal groups according to their voice quality. Content validity was assessed by five experts with clinical specialization in voice disorder and two English-Mandarin expert interpreters. Internal consistency and test-retest reliability was analyzed. The construct validity and the correlation between pVHI and GRB parameters were assessed by Pearson's correlation. The cutoff point for normal and disordered was assessed by ROC curve method. The obtained scores among the two groups were compared by using the Wilcoxon signed rank test.

Results: The results showed that Taiwanese-Mandarin version VHI provided a high internal consistency (Cronbach's $\alpha = 0.96$); the test-retest reliability in the parents of both groups of children was high for total(T) ($r=0.97$), functional(F) ($r=0.92$), physical (P) ($r=0.96$), and emotional(E) ($r=0.95$). The pVHI (T)(F)(P)(E) scores were moderately positive correlated with the GRBS perceptual parameters in the GRB($r=0.43\sim0.67$). The correlation for the individual item scores and total-scores among the Taiwanese-Mandarin version pVHI showed moderate to high correlation ($r=0.61\sim0.84$), and these results were similar to the original English version pVHI. Last, the research provided pVHI – Taiwan Mandarin cutoff point scores as 17.

Conclusions: The results from the present research showed that the Taiwanese- Mandarin version pVHI is a useful supplementary tool for assessing voice quality in children with voice dysfunction. The child with pVHI score ≥ 17 needs a careful through examination.

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Resonant Voice Therapy with Enhanced Vibrotactile Feedback as a Therapeutic Tool in Management of Deaf Speech

Deaf or hard of hearing individuals often exhibit deviant voice characteristics that compensate for the reduced auditory feedback by increasing reliance on tactile feedback for speech motor control (Higgins, Carney and Schulte, 1994). The vocal quality in these individuals is often described as pressed with a cul-de-sac resonance, perceptually. Physiologically, these correspond to hyperadduction of the vocal folds and a posterior focus of sound due to tongue retraction towards the pharyngeal wall (Boone & McFarlane, 1971) and insufficient velo-pharyngeal closure (Johnson, 2012). In addition to atypical vocal quality and increased phonatory effort, habitual vocal hyperfunction may also result in increased incidence of phonotrauma and lead to potential vocal pathologies, such as, nodules. For this population, a modified Resonant Voice Therapy would be a useful rehabilitation approach towards improving oral resonance. Resonant voice is often described as the ideal voice quality in terms of maximizing output in relationship to laryngeal effort and described perceptually as easy to produce, containing a “ring,” projecting well, and involving oro-facial vibratory sensations, especially in the mask of the face (Smith, Finnegan, & Karnell, 2005; Laukkanen, Syrja, Laitala, & Leino, 2002; Titze, 2001; Verdolini et al., 1998; Lessac, 1997). Conventional Resonance Voice Therapy relies mainly on auditory and vibro-tactile feedback, and is mostly elicited by imitating the trainer’s example and error correction (Laukkanen, et. al., 2002). When auditory input is diminished or absent, as with individuals who are deaf or hard of hearing the oral resonance may be enhanced by using additional sensory feedback e.g., using a semi-occluded vocal tract such as in phonation through a flow-resistant straw, directing the focus of the tone forward, increased awareness of vibratory sensations felt at the face and lips and minimizing the mechanical impact stress on vocal folds (Titze, 2006)

In this single subject research design study, three participants with moderately severe to profound hearing loss, exhibiting “deaf speech” were recruited and participated in a four week aural rehabilitation schedule that included resonance training with increased biofeedback in the form of vibro-tactile sensation (semi-occluded oral tract) to elicit a resonant voice with more forward tone focus. Pre and post treatment perceptual and physiologic measures (acoustic, aerodynamic and EGG data) were collected and compared to examine the efficacy of increased biofeedback on the vocal quality. The results and conclusions regarding management of oral resonance in deaf and hard of hearing population will be discussed.

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Immediate Acoustic Effects of Straw Phonation Exercises in Subjects with Dysphonic Voices

This study sought to measure any acoustic changes in the speaking voice immediately after phonation exercises involving plastic straws versus phonation exercises with the open vowel [a:]. Forty-one primary school teachers with slightly dysphonic voices were asked to participate in four phonatory tasks: 1) to phonate a sustained vowel-like sound, 2) to produce ascending and descending glissandos, 3) to produce pitch and loudness accents using the respiratory support mechanism, 4) to singing the melody of the song Happy birthday. For the experimental group, phonatory tasks were performed into a stirring straw. For the control group, phonatory tasks were performed with the vowel [a:]. Phonetically balanced text at habitual intensity level and speaking fundamental frequency was recorded before and after voice exercises. Acoustical analysis with long-term average spectrum was performed. Three spectral slope declination parameters were analyzed with Praat software. Significant changes after voice exercises for the experimental group include the alpha ratio, L1 – L0 ratio and ratio between 1 – 5 kHz and 5 – 8 kHz. Results from the control group showed no significant differences between pre and post voice training for the same acoustic parameters. The comparison of this difference (pre and post) with the difference in the experimental group was statistically different (greater pre/post difference for experimental group) for alpha ratio and L1 – L0. No statistically significant difference between the experimental group and the control group for 1 – 5/5 – 8 kHz ratio was found. Straw phonation exercises produced a greater positive effect than exercises with the open vowel /a/ on the spectral slope declination and mode of phonation in speaking voice analysis in the present study. The results indicate that the use of phonatory tasks with straw exercises can have immediate therapeutic acoustic effects in dysphonic voices.

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Comparison of Speaking Fundamental Frequency between Premenopausal Woman and Postmenopausal Women with and without Hormone Therapy

Objective: The purpose of this study was to investigate the speaking fundamental frequency (SFF) in pre- and postmenopausal women with and without hormone therapy (HT) and with low and high BMI.

Patients and methods: The SFF of premenopausal women with low BMI (n=22) was compared with the SFF of premenopausal women with high BMI (n=13), postmenopausal women with HT and low BMI (n=35), postmenopausal women with HT and high BMI (n=19), postmenopausal women without HT and with low BMI (n=28) and postmenopausal women without HT and with high BMI (n=12) using ANCOVA and post hoc tests.

Results: A significantly lower speaking fundamental frequency of the voice was only found in postmenopausal women without HT and with a low BMI.

Conclusion: The results of this study suggest that the menopause lowers the voice with approximately 14Hz and that HT and adipose tissue (high BMI) might counteract the menopausal drop in SFF.

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Voice and Communication Characteristics in Voicemails: A Comparison between Males and Females

Objective: The purpose of this study is to determine whether there are differences in communication and voice characteristics between males and females when leaving voicemails. **Methods:** 23 voicemails, including 11 voicemails recorded by males and 12 voicemails recorded by females, were obtained and analyzed to determine whether perceptual and acoustic differences in vocal quality, pitch, loudness, articulation, fluency (hesitations, pauses, prolongations, repetitions, revisions, interjections), prosody (speech rate, rhythm and intonation), message length, rate, and language existed between genders. **Results:** Overall, voicemails left by male and female subjects are very similar regarding most acoustic and perceptual parameters. The perceptual analysis showed that women speak faster ($p=0.006$) and have a more precise articulation ($p=0.007$) and richer intonation ($p=0.007$) than men when leaving voicemails. The acoustic analysis confirmed the differences identified by the perceptual analysis, showing statistical differences in F0 frequency variability ($p=0.010$) and number of pauses per minutes ($p=0.014$). Women showed more number of pauses than men, but similar message length and words per minute. That is probably why they are perceived to speak faster. There was a tendency for females to use more polite words, while men were more likely to use abrupt greetings and closings ($p=0.072$). **Conclusions:** In general, women and men's voicemails are similar regarding selected voice and communication characteristics, however women speak faster, articulate more precisely and modulate more when leaving voicemails when compare to men.

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Voice Symptoms and Vocal Deviation Self-assessment in Different Types of Dysphonia

Purpose: To identify the relationship among the type of dysphonia, vocal deviation self-assessed and the presence of voice symptoms in adults.

Methods: 164 subjects of both genders (58 men and 106 women) with an ENT diagnosis of dysphonia, divided into three groups according to the type of dysphonia: 87 individuals with functional dysphonia – FD, 35 individuals with organofunctional dysphonia – OFD and 42 individuals with organic dysphonia – OD, answered the Brazilian validated version of Voice Symptom Scale – VoiSS (*Escala de Sintomas Vocais – ESV*), consists of 30 questions with four scores: Impairment, Emotional, Physical and Total, and self-assessed their voices as excellent, very good, good, fair or poor.

Results: The mean *ESV* scores in Impairment subscale (OD= 34.4, OFD= 30.0, FD=28.1; p-value= 0.007), Emotional (OD=11.9, OFD=8.6, FD=7.6; p-value= 0.011) and Total (OD= 56.6, OFD= 49.9, FD= 46.0; p-value= 0.010) were higher in OD, followed by OFD and, finally, FD. In the Physical domain, there was no difference in scores according to the types of dysphonia (OD=10.1, OFD=11.2, FD=10.2; p-value= 0.541). The worse the vocal deviation self-assessment, the higher the *ESV* scores in Impairment (correlation= 56.6%; p-value <0.001), Emotional (correlation= 53.8%; p-value <0.001) and Total (correlation= 56.0%; p-value <0.001).

Conclusions: Individuals with OD reported higher perception of voice symptoms, followed by subjects with OFD and finally individuals with FD. In general, individuals with dysphonia had physical voice symptoms, regardless of the type of dysphonia. There are direct correlations between Impairment, Emotional and Total *ESV* scores with vocal deviation self-assessment.

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A Comparison of Self Monitoring Tools for the Normophonic Singer

Objective: Singers expect to see variability in their voice and often modify their vocal behaviors to allow tissue healing. However, singers often avoid seeking medical attention in a timely manner (Gilman, 2009). Two assessment tools, the Bastian Swelling Tests (Bastian, 1989) and Evaluation of the Ability to Sing Easily/EASE (Phyland, 2013), propose to help normophonic singers monitor levels of vocal overuse. The primary aim of this study was to compare the use of the Bastian Swelling Tests and EASE in a group of normophonic professional singers before and after vocally intense performances to determine the relationship between the two assessment tools. Additional aims were to determine singer preference between the tools as well as differences between the groups.

Methods: This study utilized a prospective observational design to compare the Bastian Swelling Tests and EASE immediately before and after completion of high level vocal activities representing singers' normal vocal load. Twenty trained opera and musical theater singers participated in the study. Singers rated the Bastian Swelling Test results on a 100mm VAS to allow for comparison.

Results: Data collection continues. Preliminary results indicated that both the Bastian Swelling Tests and EASE are useful tools for normophonic singers to track their vocal health over time. The hypothesis is that there is a relationship between these two self-rated measures and a preference for use of the Bastian Swelling Tests.

Conclusion: Normophonic singers can benefit from tools such as the Bastian Swelling Tests and EASE to monitor changes in their voice over time, provide an indication of the need to reduce vocal load, and/or seek medical treatment. Singers may be more inclined to seek medical help if they were consistently tracking their voice formally and began to notice inconsistent or long-term decline in vocal ability.

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The Use of iPad for Digital Recording of the Human Voice in the Clinical and Research Settings

Objective: The purpose of this study is to determine whether the use of iPads in the clinical and research settings for digital recording of human voices is comparable to a standard computer recording system.

Methods: 19 vocally healthy adults, 7 males and 12 females, with a mean age of 32.9 years participated in the study. Recordings were simultaneously digitalized in an iPad using a unidirectional condenser microphone for smartphones and tablets (iRig™ Mic, IK Multimedia) and in a computer laptop (Dell-Inspiron), using a unidirectional condenser microphone (Samson-CL5) connected to a preamplifier with phantom power. Both microphones were placed on stands and lined up at an equal fixed distance of 30 cm from the subject's mouth. Speech tasks consisted of a sustained vowel "ah" at comfortable pitch and loudness, numbers from 1-10, and a glissando "ah" from a low to a high note. The samples captured from the iPad were transferred via SoundCloud in a wav format. Samples from both devices were analyzed using Praat software. The acoustic parameters measured were mean, min and max F0, SD F0, jitter local, jitter rap, jitter ppq5, jitter ddp, shimmer local, shimmer local-dB, shimmer apq3, shimmer apq5, shimmer apq11, shimmer dda, NHR and HNR. **Results:** There were no statistically significant differences for any parameter and speech task analyzed (Vowel: mean F0 $p=0.845$, SD F0 $p=0.388$, jitter local 0.826, jitter rap 0.805, jitter ppq5 $p=0.929$, jitter ddp $p=0.812$, shimmer local $p=0.952$, shimmer local-dB $p=0.938$, shimmer apq3 $p=0.992$, shimmer apq5 $p=0.884$, shimmer apq11 $p=0.797$, shimmer dda $p=0.992$, NHR $p=0.228$ and HNR $p=0.350$; Numbers: mean F0 $p=0.988$, SD F0 $p=0.620$, min F0 $p=0.531$, max F0 $p=0.226$; Glissando: min F0 $p=0.405$, max F0 $p=0.939$). **Conclusions:** The iPad with a specific microphone for smartphones and tablets is a reliable means for digital recording of human voices.

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Relationships Between the Cepstral/Spectral Index of Dysphonia and Vocal Fold Vibratory Function During Phonation

Objectives: In previous work, our group identified statistically significant correlations between acoustic measures related to voice quality (levels of perturbation and noise) and estimates of vocal fold vibratory function (irregularity and symmetry) obtained using high-speed videoendoscopy (HSV). However, the actual variance explained by these correlations is relatively low ($< 50\%$), leading us to pursue a better understanding of these critical relationships. Based on recent reports of high correlations between the new acoustic measure of Cepstral/Spectral Index of Dysphonia (CSID) and perceptual judgments of dysphonia, we hypothesized that CSID may also correlate better with HSV-based estimates of vocal fold vibratory function, explaining more of the variance than has been previously reported for other acoustic measures of voice quality. Thus, this study seeks to investigate the relationship between CSID and HSV-based estimates of vocal fold vibratory function during sustained vowel production.

Methods: Using the Analysis of Dysphonia in Speech and Voice program by KayPENTAX, the CSID and its component variables (cepstral peak prominence and low-to-high spectral ratio) were calculated for 20 participants who underwent phonomicrosurgery for vocal fold lesions. Correlations were obtained between ADSV acoustic measurements and HSV-based measures of vocal fold periodicity, symmetry, and glottal area for both pre-surgical and post-surgical assessments.

Results and Conclusions: Preliminary results indicate the CSID is only marginally correlated with glottal closure patterns and does not correlate as highly as the cepstral peak prominence alone with measures of phonatory function that include glottal cycle aperiodicity. Additionally, results corroborate previous evidence that higher correlations are obtained between acoustic and HSV-based measures when examining the within-participant change in measures from pre-surgical to post-surgical assessments rather than correlating pre-surgical or post-surgical results separately. Potential future directions will be discussed that aim at improving our understanding of the relationships between acoustic parameters and underlying phonatory function.

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Toward a Training Paradigm for Clinical Singing Voice Rehabilitation

Clinical singing voice rehabilitation is most often provided by speech-language pathologists who are certified by ASHA and licensed by the state to provide rehabilitation services in a medical/private practice. While there is currently no credentialing process or training program that prepares one for clinical singing voice rehabilitation, most of those who practice have a breadth of multi-disciplinary training and experience, including at least a master's degree in speech-language pathology and considerable education and experience in vocal pedagogy and professional singing. According to Dr. Robert T. Sataloff, this is the optimal background for the practice of clinical singing voice rehabilitation.

Currently, there is no training program that provides clinical, performance and vocal pedagogy training in a single degree. Most clinicians have achieved appropriate experience and education via pursuing multiple degrees, often at multiple institutions. A comprehensive program of clinical, artistic and pedagogical training would streamline this process for the many individuals who wish to pursue this emerging profession.

This presentation will examine critical skills and possible training paradigms for clinical singing voice rehabilitation that have been proposed in a number of papers as well as at the recent Symposium *Specialty Training in Vocal Health* at NCVS in April 2013. The presentation will also outline a degree program in singing voice rehabilitation that is being piloted by UNC-Greensboro School of Music and Department of Communications Sciences and Disorders in collaboration with Duke Voice Care Center. This program will be a five year, post-baccalaureate Doctor of Musical Arts in Voice that includes a master's degree in speech-language pathology and clinical internship in singing voice rehabilitation. Students who complete the program will be prepared for ASHA certification and state licensure and fully trained to evaluate and treat singing voice disorders in a clinical setting.

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The Acoustical and Perceptual Effects of Musicians Earplugs on University Singers' Vocal Performance

The purpose of this study was to assess with female university-singers ($N = 34$) the potential acclimatization effects of wearing one brand of earplugs marketed to musicians on selected acoustic and perceptual measures of choral and vocal sound. Data were acquired during four data collection sessions across four weeks. Participants were members of two established women's choirs, Group A ($n = 24$) and Group B ($n = 10$). Each choir sang the same musical excerpt three times during weekly data collection periods: without-earplugs at rehearsal start, with-earplugs at rehearsal start, and with-earplugs at rehearsal end. For comparison purposes, Group A wore the earplugs at each of three rehearsals per week, while Group B wore the earplugs only during data collection rehearsals. Additionally, one-half of the singers, randomly selected, participated in weekly solo recording sessions that followed a similar protocol. Digital audio recordings of the choral and solo singing performances were used for analyses of long term average spectra (LTAS), intonation, and amplitude. Among primary results: (a) choral and solo LTAS data indicated significant differences in mean signal amplitudes between the no-earplugs and with-earplugs conditions, (b) solo amplitude means indicated a < 1 dB difference between conditions in 90% of the recordings, (c) choral pitch analyses indicated earplugs did not cause choristers to sing less in-tune, (d) fundamental frequency analyses indicated that earplugs did not cause soloists to sing significantly more or less in-tune, and (e) the majority of choral (87.50%) and solo singers (75%) reported being able to hear themselves best when not wearing earplugs during the weekly recording sessions. The results were discussed in terms of possible acclimatization effects, limitations of the study, and suggestions for future research.

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A Comparison of Measured Nasalance with Perceived Nasality in Expert Listener Ratings

Fifteen trained, western-classical singers performed weekly vocalizations for ten weeks to measure the effect of the visual feedback from the nasometer graph on the amount of nasalance, or resonance in the naso-pharynx (nasality). As a group, subjects showed a decrease in nasalance as weeks progressed, which aligns with western-classical tonal ideals of non-nasal tone produced by a closed velopharyngeal port during singing. As a follow-up to this study, expert listeners from multiple university voice faculty, rated the recordings for amount of resonance in the naso-pharynx. Also, recordings of scales were rated for increasing, decreasing, or consistent nasality as fundamental frequency ascended. These results will be compared to those by Birch, Sundberg, et. al.¹ who found little user reliability in ratings of perceived nasality, compared to nasalance.

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A Multi-site Study of Vibrato and Non-Vibrato Singing in Collegiate Voice Majors

Abstract: A consistent vibrato is prized in classical solo singing, but is often de-emphasized or even discouraged in choral singing. The author, in collaboration with colleagues at five other U.S. universities, has examined singing samples of male and female collegiate singers on five vowels (/i, e, a, o, u/ and three conditions (habitual, best classical, and non-vibrato production). Measurements of mean vibrato rate, mean vibrato extent, vibrato jitter and mean SPL extent were made using VoceVista 3.4.3. These measurements were compared against subject gender, age, voice type, length of training and style of music commonly sung. Results of the study are compared against Titze's conclusion that singers reduce vibrato extent rather than vibrato rate in order to sing without perceptible vibrato.

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Vocal Warm-Ups: Teacher-Designed Protocols vs Concone Method with Semi-Occluded Vocal Tract Postures

Expert voice teachers are able to prescribe vocal warm up exercises tailored specifically to their students' technical capabilities and needs: they adjust frequency, amplitude, duration and timbre to create a regimen of vocalises designed to optimize vocal production (e.g. breath connection, registration, and articulation). Lacking these procedural and conceptual schemas, however, students tend to have difficulty transferring these exercises accurately and effectively to their individual practice sessions. Students are further hindered by their nascent capacity to identify and remediate vocal issues strategically.

This disconnect in teacher-student communication and perception is well-documented in research on skill acquisition. It is the critical factor in the effort to develop best studio teaching practices, particularly in identifying elements in contrasting pedagogical methodologies which promote efficient independent work in the early stages of singers' expertise development. This study examined students' cognitive processing of technical instructions in the practice room. Two treatment conditions were compared: (a) vocal warm-ups from traditional individual voice lessons; and (b) a standardized combination of Concone Method exercises and semi-occluded vocal tract exercises.

Participants kept a semi-structured practice journal for a period of two weeks, and then videotaped a warm-up session with concurrent thought-process verbalizations. Participants were recorded singing baseline and post-treatment MDV (*messa di voce*) tasks and performances of a short excerpt typical of undergraduate repertoire. MDV recordings were analyzed acoustically (MPT, mean- max- and average intensities, HNR) and performances were perceptually rated by a panel of expert listeners. These data were correlated with findings from the coding of journals and verbalizations.

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The Effects of Vocal Training on Acoustic and Aerodynamic Vocal Measures

Objective: This study was designed to determine the impact of vocal training on acoustic and aerodynamic characteristics of undergraduate and graduate voice majors.

Methods/Design: Participants were three cohorts of singers, followed for two years upon admission to either an undergraduate or graduate vocal performance program in the School of Music. All students underwent laryngeal videostroboscopy upon entry to the program in order to screen for vocal pathology. Acoustic data were collected as the students sang a vowel in full voice, fifteen times, for four seconds each. Data were analyzed using the Computerized Speech Lab (CSL, KayPentax). Each singer's aesthetic (rather than physiological) vocal range was obtained using Praat, and converted to semitones. Aerodynamic measures were obtained during sung /pi/ syllable trains in chest, passagio, and head registers using the Phonatory Aerodynamic System (KayPentax). Phonatory threshold pressure was also obtained. The number of participants with valid data varied from eight to 28, depending on the task. Paired t-tests were performed when adequate data were available. Acoustically, there was a significant increase between program entry and program completion in semitone range, and frequency and amplitude of vibrato. Aerodynamically, the greatest changes from program entry to program completion were evident during the passagio and head register tasks, particularly in estimated subglottal pressure, airflow, and sound pressure level.

Results and Conclusions: Data were characterized by very large standard deviations, with little apparent difference between undergraduate and graduate singers. Acoustically, there was a significant increase between program entry and program completion in semitone range, and frequency and amplitude of vibrato. Aerodynamically, the greatest changes from program entry to program completion were evident during the passagio and head register tasks, particularly in estimated subglottal pressure, airflow, and sound pressure level. It appears that with vocal training, an individual's performance improves in more challenging tasks. For example, students demonstrated the ability to extend their fundamental frequency range, and modified vibrato, as well as to improve the production of passagio and head registers. These challenging skills are likely to require the intensive training provided by a university-level, vocal performance program. In the vocal training and development program reported here, the voice studies area is classically oriented with emphasis toward opera performance in the graduate program. All the six full time faculty adhere to the principles of *bel canto* and traditionally accepted processes of healthy voice production.

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Shifting Gears: Formant Tuning Strategies of Elite Operatic Baritones

Operatic singing requires the negotiation of significant acoustic, aerodynamic, and expressive forces. This musical genre demands a vocal quality free of breaks or sudden shifts throughout the singing range. In the transitional area known as the “passaggio,” performers alter the vowels of their higher notes, creating an acoustic shift (formant tuning) and the illusion of a seamless vocal line.

Research has demonstrated that sufficient acoustic data exists on audio recordings to infer the formant tuning practices used by operatic singers. Additionally, the passaggio phenomenon has been examined in soprano, alto, and tenor voices, but the baritone voice has not been thoroughly examined. A clearer understanding of elite baritones’ passaggio management strategies as demonstrated in professional audio recordings may have profound pedagogical implications.

For the purposes of this study, an operatic aria was selected that is common to the baritone repertoire: Gounod’s “Avant de quitter.” The climactic moment of this piece contains a challenging four-note, stepwise passage (E-flat4, F4, G4, B-flat3) on a sustained /a/ vowel in which the voice transitions through the passaggio region. An acoustic analysis of this selection reveals the singer’s formant tuning strategy. To provide the most robust dataset possible, all extant commercial recordings of this aria ($n \geq 100$) were compiled and analyzed to determine vowel (F1/F2) shifts and H2/H3 strength. Trends in formant tuning strategies were studied and concomitant pedagogical implications and recommended areas for further study were examined.

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**The Effects of Choir Spacing and Choir Formation on Long-Term Average Spectra (LTAS)
Acquired from a Mixed, SATB Choir**

Vocal methods literature treats choir spacing and choir formation as time-efficient, nonverbal strategies to change the quality of a choir's sound. Choir spacing refers to how closely singers stand in relation to each other in performance. A choir formation is a positioning of singers solely according to the scored voice parts they sing.

Since 1960, a host of perceptual preference studies has examined these two strategies. Only recently, however, have separate lines of investigation tested the effects of choir spacing (e.g., Daugherty, et al., 2013) and the effects of choir formation (e.g., Morris, et al., 2007) on the long-term average spectra (LTAS) of choir sound. The purpose of the present study was to compare the effects of three inter-singer spacing conditions (close, lateral, circumambient) and two choir formations (sectional formation, mixed formation) on LTAS data acquired from a mixed, SATB choir as it sang a largely homophonic motet. Among the controls instituted: (a) videotaped conducting to insure consistency of tempo and the same conductor behaviors during the sung trials, (b) random assignment of singers to consistent row positions within the choir, (c) maintenance of the same distance from the front row of the choir to the microphone locations in all trials, and (d) a randomly ordered performance sequence of the choir spacing and choir formation variables. Results were discussed in terms of optimum singing efficiency, vocal/choral pedagogy, and the logics informing choir spacing and choir formation schemata.

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One-Time Estimates vs. Three-Week Voice Log Estimates of Voicing Behaviors in Singers, Actors, and Non-Performing Students

This study compared the estimates of voice-related behaviors offered in a clinical history questionnaire as compared to estimates derived from three weeks of daily voice logging. Twenty- three voice performance students, fifteen vocal music performance students, and Fifty-three speech language pathology master's students have completed the protocol. All participants complete a two page history questionnaire that asks about total daily minutes of talking, recitation, singing, fluid intake, reflux-related symptoms and behaviors, etc. A daily voice log is then kept for three weeks that asks them to record data on these same parameters. Estimates of average daily values are derived from the three week log to compare to the initial estimates they provided during practice time. Analysis is underway to compare the one-time estimates on each parameter vs. the 3-week daily average. Preliminary analysis suggests that both groups provide one-time estimates that notably over-estimate some behaviors and under-estimate others relative to the daily voice log. Further analysis will compare the voice performers to those with less heavy vocal demands, the speech language pathology students.

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Effects of Vibrato Extent on Perception of Singer Intonation

Objective

Previous researchers have found that vibrato plays a central role in listener perception of what is judged as “in-tune.” Listeners require more time to judge intonation accuracy and they accept a wider range of acceptable tuning with vibrato tones compared to tones without vibrato. Recent study has shown that listeners seem more forgiving of poor pitch accuracy in singers than in synthesized voices and string and wind instruments. The purpose of this study was to investigate the role of vibrato extent in perception of singer intonation accuracy.

Method

A professional soprano sang ascending/descending arpeggios on the tonic and fifth (scale degrees 1-5-8-5-1) using the syllable [do] in several keys, and was digitally recorded. We processed sound files and created experimental stimuli that incorporated arpeggio patterns with three vibrato extent conditions: no vibrato, narrow width (± 35 cents), and large width (± 100 cents). All vibrato examples had a modulation rate of 6 Hz. Alterations in frequency were made to the fifth only, and included deviations of 0, ± 20 , and ± 40 cents relative to equal temperament. All vibrato and frequency manipulations were accomplished with Auto-Tune and Pro Tools software. Participants were all music majors ($N = 60$), and comprised 30 vocalists and 30 instrumentalists. Listeners heard fifteen arpeggio patterns and rated each using two 7-point scales: one for intonation accuracy, and one for tone quality.

Results and Discussion

Results were discussed in terms of previous research concerning effects of vibrato on judged intonation, and the relationship between intonation and tone quality was addressed. Limitations of the study, implications for voice studio teachers and choral conductors, and directions for future research were also presented.

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Effect of a Core Exercise Program on Respiratory and Laryngeal Function in Choir Singers

Vocal training for singing focuses on proper breath support, e.g., the use of diaphragmatic breathing, to increase vocal efficiency, range, loudness, and duration. However, many singers have difficulty using diaphragmatic breathing appropriately and will instead use incorrect muscle groups, such as laryngeal, neck, and upper torso muscles, to achieve these goals. The result of this incorrect muscle use is a reduction in singing quality and power, and may also lead to vocal strain. Core exercises, which focus on engagement of the abdominal muscles to provide a source of power, would be beneficial increasing vocal efficiency while singing. These exercises are frequently used by athletes in a variety of sports to increase endurance and performance. Such exercises would be particularly useful to beginning singers, who may rely on inappropriate muscle groups while singing. The purpose of this study is to examine if an exercise schedule involving core exercises would enhance vocal performance in a group of young college-aged singers.

Twenty undergraduate students majoring in vocal music education and vocal performance will serve as participants. These students participate in at least two choir performances during a semester. All participants will be in good general health and will be free from colds or allergies on the days of testing, as such factors may affect voice production.

Following acquisition of baseline data, 10 of the students (Group 1) will complete a list of core exercises 3 times per week. The remaining 10 students (Group 2) will continue with their daily activities, exclusive of the core exercise program. All participants will follow the same rehearsal schedule for the performance. The voice recordings and subjective ratings will be repeated immediately prior to the performance and 24 hours following each performance. Each participant will therefore complete the assessments during three different sessions. The voice recordings will consist of speech samples (three repetitions of the sustained vowel “ah” and three readings of a short paragraph) and singing samples (three repetitions of /a/ at middle register, in passaggio, and one repetition “Star Spangled Banner”). Data collection and analysis is currently underway.

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The Effects of Specific Non-Verbal Conductor Behaviors by Multiple Conductors on the Vocal Output of a Choir

Research suggests that non-verbal conducting behaviors can affect the sound of a choir. The question remains which gestures or behaviors are most effective in soliciting efficient choral sound and which gestures or behaviors conductors should avoid in harmony to healthy vocal output?

This study investigated the effects of varying non-verbal conducting behaviors exhibited by multiple conductors ($N = 10$) on acoustical (LTAS) and perceptual (pitch analyses, singer survey, expert listening panel) measures of the conglomerate vocal sound of an established chorus ($N = 25$) singing a previously learned a cappella choral composition. I employed a variety of visual measures (grid overlay analyses for gesture size and plane, facial affect inventory, hand shape identification, posture analyses) to videotaped conductor performances in order to objectively document particular non-verbal conductor behaviors.

Results were discussed in terms of non-verbal vocal pedagogy, habituated vocal behaviors, and directions for future research.

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An Analysis of Broadway Callback Sides for Female Performers

Musical Theatre singers who audition professionally must sing specific selections taken directly from cuts of the show being cast, called sides. These sides are designed to test the skills of the performer and generally contain the most challenging vocal demands for each role. A detailed analysis of each of these audition selections provide performers and voice teachers with a tangible goal in training to meet the demands of a musical theatre career.

Official audition material from each female leading role on Broadway will be digitized using the computer software Finale and run through a computer algorithm to determine specific demands, including range, tessitura and vocal quality. The results will be analyzed and compared to provide a quantifiable skill set required by the musical theatre industry.

The purpose of this study is to determine the range and tessitura across every genre of musical theatre (i.e. Legit, Traditional, Contemporary, Pop/Rock), and reach an average range spectrum for each. Additionally, an analysis of vocal registration expectations will be determined, i.e. whether top notes are typically produced in chest register, head register, or mixed.

While there are unique requirements for every role on Broadway, this research provides performers and teachers a clear picture of the typical vocal demands that today's musical theatre performers need to face and successfully negotiate.

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Attempts of Visualization of Singing Techniques: MRI Motion Imaging of Diaphragm Activities and Acoustic Features during Singing

Introduction and Study Objective: One of the most significant issues of singing performance and vocal pedagogy is that singers cannot visualize their own systems responsible for singing. When describing their singing techniques, therefore, singers/voice teachers often verbally express their physical awareness. Our recent interviews of professional singers/voice teachers and voice students indicated that they consider the physical awareness of controlling the diaphragm activities played a major role in desirable singing. To visualize the anatomical evidences for this physical awareness of control, MRI motion imaging during singing was utilized as a tool, along with acoustic analyses of the singing voices.

Methods: Two sopranos, one professional singer and one voice student, were imaged by MRI during singings of scales and octaves on the vowel /a/. Because of the MRI scanner generated loud noise, singing voices for the acoustic analyses were recorded using the same tasks in an anechoic room just after the MRI experiments. In acoustic analyses, a pitch analysis method designed for accurate and temporally fine measurement and a spectral analysis method applicable to analysis-by-synthesis research paradigm were used.

Results and Conclusion: As the professional singer was physically aware of, her MRI images indicated well-controlled diaphragm activities with timely manner and great range of motion appropriate for each task, which were clearly differentiated from those of the voice students. Acoustic data comparisons between the professional singer and the voice student suggested different levels of singing techniques in relation to the diaphragm activities.

This work was supported by JSPS KAKENHI Grant Numbers 25370117 and 24500233.

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Effects of Varied Imagery Instructions on Acoustic and Perceptual Measures of Two Sung Vowels

Singing teachers sometimes employ focus of attention imagery to elicit perceived timbral changes in their students' singing tone. To date, however, the acoustical and physiological results of such instructions remain poorly understood.

The present investigation sought to determine the effects of 6 focus of attention imagery instructions on the sung tone of 20 trained singers as determined by multiple acoustic measures and expert listener preferences. Participants individually sang the same phrases ending in a sustained /a/ or /i/ after receiving the following counterbalanced instructions: (a) no instruction (baseline), (b) focus on your throat (i.e., thyroid notch), (c) direct the sound out the top of your head, (d) direct the sound behind your teeth, (e) direct the sound to your cheekbones, (f) direct the sound to a microphone, and (g) direct the sound to the opposite wall. Steady-state one-second excerpts from each /a/ and /i/ vowel were isolated to determine any consistent changes in formant frequency, cepstral peak prominence (CPP), and intensity. Ten expert listeners evaluated each recording using a series of sort-and-rate tasks where seven icons (one for each condition) were each linked to an audio file of a given participant's performance. Listeners placed the icons onto a horizontal line (anchored with the terms *least pleasant* and *most pleasant*) so that the physical distance between icons represented how different the conditions sounded. Listeners played each performance as many times as needed. Scores from the sort-and-rate were analyzed using multi-dimensional scaling (MDS) to identify whether focus of attention imagery instruction affects voice quality. Results will be discussed in terms of implications for singing voice training.

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Impact of the 'Day Job' on Performers' Vocal Health

Employment across the range of vocal artistry is notoriously episodic and unpredictable. Few performers make their living reliably from their art-form alone. Driven by a need for steady income in professions which have spasmodic job options and where pay rates rarely recognize the years of training, experience and skill maintenance required to attain mastery in their artistic field, there often is a socio-economic imperative for singers to seek additional work – to have a ‘day job’.

Existing studies relating to occupational voice health, across a range of employment were reviewed in order to contextualise this investigation. Research relating to voice health and voice stress within a cohort (N=102) of professional contemporary gig singers (Bartlett, 2011) defined the type, frequency and duration of work outside their professional singing employment. Qualitatively-moderated responses were used to evaluate the impact of these ‘day jobs’ on the singers’ vocal health.

Findings from the study present strong indicators that the source of many voice problems for professional singers lies in unrecognized abuse or misuse of their everyday work-related speaking voice use rather than their performance style choices. This is informing knowledge for all voice care professionals who work with singers.

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Singer's Voice Source in Different Vowels

Objectives: It is frequently assumed that the waveform of the transglottal airflow is affected by the resonance frequencies of the supraglottal system, i.e. the formants. The current study aims at testing this assumption by comparing professional singers' voice source parameters in different vowels.

Methods: Recordings of audio, electrolaryngograph and airflow signals were made using a hybrid system composed of a MS110 computer interface (Glottal enterprises) and an electrolaryngograph microprocessor (Laryngograph). Eight professional male singers were asked to perform a legato sequence of vowels at different pitches. Voice source was analysed by means of inverse filtering using the custom made Decap software (Svante Granqvist), with regard to AC amplitude, maximum flow declination rate, normalized amplitude quotient, dominance of the fundamental and closed quotient. The speed ratio between contacting and de-contacting was determined from the electrolaryngograph signal (Lx) were determined using the script in the custom made Sopran software (Svante Granqvist).

Results: Both the inverse filtering parameters and the contacting/de-contacting speed ratio differed between vowels, suggesting effects of source filter interaction. However, these effects varied greatly between singers.

Conclusions: Changes in vowel seem to affect the transglottal airflow waveform in a way that differs between different singers.

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Voice Source Properties at the Beginning and After Higher Singers' Education: Comparing Students with Professionals

Objectives: Training of the singing voice is associated with development of the acoustical characteristics of the voice, such as timbre and loudness and also their relationships with pitch. These properties correspond to physiological aspects of the voice source, e.g. pulse amplitude, maximum flow declination rate, dominance of the fundamental and closed quotient. It seems relevant to monitor, in an objective manner, such effects of singers' education. The current study compares voice source properties of first year male students with those of professional singers.

Method: Recordings of audio, electrolaryngograph, oral pressure and air flow signals were made of fourteen first-year singing students at the beginning of their university studies. Spontaneous speech, singing a vowel sequence on different sustained pitches and a *messa di voce* repeating the syllable /pae/ at low, middle and high pitch were recorded. Oral pressure during the /p/ occlusion was accepted as an estimate of subglottal pressure (P_{sub}). Voice source was analysed by means of inverse filtering and relations between this pressure and maximum flow declination rate, normalised amplitude quotient, dominance of the fundamental, closed quotient, contact quotient and sound pressure level were examined. In addition, long-term average spectra were analysed.

Results: Comparisons with the corresponding data previously reported for professional classically trained singers showed that the students sang in a lower and narrower range of sound pressure level and P_{sub} , and, at high pitch, increased glottal adduction with increasing P_{sub} and produced a weaker singer's formant cluster.

Conclusion: developing phonatory control at high pitch seems an important target of voice education in the classical style.

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Semi-Occluded Vocal Tract Gestures with Real-Time Feedback of Airflow: Impacts on Voice Source During Vocal Training

Objectives: Semi-occluded vocal tract gestures have been used in voice therapy and voice pedagogy in order to promote voice economy. As these techniques are all based on waveform of the transglottal airflow interactions with formants, it seems important to add real-time feedback of airflow to such techniques. The current investigation aims at testing whether the use of a flow-ball as a semi-occluded vocal tract gesture, coupled with concomitant real-time airflow feedback, can add long-term lasting effects on voice source.

Methods: A longitudinal study was carried out with 10 advanced classical singing students for 3 months. Singers were asked to have a daily practicing regime that included the practice of (i) a Rossini ascending and descending arpeggio in different tonalities and (ii) an ascending and descending 3 notes arpeggio exercises in staccato, using a flow-ball. Recordings of audio, electrolaryngograph and airflow signals were made using a hybrid system composed of a MS110 computer interface (Glottal enterprises) and an electrolaryngograph microprocessor (Laryngograph), previous to the beginning of the study and once every-month. For each recording, participants were asked to perform the two exercises included in their daily practicing regime in the following order: (i) without, (ii) with and (iii) without the use of flow-ball. Data were analyzed in terms of speed ratio between contacting and de-contacting electrolaryngograph (ELG) signal and contact quotient (Qx). Maximum flow declination rate (MFDR) was determined from airflow glottogram.

Results: The continued use of a flow-ball seems to increase speed ratio of the contacting and de-contacting time and MFDR, and to decrease Qx, even when the exercises are performed without using a flow ball.

Conclusions: Real-time feedback of airflow seems an important tool in the singing studio for promoting efficient use of voice source.

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A Perceptual Study of Operatic Vibrato Using Voice Synthesis

While it has been argued whether or not vibrato can be trained, it is generally agreed upon that vibrato is one indicator of classical singing voice quality. Many factors related to perceptions of vibrato differences and qualities are unknown. This study explored perceptions of vibrato in both trained singers and non-singers using synthesized voice samples. Trained singers were defined as those participants with a history of 3 years of classical singing training. The first objective was to determine the thresholds for perceived differences in both groups at three pitches: C4, C5, and C6, representing the low, medium, and high registers of an operatic soprano voice. Vibrato rate and extent were presented to subjects in a method of adjustment, with incremental changes of .05Hz and 5 cents, respectively. Subsequently, synthesized samples were played in pairs and participants determined their “ideal” vibrato in terms of rate and extent by forced choice. It was hypothesized that singing training and pitch would impact thresholds for perceived differences and preferences for vibrato characteristics. The results will be discussed.

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Vocal Measures of Highly Trained Singers Before, After, and the Day-After Performance

Objective: This study was designed to assess the vocal performance of singers in a realistic setting, at three points in time. The primary goal was to determine indices of vocal fatigue.

Methods: Participants were eight singers performing the opera, *Salsipuedes*. Acoustic and aerodynamic data were collected after vocal warm-up, immediately preceding the performance, immediately following the performance, and the day after the performance. Laryngeal videostroboscopic assessment was performed immediately before, and the day after the performance. Participants sang “Happy Birthday” and produced staccato /a/ as softly as possible in their head register. They produced /pi/ syllable trains while singing in full voice at their self-selected most comfortable pitch. For the soft, high singing, measures were obtained of the accuracy of the fundamental frequency produced at the highest pitch, as well as the difference between the loudest and softest notes. Phonatory onset analysis for the staccato /a/ is still underway. For the aerodynamic analysis, measures of phonatory threshold pressure, estimated subglottal pressure, airflow, laryngeal resistance, and sound pressure level were obtained.

Results and Conclusions: No clear indices of vocal fatigue were apparent. Visual comparisons of videostroboscopy revealed little physiological change except in one singer who had shown unilateral pre-nodular swelling in the initial testing that was bilateral post-performance. Acoustically, there was no pattern of change with either Happy Birthday measure. Across aerodynamic measures for men, sound pressure level remained relatively constant, while laryngeal resistance increased, pressure decreased, and flow increased across the three time points. For women, sound pressure level, pressure, and flow increased across the three time points. Laryngeal resistance decreased immediately post performance compared to pre-performance. We conclude that women, in particular, did not adequately warm up before performing. We suggest that while vocal exercises are considered the pre-performance standard, few singers completely warm up before performing. It is possible that a more physical, rather than an isolated vocal warm up, is a more effective strategy.

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Comparisons of Acoustical and Perceptual Data from Experienced Female Singers Performing the Same Sung Material in a Recital Hall and in a Practice Room with Digitally-Produced Reverberation

The purpose of this study was to compare parameters of vocal production among solo singers ($N = 30$) performing the same series of vocalises and songs in a recital hall and in an individual practice room designed with adjustable digitally-produced reverberation to determine if participants produced the same results in each space. Sound pressure level (SPL) was acquired by a head-mounted microphone, and distance dose (Dd) was calculated by an Ambulatory Phonation Monitor. The digital reverberation in the practice room was set to match the reverberation rate of the recital hall at 500 Hz. Participants sang in a counterbalanced venue order the same series of prepared vocalises and songs in each of the rooms with a rest period of thirty minutes in between each recording period. After each recording period participants completed a survey that solicited perceptions of loudness, singing effort, and preference between rooms. Statistical analyses compared the SPL and Dd between rooms. Results were discussed in terms of the differences in vocal fold activity between the rooms and implications for future research.

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The Mixed Register in Contemporary Practice "Passaggio" in the Belt Voice Analyzed with Objective Signals

Belting is a term used rather frequently by singers and voice teachers, but usually without a precise definition. Within the somewhat meager category of objective descriptions of belting there is some consensus that a prominent feature of belting is a strong second harmonic enhanced by a relatively high first formant and closed quotient. Thus high in the (female) belting range there arises a situation similar to that of male upper passaggio in classical technique, where the second harmonic ($2 \times F_0$) can exceed the first formant frequency. In order to reach higher F_0 s, the singer must allow the second harmonic to pass beyond the first formant, and in the optimal case maintain resonance with a higher formant on a harmonic higher than the second.

This study will present and analyze some maneuvers of skilled practitioners of belting in encountering this region where the voice "turns over." Analysis will be done with two non-invasive signals: microphone and electroglottograph (EGG).

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Graduate Voice Assessments: Measuring the Vocal Development of Singers over a Two-Year Master's Degree Program

This pilot study investigated the vocal health and efficiency of graduate school singers (voice pedagogy and performance majors) upon entering and upon completion of a two-year Master's degree program at a northeastern conservatory by acoustical and perceptual assessments. The following research questions guided the study:

1. What is the vocal profile of an entering Master's degree singer majoring in voice pedagogy/performance?
2. What differences may be measured after two years of study at a music conservatory?
3. What protocol is best for testing these voices in anticipation of a longitudinal study?

The participants ($N = 20$) were young-adult singers, aged 21–30, pre-tested as entering Master's degree students and post-tested nearing graduation of that degree program, a two-year differential. Procedures included measurements of airflow and acoustical measurements of perturbation and other properties via the MDVP (Multi-Dimensional Voice Program by KayPENTAX), and speaking fundamental frequency (Real Time Pitch). Perceptually, range limits, efficiency of phonation (breathy to pressed), intonation, and postural observations (stance, head, neck, tongue, and jaw) were recorded. Demographic information included past vocal health issues and current vocal concerns at the time of both tests.

Results were reported for all acoustical and perceptual tests and examined for differences and commonalities, both during the pre-test and the post-test investigations. Protocol adjustments for future assessments were suggested. Future research will include undergraduate singers (who will be post-tested at the four year conclusion of their degree) in addition to graduate singers as the Voice Assessment procedure has been approved for a ten- year longitudinal study.

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Prosodic Strategies during Voice Imitation by a Professional Impersonator: How to Switch from One Target to Another?

Introduction: Previous studies we presented to the Voice Foundation those last years have shown the importance of prosody during the performance of voice imitation. The same manner we perceive and identify a speaker by his own prosodic patterns, the professional impersonator adapts his pitch range, melodic curve and rhythmic characteristics in order to sound like his target speaker. He uses simultaneously the two strategies described by linguists as the model of interactional adaptation: convergence and synchrony. Moreover, he is able to select and reinforce some clues and to neglect others, depending on what he considers relevant.

Objectives: The aim of this study is to observe the prosodic flexibility of a professional impersonator during the imitation of several different target speakers. Our hypothesis is that the melodic curve and the rhythmic patterns are mandatory to sound like the target speaker, whereas the fundamental frequency is less important. We suppose that the professional impersonator keeps some of his natural characteristics, including pitch.

Material and methods: We have recorded the most famous French impersonator during the imitation of 7 different characters, on the same text material. Using PRAAT, we have labeled and annotated the signals in phonemes, words, clitic groups and pauses, in order to study the instant variations of pitch and rhythm.

Results: At this stage, the study is not entirely completed yet, the results will be presented.

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The Effects of Singer Head Position on Acoustical and Perceptual Measures of Performances by Experienced Female Singers

Some vocal pedagogy textbooks recommend that singers keep the chin level with the ground and avoid excessively lifting or lowering the chin during phonation (e.g., McKinney, 1994). Magnetic resonance imaging (MRI) research has shown positive correlations between craniofacial skeleton and cervical spine positioning and vocal tract structures (e.g., Miller et. al, 2010). The purpose of this study was to determine the effects, if any, of lowered ($< 70^\circ$), neutral ($70-110^\circ$), and elevated ($>110^\circ$) head positions angles (determined from postural markers adhered to the nasion and tragus and a line extended to constitute the vertical plane) on acoustical (long term average spectra, formant frequency profiles) and perceptual (questionnaires, expert listener surveys) measures acquired from female singers ($N = 30$) performing the same song. Results were discussed in terms of advice that might be given to singers concerning optimal head position for singing, and the direction of future research in this area.

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Fitzmaurice Voicework Pilot Study

Objectives - Fitzmaurice Voicework® is an approach to voice training intended to improve vocal capability for performance. The approach has received anecdotal support with regard to its effectiveness. The goal of the pilot study was to investigate whether participants' vocal production showed improvement post training, and if further studies with larger sample populations are warranted.

Study Design - A repeated measures pilot study of participants in Part 1 of a two-part Fitzmaurice Voicework® teacher certification program was used to investigate acoustic changes in participants' voices. Maximum phonation time (MPT) was also measured.

Methods - Eleven participants with no reported voice problems were studied. Pre and post training recordings were made of each participant. Measures of maximum phonation time (MPT) were made and the recordings were analyzed for jitter, shimmer and noise-to-harmonics ratio (NHR).

Results - The measure of effect for MPT was moderate, and there was an overall increase in MPT from pre to post testing, with 70% of participants showing an increase in MPT. Though the measure of effect sizes for jitter, shimmer and NHR were small, mean measurements for shimmer decreased slightly, and mean measurements for jitter and NHR showed almost no change.

Conclusions - There were indications that Fitzmaurice Voicework training may have positive outcomes for actors and professional voice users, particularly in increasing MPT. In some other studies of actors' voices, shimmer increased from pre to post voice training. Further studies with larger subject groups are needed to investigate the significance of the increase in MPT noted in this study, and to test whether Fitzmaurice Voicework training can help to lower rates of shimmer and jitter that have been noted in other studies of actors' voices.

The study design and protocols were submitted to the University of Maryland, Baltimore County Institutional Review Board (IRB). The IRB approved certification of the study and found that it met the criteria for exemption from further review. All participants were given and signed an informed consent document.

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Functional Basis of Squall: Stroboscopic and Acoustic Findings

Squall is a frequent component of American black gospel singing and its use is generally restricted to moments of high emotional intensity. A pitched yell, it is presumably characterized by high phonatory intensities, high levels of vocal distortion, and a strong adduction of the thyroarytenoid muscles and/or supraglottic structures. It is frequently a desired component of black gospel singing. Its use may cause harm in some singers while other singers have no adverse affects.

Squall is little understood in the scientific community. An acoustic and stroboscopic examination may reveal its functional basis, which may help the voice community better care for performers of black gospel music.

This study examined the physiology of squall, its effects on the vocal mechanism, and its concomitant vocal tract constriction and/or strain. Five professional gospel artists who were self-reported users of squall were recruited. Stroboscopy with high-speed digital imaging was performed by a board certified laryngologist to determine the vocal fold vibratory pattern employed during squall. The involvement of ventricular vocal folds and the pharyngeal constriction in the supraglottic structures was examined. Acoustic analysis of recorded samples were performed and included fundamental frequency, periodicity measures as well as spectral, and intensity measures.

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Toward a Characterization of Western Operatic Singing Voices

Objective: One can easily recognize the musical style of a singer by listening to his/her sung performance. Several acoustical parameters of the Western operatic singing technique have been studied. However, the number of parameters could be extended and the effect of melody on these parameters remains unclear. By observing the effects of melody and technique on acoustical and musical parameters of the singing voice, this study aims at further characterizing the Western operatic singing technique.

Methods: Fifty professional singers performed two contrasting melodies (popular song and romantic melody) with two vocal techniques (with and without operatic singing technique). The common quality parameters (energy distribution, vibrato rate and extent), perturbation parameters (standard deviation of the fundamental frequency, signal-to-noise ratio, jitter and shimmer) and musical features (fundamental frequency of the starting note, average tempo, and sound pressure level) of the 200 sung performances were analyzed.

Results: The results show that the choice of melody had a limited impact on the acoustical and musical parameters observed, whereas a particular vocal profile appeared depending on the vocal technique employed. By examining these parameters in a theoretical model, this study highlights the relevance of vibrato rate, sound level, energy distribution, fundamental frequency of the starting note and tempo in describing the Western operatic singing technique.

Conclusions: This study confirms that vocal technique affects most of the parameters examined and that the effect of melody is limited. In addition, the observation of quality and musical parameters contributes to a better understanding of the operatic singing technique. Conversely, the perturbation parameters don't seem to take part in the characterization of operatic singing voices. Although the suggested theoretical model needs to be further developed in future research, it already generates implications for research and teaching.

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A Helpful Method of Identifying the Middle-to-Low Vocal Register Shift to Aid in Determining Voice Categories of Female Singers

Identifying the voice category of adolescent or adult female singers can be problematic. This requires determining: 1) location of middle-to-low register shift, 2) location of high-to-middle register shift, 3) comfortable tessitura, and 4) fullness of sound in either lower or upper range.

In performance, female singers appropriately allow the voice to shift from middle to low register on a variety of pitches—typically A^3 - F^4 for classical style and C^4 - C^5 for musical theater style, making identification of exact location of this register shift difficult. Using Ware/Titze's Classification of Registers by Vocal Range which defines three primary female voice registers—low (chest), middle (modal, blended), top (head), this presentation will describe a method of vocalizing the middle-to-low register shift, involving an intentional delay of the shift of crico-thyroid (CT) dominant tone to thyro-arytenoid (TA) dominant tone to the lowest comfortable pitch for the singer, in the vicinity of Bb^3 , A^3 , and Ab^3 . Using this method, the register shift typically occurs between Bb^3/A^3 for most sopranos and A^3/Ab^3 for most mezzo-sopranos/altos.

Audio/video demonstrations of listening for the delayed middle-to-low register shifts in sopranos and mezzo-sopranos/altos will be included. Practical application of this method in vocal/choral auditions and voice lessons, assigning female singers to choral voice parts, and influence of voice category on solo repertoire choices will also be discussed.

Learning to hear and identify the pitches of this delayed middle-to-low register shift can assist the voice teacher or choral conductor in predictably identifying the singer's voice category. Based on over thirty years of successful use of this method, it also provides an ongoing tool for observation of developmental voice category changes in females. The method is brief, easy to learn to hear and observe, and proves reliable in assisting identification of soprano or mezzo-soprano/alto voice categories.

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Phonation Behaviors and Perceived Vocal Efficiency of Barbershop Singers During a Weeklong Barbershop Singing Convention: A Case Study

No empirical studies to date have acquired ambulatory phonation monitor (APM) data from barbershop singers across an intensive week of voicing. The purpose of this case study was to document phonation behaviors (Dt, Dd) of two male faculty members at Harmony University, an annual weeklong convention sponsored by the Barbershop Harmony Society. Participants wore dosimeters for waking hours each of six days and responded daily to a series of voice health indicator statements and a questionnaire that solicited number of sleep hours. Among primary results: (a) mean phonation time dose percentages (Dt) indicated the two participants experienced mean vocal fold contact 30.02% and 25.23% of the time while wearing an APM; (b) mean distance doses (Dd) per participant were 0.33 and 0.44 meters per second, respectively, for the week; (c) disaggregation of acquired data by time of day (morning, afternoon, evening, and night) indicated that most of the vocal fold contact time and the highest amplitude levels occurred in the afternoons during participant teaching times; (d) responses to daily questionnaires indicated that although one participant did not perceive much change in vocal quality over the course of the week and the other participant perceived a gradual decline in perceived vocal efficiency over the course of the week, both men thought they had experienced appropriate voice care; and (e) reported sleep hours ranged from 3.5 to 7.0.

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The Physiological and Psychological Benefits of Vocalism to the Aged Singer

The objective is to illustrate the impact that voice professionals can have in educating an increasingly aged population as to the benefits, physically and psychologically, that singing can provide. According to a report issued by the United States Census Bureau, the population of adults 65 and over will increase 45% over the next two decades. This, coupled with rising healthcare costs, has led many in the government, business world, and healthcare industry, to search for ways to mitigate these circumstances. As a result, greater emphasis is being placed on preventive care and wellness programs. These approaches have been found to result in a better outcome not only for the individual but for the health system as a whole.

Research on the benefits of singing in the aforementioned areas was conducted to determine the most significant and advantageous elements. The resulting information was clarified and condensed into a seminar format. It was then presented to a group of 40 seniors at a conference designed to address issues and topics of specific interest and relevance to this demographic. The presentation included hard data, anecdotal evidence, and illustrative audio/video examples. At the seminar's conclusion, the participants were polled to determine what impact, if any, this had.

The result was significant. While approximately half the group said at some point they had engaged or were currently engaged in some type of vocalism, by the end of the seminar over 90% indicated that, as a result of this new found knowledge, their motivation to continue or begin some type of singing had increased.

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Assessment Rubric as a Tool to Increase Student Motivation in Applied Voice

The purpose of this study was to find out what kind of connection there may be between student understanding of teacher expectations and student motivation. Finding out what connects these two may help the applied voice instructor to enhance student motivation while teaching applied lessons. “Teachers need to communicate to students the objectives of the lesson—what it is the students should learn. Doing so may enhance the students’ self-efficacy for the task at hand by helping students feel confident in their work” (Schunk, 1982; Ames, 1994). Once students gain self-efficacy, the students may grow as independent artists who create and produce music according to their own authentic voices. Being an independent artist means putting together concepts learned from the rubric to a coherent whole (Krathwohl, 2002).

Students who participated in this study were enrolled in Applied Voice Lessons with the researcher. Students selected to participate in this study were asked to complete a pre-treatment survey developed by the researcher designed to measure existing student motivation. Students from the treatment group were introduced to the rubric at the beginning of the semester. The rubric was used as a tool to encourage student motivation to achieve target scores, attainable high standards, as defined by the assessment tool created by the voice faculty. At the beginning of each weekly lesson, students were asked to complete a short survey on the relationship between their understanding of the content taught during the prior week and their motivation to practice. At the conclusion of each weekly class, students performed musical selections suggested by the instructor. This performance was recorded and evaluated using the rubric by both the student and the instructor. The instructor used both evaluations to instruct the student with specific steps to improve skill acquisition over the following week. The rubric, typically used for evaluative purposes during the final exam, became a teaching tool, in the hopes that if students have a clear understanding of the expectations of the faculty, as well as clear directives on how to achieve success in the skills scored on the rubric, they will be more intrinsically motivated to work independently to develop those skills. At the conclusion of the treatment, students participating in this study were asked to complete a post-treatments survey developed by the researcher designed to measure existing student motivation.

Data from responses on the pre and post-assessment were compared to determine growth in intrinsic motivation, if any. In addition, student responses to the weekly survey were analyzed to determine usefulness of the rubric as a teaching tool to enhance student motivation to practice. It was determined through analysis of the data that the use of the assessment rubric as an instructional tool did not increase intrinsic motivation of students. However, several interesting ideas were developed from analysis of the surveys, the most important being that each student has different motivation to practice, outside the expectations of the instructor or achieving a good grade, so the instructor must provide differentiated instruction to increase student motivation.

Synesthesia vs Proprioception – Systematization Essays

This paper was presented on the 19th Brazilian Conference on Speech-language Pathology and on the 8th Speech-language International Conference, “Professional Voice”, held between October 30th and November 2nd, 2011, in São Paulo/SP. It’s a report about Rock Applied Pedagogy developed during 15 years of researches and working with rock vocal technique, on its many subdivisions, bringing up the need of systemizing its own theory / practical shape to and on rock singing, and also aligning the mystery that exists on the development of rock singing techniques.

This reflection, particularly, aims to discuss the concepts of Synesthesia and Proprioception and their respective didactical implications during the process of teaching/learning of rock singers.

Educational experiences constantly point an inadequate concept of synesthesia (Individual and spontaneous subjective association between things from different natures, but seem to be closely related) during the development of vocal technique, because its condition *sine qua non* is, on one side, the vocal technique or the singing teacher with the ability to work with its metaphors and strategies, subjectiveness of the learner; on the other side, the learner being sensitive to this type of intervention. This condition *sine qua non* is not always available during the learning process, sometimes because the teacher is incapable, sometimes because the student is incapable; or sometimes both. It is not surprising that in any case the process of teaching/learning will be seriously jeopardized and the practice will reassure the myth that some people “were born to sing” and some others “were not”.

It would be very different using a strategy based on the proprioception concept, the sensitiveness of bones, muscles, tendons and articulations give the brain information about static, equilibrium, movement of the body through space, etc. And teaching experience has shown that is the most adequate way of developing vocal technique, only stimulating the learner to have his/her own proprioceptive consciousness through a constant monitoring of the physical sensations produced by each corporal experience in a way to develop muscle memory and always use it when necessary.

Finally, on this didactical/pedagogical work field, the only condition *sine que non* to guarantee a learner’s vocal technique development, is the ability his/her teacher has with proprioceptive consciousness; ability that is resulted from adequate and objective training; and that is not related subjective suggestion on subjective sensations to some subjectivity... in other terms, metaphysical practices.

Effects of Respiratory Muscle Strength Training in Trained Singers

Many vocal pedagogical practices revolve around the notion of controlling airflow and lung volumes and focus heavily on the concepts of breath support and breath control. Despite this emphasis, the effects of increased respiratory muscle strength on airflow and phonation patterns in trained singers remain unknown. This study addressed two questions: 1. Can singers improve respiratory muscle strength through focused training? 2. Is improved respiratory muscle strength reflected in the singing voice?

A single subject design was used to determine if a respiratory muscle strength training program would increase respiratory muscle strength and, as a result, improve control of subglottic pressure and breath support. Improved breath support was hypothesized to manifest in differences in airflow, vibrato, and phonetogram characteristics. Six graduate level voice students were recruited to complete the protocol which consisted of a baseline phase followed by either inspiratory muscle strength training followed by expiratory muscle strength training or vice versa. Training was completed with threshold pressure trainers. Participants completed 5 sets of 5 repetitions daily with the trainers set at 80% of each participant's maximum expiratory or maximum inspiratory pressures for the expiratory muscle strength training and inspiratory muscle strength training programs, respectively. Thus far, results have shown increased respiratory muscle strength as a result of training. The effects of increased respiratory strength will be examined with regards to airflow, vibrato, and phonetogram characteristics within and across subjects.

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Acoustic and Perceptual Measures of Pre-Service Teachers' Voice Use during Student Teaching

Pre-service music educators often use their voices very differently when in university classes compared to student teaching. Consequently, students often complain of voice issues that can arise from overuse and changes in vocal demands during their student teaching experience. The purpose of this investigation, therefore, was to measure student voice use acoustically (F_0 , tone color) and perceptually (range, agility, singer perceptions, researcher perceptions) prior to and during student teaching. Participants ($N = 10$) were music education majors at a large university in the United States. Half of the participants ($n = 5$) were vocal/choral music education majors and half ($n = 5$) were instrumental music education majors. Prior to and during student teaching, students completed the Evaluation of the Ability to Sing Easily (EASE) voice survey as well as a voice intake form. Participant perceptions of voice when speaking and singing were obtained. Videostroboscopic examination was performed three times: once prior to student teaching and twice during student teaching. Participants kept a weekly voice journal indicating perceptions of voice use, changes in vocal ability, conditions affecting the voice, and daily schedules. Results are discussed in terms of application to voice pedagogy, teacher training, and ideas for future research.

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Who Believes What? Singers' Belief in Vocal Health Information and Misinformation

Objective: Anecdotal evidence from voice clinics and music studios indicates that singers may subscribe to information about the voice that is not true. Belief in these vocal “myths” may be detrimental to the vocal health or technique of some singers. This study was designed to investigate the preponderance of myth belief among singers of amateur, semi-professional, and professional status age 18 and older.

Methods: A 50-question survey was developed to represent a continuum of “fact” and “myth” statements all derived from the literature or on line. A 6-response array was developed, including:

Yes, I've heard of this before and

- a. I disagree
- b. I neither agree nor disagree
- c. I disagree

No, I've not heard of this but

- a. I find it believable
- b. I find it somewhat believable
- c. I do not find it believable

The survey was incorporated into the internet survey tool, *Toluna* Quick Surveys. The link was sent to members of the singing communities known by the authors and then snowball sampling was used to broaden the sample size.

Results: Completed surveys were received from across the United States (N=379, 18-85 yrs). Collective response analysis indicates that having heard a “myth” does not necessarily lead to belief. Internet “facts” that were outrageous to the researchers were also unbelievable to the majority of singers. Responses indicated a lack of understanding of the singing mechanism that allows many singers to believe concepts that are anatomically unreasonable. Additional analysis is underway to determine patterns of responses as they relate to singer age and professional status.

Conclusion: Internet access has increased type/number of both accurate and erroneous information sources for voice health that do not undergo peer review. We believe our analysis will help delineate target groups (age vs. professional status) in need of education about healthy voice care.

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Deirdre D. Michael, PhD

Voice Changes in Classical versus Belt Musical Theatre Performance

In musical theatre performance, singers are often faced with challenging vocal demands not only during a show, but also in the rehearsal process leading up to the run of performances. During the rehearsal process, singers and actors often complain of vocal fatigue, strain, as well as subtle changes in voice quality. This case study aims to capture perceptual and stroboscopic voice changes over the course of a rehearsal process in both classical and belt singing styles.

Voice samples and laryngeal videostroboscopic evaluations were collected from two singers before rehearsals began and after the run of performances of two musical theatre shows. The shows had comparable amount and intensity of rehearsals, with one incorporating predominantly classical singing and the other using the belt style. Pre and post samples were evaluated by speech-language pathologists who specialize in voice care.

Data collection is currently in progress. Results will indicate whether voice changes occurred in one style of singing versus the other. Due to the limited number of participants, this is regarded as a pilot study that may promote further investigation into voice care related to rehearsals in musical theatre performance.

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When Does Voice Warm-Up Become Endurance Training?

Objective: Discern if well-regarded and commonly used vocal warm-up approaches differ in their recommendations for length of warm up and if they address the well-studied aspects of training for sport performance within the areas of skill acquisition, injury prevention, and fatigue resistance.

Methods/Design: Narrative review that combined published singing warm-up regimes with exercise physiology literature for limb skeletal muscle warm-up to discern if the vocal warm-up literature addresses the goals of skill acquisition, injury prevention, and fatigue resistance. More specifically, analyses of specific warm-up exercises by category was completed to allow for potential consideration of influence of warm-up on singing style. Biomechanical aspects of published exercises were evaluated for injury prevention components. Length of recommended vocal warm-up regimes were evaluated for potential influence on laryngeal skeletal muscle fatigue-resistance training based on limb-skeletal muscle training recommendations

Results: Published singing warm-up regimes have traditionally addressed skill acquisition for classical singing style with little attention to specific exercises for injury prevention. While fatigue resistance was not an explicit goal of the warm-up approaches, the longer warm-up times recommended may result in up-regulation of those physiological mechanisms that promote fatigue resistance.

Conclusions: Singing training approaches will benefit from further cross-pollination of principles of muscle training from the field of exercise science in an effort to expand the types of singing styles that would benefit from vocal warm-up. Singing style should be a factor in warm-up choice to facilitate proper laryngeal skeletal muscle training goals.

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A Survey of Working Broadway Performers' Academic and Non-Academic Training Experiences

Vocal demands for aspiring Broadway singers/actors have changed exponentially in recent years, shifting from classical/ legit singing styles to nearly exclusively Contemporary Commercial Music (CCM). Musical theatre employment research is nascent, and vocal coaches and instructors must speculate on how they may best prepare students for elite theatrical careers. Does the pre-professional training of collegiate programs lead to greater employability, or would young performers be more successful if trained vocationally outside of academia?

To establish best practices in collegiate voice pedagogy, it is essential to reexamine curricular requirements. What aspects of older curricula (e.g. the integration of musical theatre performers into classical voice studios, core musical and general education standards, etc.) have effectively equipped students for the new CCM-dominant vocal requirements and career needs of the Broadway stage? The real-world experiences of successful performers may also be of use in such an examination. To date, no studies have been conducted to determine if collegiate musical theatre training produces higher success rates for Broadway performers than non-academic (vocational) training. Are there statistically significant employment advantages to the comprehensive education requirements required for accredited degree programs?

A survey was administered to assess the nature and duration of the vocal training completed by successful musical theatre performers, defined for this study as those who have achieved Actor's Equity employment contracts on Broadway or national tours. This data has pedagogical and curricular implications that may enhance the training (both academic and vocational) of aspiring Broadway performers. Reported results focus on descriptive analysis of collected survey responses grouped by demographic data, types of training received, academic concentrations and degrees completed prior to Equity employment, and the means by which artistic representation was first acquired.

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Massage Techniques for Jaw Tension and Temporal Mandibular Joint Dysfunction.

Many voice coaches, voice trainers, and speech language pathologists work with individuals with extraneous tension in the jaw, tongue, neck, and shoulders. Jaw tension has been both clinically and experimentally detrimental in optimal voice production (Cookman & Verdolini, 1999). Although most situations of jaw tension can be easily reduced through general relaxation techniques, some individuals present with more stubborn, complex tension patterns. One such pattern is Temporal Mandibular Joint (TMJ) Dysfunction. This problem not only presents with impairment in articulatory and vocal techniques but it has medical complications that may create concern for the voice professional when treating one with TMJ Dysfunction. This workshop will briefly discuss the normal and abnormal functions of the TMJ and the speech and voice problems presented when this joint malfunctions. It will briefly outline the different methods of diagnosing TMJ Dysfunction and the multiple treatments available to those suffering from TMJ Dysfunction. The majority of the workshop will be training the participant in jaw and face massages to alleviate the musculoskeletal tension frequently associated with TMJ Dysfunction. Techniques presented have been adapted from the St. John's Neuromuscular Therapy, Myofascial Release, and general physical therapy techniques. Finally, a discussion on the multidisciplinary team involved in treating this disorder will transpire with special consideration of the performer with TMJ Dysfunction. The presenter Miriam van Mersbergen, Ph.D., CCC-SLP has been formerly trained in St. John's Neuromuscular Therapy and Myofascial Release for the face, head, and neck and has attended various physical therapy continuing education seminars on the treatment of TMJ Dysfunction.

Miriam van Mersbergen, Ph.D., CCC-SLP, Assistant Professor, Northern Illinois University

Breath Management and the Multidimensional Performer

Objective: To give participants a capsule opportunity to connect with new voice/movement research in a practical and enjoyable way.

Methods/Design: Presenters will make necessary introductory remarks, then lead participants through physical/vocal exercises that integrate techniques from voice, dance and acting.

Results and Conclusions: Optimal use of the anatomy can facilitate breath management during movement. Exploratory studies (2009 – 2013) in the UK and Australia have shed considerable light on the breath management strategies of performers who dance, act, and use voice simultaneously. And formal communication among actors, singers and dancers regarding their respective trainings is beginning to happen. This participatory workshop draws on recent research and an integrative perspective, as it makes direct, practical connections across a range of techniques from the separate disciplines of voice, acting and dance. Participants will explore the multi-tasking capabilities of trunk muscles while noting the relationship of physicality to vocal range and resonance, clarity of speech and intention.

The first author led research studies: at PhysioEd Medical in London, with physiotherapist Jane Grey (2007 – 09); at the University of Queensland, Brisbane, Department of Physiotherapy, School of Health and Rehabilitation Sciences, Paul Hodges, chief investigator (2010); and at the University of Tasmania Launceston, with physiotherapist Marie-Louise Bird (2013). The second author works regularly with singers, dancers and instrumentalists, in both clinic and performance situations. She is herself a dancer/choreographer and singer with 10 years' experience as a musical theatre performer.

Joan Melton, PhD, ADVS, Emeritus Professor, voice/movement specialist and researcher, California State University Fullerton

Jennie Morton, BSc (Hons) Osteopathy, Lecturer in Performing Arts Medicine, also Osteopath, University College London and British Association for Performing Arts Medicine

The Five Star Recipe: Ultimate Preparation for a CCM Performance, Audition or Recording Session

This workshop provides a step-by step guide for preparing a song technically and artistically for maximum success. From knowing the material to presenting it without contrivance, Melissa Cross presents simple, effective exercises based on the compositions chosen by (3) volunteer students. Beginning with an understanding of the intervals and effortless navigation of registration issues, the exercises proceed through phrasing that mirrors the spoken word without defying the important rhythmic foundation of the tune. The mental experience of honest performance and additional tools for the frightened and self-conscious performer will also be addressed. Participants will have the opportunity to engage in each step of the process. Crucial information regarding the particulars and current practices relating to rock band auditions, auditions for The Voice and American Idol, etc, and recording in the professional and home studio with latest technological advances will also be included.

Melissa Cross, MA, Melissa Cross Vocal Studio

New Emotional Freedom for the Voice: Empowering Performers to Produce and Modulate Emotion.

Whether onstage or at the podium, our emotions effect our phonation! “The Affect effects the Effect.” Thus the ability to accurately observe and correctly identify our emotional states is the beginning of freedom of vocal control in public situations.

Alba Emoting™, solidly based in current neuroscience, allows any person to experience universal human emotions through purely physiological means. Once mastered, Alba empowers the individual to control subjective responses to stimuli.

This workshop will give all participants a glimpse of the method through direct physical experience. In an exercise with one of the basic universal emotions you will encounter your own body in a revolutionary way. The Emotional Effector Pattern exercise will be crowned with The Step-Out protocol to neutralize the emotion produced.

Patricia Angelin (MA, SAG-AFTRA, AEA, Irish Equity), is the first professional actor/singer to be certified both as a Master Practitioner (CL5P) and Teacher (CL5) of Alba Emoting™ directly under Susana Bloch of the Marie and Pierre Curie Institute of Neurosciences (CNRS), Paris. Founding Teacher, Alba Technique NY, 139 West 28th Street, Suite 3E, New York, NY 10001.

Mr. Ronn Burton, BFA (Shenandoah Conservatory), Alba Emoting CL3, Assistant at Alba Technique NY

Self-Education for the Voice Professional: NYSTA's Pioneering Online Learning for Voice Teachers around the Globe

While organizations, both national and local, have long offered professional development opportunities for teachers of singing, online and distance offerings have been few and far between. Though educators in other fields have developed online courses, voice teachers have generally experienced professional development by means of a more traditional delivery. There is a great need for the expansion of online offerings in vocal education. This presentation is intended to pinpoint the areas in which teachers of singing can improve their instruction and to demonstrate NYSTA's pioneering work in this field, while offering new advice on how other organizations and individual singing teachers can make quality online education "happen." This presentation will consist of a PowerPoint demonstration, a panel discussion, and a concluding question-and-answer session.

The primary content of the presentation will be a technical walkthrough and discussion of various challenges involved in mounting an interactive vocal pedagogy course online. Some of these topics will include equipment, what to remember and avoid, time schedules (with consideration of time zones), online payments, optimal viewing angles, and other pertinent information. Clips from various courses will also be played with opportunity for audience interaction.

During the final portion of the presentation, participants will have the opportunity to ask the panelists specific questions about web-based teaching and learning technology in general and the NYSTA Oren Lathrop Brown Professional Development Program in particular.

Matthew Hoch, DMA, Vice President, New York Singing Teachers Association (NYSTA),
Music Department, Auburn University

“The hole in the sky” – finding the path through the tenor *passaggio*

Using movement, breath management activities, appropriate vowel modification, and semi-occluded vocal tract posture, the author, a tenor and an experienced teacher of male voices, will demonstrate different strategies which have proven effective for helping tenors through the *passaggio* into the highest notes of the tenor range.

Workshop needs: 3 demonstration students (tenors!) who could use some guidance on singing high; a piano; an accompanist would be nice for working repertoire.

John Nix, Associate Professor, University of Texas at San Antonio

**Voice Optimization and Rehabilitation in Indian [Hindustani Classical and Bollywood Singers]:
Understanding vocal techniques and nuances and application of voice science**

Hindustani classical singing is the classical genre of India [with the exception of Southern India], while Bollywood or playback singing is the popular genre. With globalization and crossover of singers and the increasing popularity of Indian singing, Indian vocalists perform and teach all over the world, including North America, Europe, East Africa and U.K. As a result, an increasing number of voice pathologists and voice teachers are faced with the situation of working with Indian singers. This may seem challenging as the vocal aesthetics and techniques and the vocal pedagogy of Hindustani singing is distinctly different from Western singing. Improving understanding and communication between diverse vocal approaches involved in different singing styles would contribute to developing a cross cultural understanding of vocal elements and a universal approach to habilitation and rehabilitation of the singing voice that can cross borders, while remaining sensitive to the aesthetic and performance demands unique to each vocal style.

In this workshop, I plan to demonstrate and explain some of the common vocal pedagogical approaches and vocal elements and nuances of Indian singing and share my experience of applying voice science to traditional voice training techniques in Indian singers.

Dr. Sadhana Nayak M.S. [Otolaryngology], Laryngologist [Specialization- Performance & Professional Voice], Voice Trainer & Researcher, Indian Classical & Contemporary Vocalist

Cepstral Analysis of Speech Using *ADSV*TM: Clinical Applications

This workshop will provide an overview and demonstration of the *Analysis of Dysphonia in Speech & Voice (ADSV)* program (KayPentax, Montvale, NJ). From measures of the cepstrum and the spectrum, the *ADSV* program provides analyses that correlate with the overall severity of dysphonia in both continuous speech and sustained vowel samples in an automatic, easy-to-use format. The *ADSV* program was developed to (a) incorporate robust spectral/cepstral methods that move beyond the limitations of traditional time-based measures such as jitter, shimmer, and HNR; and (b) incorporate a set of common algorithms and measures that would be applicable to *both* continuous speech and sustained vowel productions in a relatively "automatic" and user-friendly manner.

This workshop will provide the following:

- A brief review of research which has established the validity of the procedures used in the *ADSV* program.
- A description of the procedures used in computing the cepstrum and a description of key spectral/cepstral measures used in the *ADSV* program including the Cepstral Peak Prominence (CPP) and the *Cepstral Spectral Index of Dysphonia (CSID*TM). The *CSID* provides a single, easily interpretable summary measure that compiles information from several cepstral/spectral measures into an objective estimate/correlate of perceived dysphonia severity that can be used to confirm or guide the perceptual judgments of the listener.
- Examples of continuous speech and moderately-to-severely dysphonic vowel production analysis using the *ADSV* program. Analysis of voice samples elicited from workshop attendees will also be demonstrated.

Shaheen N. Awan, Ph.D. CCC-SLP ASHA Fellow, Dept. of Audiology & Speech Pathology,
Bloomsburg University of PA

Rock Rehab: A Collaborative Approach to Working with the Injured Rock Singer

Rock singing requires tremendous feats of vocal athleticism and extended vocal techniques. Rock singers typically have extremely demanding performance, rehearsal and recording schedules, not to mention the speaking demands associated with media and publicity events. They often have little or no vocal training, and may even be averse to seeking training due to a perception that a voice teacher will try to “change” their voice into something operatic and less “edgy.” When rock singers experience a voice injury, it is critical that their singing voice rehabilitation plan be customized to address the singer’s style, “vocal signature,” and vocal demands.

This workshop will demonstrate a collaborative approach to singing voice rehabilitation, with a CCM voice teacher who specializes in rock singing and a singing voice speech-language pathologist. The instructors will explore and demonstrate intervention strategies to ensure that the voice is receiving adequate and appropriate exercise that is customized to the singer’s style and specific injury. Together the presenters will illustrate the numerous factors that must be addressed as a part of the rehabilitation process, including vocal pacing strategies, body alignment and body movement, the use of audio amplification and recording equipment, vocal efficiency for speaking and singing, and “safe” use of extended vocal techniques.

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

Leda Searce, MM, MS, CCC-SLP, Singing Voice Specialist and Director of Performing Voice Programs and Development, Duke Voice Care Center

Matthew Edwards, Assistant Professor of Voice, Musical Theatre Styles Specialist, Treasurer, Virginia NATS, Faculty - CCM Institute, Shenandoah Conservatory, Shenandoah University

Assessment of Intonation: Learning from Technology

Of all the terms that describe the singing voice, “pitch” should be the most objective, as it is the perceptual correlate of fundamental frequency, which can be measured objectively. By extension, ‘intonation’, the ability to sing notes accurately, can also be assessed objectively. Intonation should then be a perceptual quality on which singing teachers, choral directors, and coaches can agree. However, Gilman and Michael have shown that singing teachers vary widely in their ratings of intonation, and those ratings are not well correlated with the actual accuracy of fundamental frequency. Singing teachers were asked to rate intonation for samples of 5-note scales performed by a variety of singers. Some of these samples were “tuned,” using a pitch-correction software program, Melodyne. Contrary to expectations, improved accuracy did not necessarily improve the intonation ratings. In fact, samples corrected to be ‘perfectly in tune’ were often rated as having very poor intonation. This calls into question the use of autotuning in the music industry. It also raises a more fundamental question: What are the criteria used to determine good intonation?

This workshop brings voice scientists together to consider how (or if) intonation can be separated out from other characteristics of voice. Participants will listen to and rate both tuned and untuned samples. (The samples will be played on a laptop with a small amplifier; no special audio-visual equipment is necessary.) They can then share and discuss their own perceptual strategies. The workshop format provides excellent opportunity for voice professionals to brainstorm about how this technology of autotuning can be used to help train assessment of intonation, shedding new light on an age-old problem in the world of singing.

Deirdre D. Michael, PhD, SLP, CCC, Assistant Professor, Department of Otolaryngology,
University of Minnesota

Marina Gilman, MM, MA, CCC-SLP, Department of Otolaryngology, Emory University, The
Emory Voice Center

What Belters Can Learn from Opera Singers: Estill Voice Training Figures for Both!

This Estill Voice Training™ (EVT) workshop will highlight key ingredients of Opera and Belt “recipes” and show how these distinct sounds are produced with many of the same physical features. A “Rosetta Stone” of voice production, EVT offers translations for common techniques already used by successful singers. EVT integrates pioneering scientific research with the artistic study of voice to explain principles underlying vocal endurance, flexibility and health. The unique exercises, Figures for Voice, address power, source and filter properties of voice production, and include: *retraction of the false vocal folds* for healthy voice production; *variation of larynx height* for treble/bass resonance; and, *changing vocal fold mass* for voice quality modifications. Participants will produce select Estill Figures, describe the underlying anatomy and physiology, and apply them in specific solutions for effective Opera and Belt. Participants will discover that Opera and Belt have much in common by meeting the following objectives:

1. Identify the key Estill Figure “recipe” for the Opera and Belt Qualities
2. Identify the acoustic, physiologic and perceptual features of Opera and Belt Qualities
3. Compare and contrast vocal productions of Opera and Belt
4. Demonstrate the core Figures in producing Opera and Belt
5. Apply Estill pedagogical principles to personal studio practices

Kimberly Steinhauer, PhD, President, Estill Voice International, Voice Faculty, Point Park University, Conservatory of Performing Arts

Mary McDonald Klimek, MM, MS-CCC/SLP, Vice President, Estill Voice International

Digital Voice Processing for Live Performance

Equalization, compression, reverb, doubling, and Auto-Tune are common tools used by singers and producers in the recording studio. Many teachers are not aware that these effects are also available in live performance. While past generations used audio technology primarily for amplification, contemporary artists now routinely alter their vocal quality with this technology to create unique sounds. In combination with choosing the best microphone for the performer, this technology can help singers produce desirable vocal qualities while reducing vocal load.

This workshop will first cover the basic “tricks of the trade” with a simple Garage Band demonstration. The instructor will then work with students, in a master class setting, to demonstrate practical application of these effects in the voice studio. Participants will leave with a basic understanding of how recorded voices are enhanced, equipment that can be purchased in order to use digital processing in lessons and live performance, and how to use this technology to improve student outcomes in the private studio.

Matthew Edwards, Faculty - CCM Institute, Assistant Professor of Voice, Shenandoah Conservatory,
Shenandoah University

Creaky Voice: Exercises to Open the Door of Efficient Singing

Abstract: Vocal pedagogues have long since believed that glottal fry or “creaky voice” can be used as a means to achieve low register coordination. McKinney (1994) commented, “Once he has learned to make a fry with some ease, the student can usually produce some improved tones in his lower range by starting the fry and then sliding up easily into the lower tones of his modal voice.”

In this workshop, vocal pedagogues David Bankston and Amelia Rollings will examine the practical nature of using glottal fry tone or creaky voice in voice teaching. Primary techniques include the use of both ascending and descending creaky voice exercises throughout the entire range to (a) achieve ideal vocal fold closure that is neither pressed nor breathy, (b) stabilize laryngeal position while singing melodic leaps, and (c) unify registers and therefore accomplish an even scale.

Workshop participants will have the opportunity to try each exercise, although a large portion of time will be dedicated to incorporation of these methods with participating singers and a brief question and answer time.

Dr. David Bankston, DMA, Professor of Voice, Coastal Carolina University

Amelia Rollings, Ph.D. Student, The University of Kansas

Connecting to the Musical Theatre Song: Emotionally, Musically and Vocally

One of the challenges voice teachers face is helping the student connect to a song. Singing a song is more than singing the written notes and lyrics. The singer must include musical style, expression, emotion and storytelling so the audience is invited into the character's world through song. The storyline is expressed vocally through the choice of style and various vocal qualities.

Emotions and expressions can be created vocally by varying the dynamics, coloring the tone, varying the use of vowels and consonants, emphasizing alliterations, and by using "vocal stylisms" such as bending the pitch, crying, growling, and using vocal fry or a kind of "creaky" sound.

This workshop will interact with participants and work with music theatre singers to examine specific ways to explore and connect to their song emotionally and vocally to connect to the song.

Edrie Means Weekly, B.M.E., M.M., Associate Professor of Voice and Vocal Pedagogy, Contemporary Commercial Music Vocal Pedagogy Institute, Co-Founder, Shenandoah University and Conservatory of Music

The Flow Ball: Visual Feedback while Using a Semi-occluded Vocal Tract Gesture

One may argue that teaching and learning to play a musical instrument is a continuum of learning to transform thoughts and ideas into meaningful gestures that originate effective and affective musical communication. During this processes, there must be a combination of the student's knowledge (constituted by personal observations and internal experiences) with that of external experts, through dialogue and development of conceptual frameworks that allow reflection, decision and action planning. In other words, what the student's already know is challenged by what the teacher's know through the provision of feedback. This, in turn, promotes the acquisition of certain concepts and practicing strategies that facilitate decision making to solve problems and modify less efficient behaviours. The use of meaningful feedback is therefore of paramount importance to integrate learning with the awareness of deeper knowledge.

In the singing studio, there are several types of feedback that must be combined to enrich the scope of teaching-learning approaches, adapting them to the student's learning abilities. Taking into account that some students will respond better to listening, modelling the example given by the teacher (aural learners), to feeling (kinaesthetic learners), to understanding the concepts (intellectual learners) and to seeing (visual learners), the type of feedback given in a singing studio must find the best combination to serve the idiosyncrasies of a particular student.

This workshop aims at experimenting an additional tool that may contribute to the provision of both visual and kinaesthetic awareness of flow phonation, while using the benefits of semi-occluded vocal tract gestures. The aim is to promote flow-phonation in classical singers by using this tool while practicing specific isometric, isotonic and calisthenic type of vocal exercises. Ultimately, this tool may be applied to promote self-regulation strategies for breath management in singing students. Flow balls will be provided to each participant participating in the workshop.

Filipa Martins Baptista Lã, PhD, MMus and BSci, Assistant Professor in Music, University of Aveiro, Department of Communication and Arts, INET-MD, Campus Universitário de Santiago

Use of Semi-Occluded Vocal Tract Exercises for Post Operative Rehabilitation of the Singing Voice: The Why, When, and How

Semi-Occluded Vocal Tract (SOVT) exercises have long been used in both the area of speech pathology, vocal pedagogy and vocal coaching. Described by Titze in 2006, an SOVT introduces some sort of narrowing somewhere along the vocal tract. This narrowing can occur at any supraglottic point along the vocal tract. SOVT's are used very frequently in various types of voice therapy techniques including resonant voice therapy, lip trills and many other techniques. Given the ubiquitous nature of these types of techniques, it is important for voice clinicians to have a sound understanding of the physiology behind these exercises in order to maximize their effectiveness during voice therapy. Additionally, it is helpful to understand how to modify these exercises to suite the needs to individual patients. This presentation is designed to give participants a general understanding of both the theoretical basis and physiology of semi-occluded vocal tract exercises when used for voice therapy with specific attention to post operative rehabilitation of the singer. The presentation will discuss why SOVT's can be so effective and when it is appropriate to use them. Additionally, several variations of these exercises will be introduced and completed by participants in a workshop style format. At the end of the presentation, participants will have an understanding of how to use these exercises for various different voice disordered populations including general voice, professional voice and singing voice. Participants will actively participate in session.

Marci Rosenberg, MS CCC, Speech Pathologist Voice and singing Specialist, University of Michigan, Vocal Health Center

A Wired Demonstration of Female Belt Voice Phenomena

In this demonstration, voice practitioners and researchers Richard Lissemore and Donald Gray Miller use the Voce Vista software system with electroglottography, audio signals and spectral analysis to illustrate, in real time, vocal resonance phenomena specific to the female mix voice, yell voice and techniqued belt voice. Phenomena to be demonstrated and discussed include:

Effects of glottal attack on resonance

First formant (F1) tracking of the second harmonic (H2)

Effective Closed quotient analysis for F0s in the mix, techniqued belt and yell voices

Comparative formant tracking (resonance) strategies

Miller has previously demonstrated the resonance difference between the classical mix and the belt voice. This workshop refines those differences to include a distinction between the techniqued belt voice and the yell, the latter demonstrating a loud, abrasive yell-like resonance which may potentially lead to vocal injury.

2 female singers will demonstrate for this workshop. Both singers will be supplied by the presenters. A piano and overhead video projection will be needed for this wired demonstration.

Richard Lissemore, MM, Voice teacher and researcher, The City University of New York, Speech, Language, Hearing Science doctoral program

Donald Gray Miller, PhD, Voice Researcher, Groningen, NL

“Who’s in charge?” *Dealing with Audition Pressure*

Most singing teachers try to create a supportive and comfortable environment in their studios. They want their students to feel relaxed and unthreatened as they work on voice technique and repertoire. That environment, while conducive to learning and growing, does not, however, prepare students for the stress and pressure of auditions.

After teaching and coaching both professional and amateur opera singers, music theater singers, and concert singers for almost forty years, I have found that most singers tend to switch roles at an audition. They look for reactions from the auditioner and thus make the auditioner, the performer and themselves, the audience.

In this workshop, I will create for the singers an audition environment and introduce a variety of intrusions and distractions that typically occur at audition venues such as a hostile casting agent, a noisy room, a poor accompanist, or a micromanaging director. Based on their reaction to the stimuli, I will offer strategies to help them more effectively manage those responses, including flexible character development, intense focus on staying “in the moment” as the moment changes, and sometimes simply ignoring the intrusive stimuli. Teachers will be encouraged to simulate auditions in their studios and time will be set aside for questions and answers.

Robert Edwin Studio, LLC, Associate Editor – NATS *Journal of Singing*,

Airflow and Resonance – Two Foundational Elements of Healthy Voice Production

This workshop will focus on specific tools used to instruct a professional vocalist how to increase flow by eliminating excess glottal resistance. In addition, specific approaches to helping a professional vocalist realize “resonant voice” (easy production with a feeling of sympathetic vibration towards the front of the face) will be demonstrated. Semi-occluded vocal tract postures, including the lip trill, raspberry (upper and lower lip), tongue trill, nose pinch, standing wave (a device employed by the late Dr. Barbara Doscher), and straw phonation will be explored. Live examples of male and female singers in classical, musical theatre and pop will be utilized. This workshop aims to highlight some of the “big ballpark” commonalities between all styles of singing.

Brian P Gill, Department of Music and Performing Arts Professions, NYU Steinhardt School of Culture, Education and Human Development

Use Your Head: Improving Breath Management and Resonance Using Release Maneuvers for Head and Neck

Objective: Participants improve breathing mechanics and reduce muscle tension dysphonia through a comprehensive muscle release sequence focusing on the head and neck, including laryngeal release and massage inside the mouth.

Overworking muscles in the head and neck adversely affect many aspects of the speaking and singing voice, including pitch range, dynamics, consistency, ease, articulation, and flexibility. Releasing misplaced head and neck tension ameliorates these issues, improving both resonance and breath flow. Without that understanding, many speakers and singers use increased air pressure to remedy these resonance faults. Unfortunately, the resulting higher subglottic pressure often destabilizes the larynx. To restore stability, compensatory behaviors often involve even more tension in the head and neck. With increasing tension, the resonance deteriorates further, and the cycle continues. Learning to release the overworking muscles instead of merely intensifying air pressure results in better breath management and enhanced resonance.

Methods: This hands-on workshop employs massage, release, and breathing techniques. Simple exercises demonstrate the practical application of muscle release to breathing and vocalization. Methods that inform this work include shiatsu, strain-counterstrain (passive positional release), Stough Breathwork, Pilates Breathwork, and The Thompson Method. A comprehensive muscle release sequence, including laryngeal and mouth massage, targets muscles in the:

- neck (upper trapezius, erector spinae, suboccipital, sternocleidomastoid, scalenes, levator scapulae, suprahyoid, infrahyoid);
- jaw (masseter, temporalis, digastric, medial pterygoid, lateral pterygoid);
- tongue (genioglossus, geniohyoid, hyoglossus, styloglossus, stylohyoid, lingualis); and
- oropharynx (velum, palatoglossus)

Results and Conclusions: Participants leave the workshop with improved breathing habits and enhanced resonance. The comprehensive massage and exercise sequence taught in this workshop provides participants with a valuable takeaway for home and studio use, allowing them to experience the dynamic relationship between breath management, resonance, and muscle release in the head and neck, including the cervical spine, occiput, jaw, tongue, larynx, and oropharynx.

Ruth Williams Hennessy, MM , Director, Hennessy Whole Body Voice

Cool-Down Exercises for Singers

Objectives

Cool-down exercises are routinely prescribed for singers, yet few protocols exist regarding best practice. A vocal cool-down protocol was designed as part of a study comparing objective and subjective measures of vocal function after using different recovery methods following rigorous voice use. The cool-down protocol is designed to gently lower the voice from a high tessitura to an optimum pitch for speech. Additionally, the exercises foster decreased tension through gentle stretching and prepare the voice for healthy, resonant speech.

Methods

The facilitator will demonstrate the cool down exercises using a prearranged subject, and the audience will be encouraged to participate. The protocol begins with exercises which guide the voice to optimum pitch levels for speech. A descending loop and descending scales are used to gently bring the voice to mid-range pitches. Next, deep breathing and stretching exercises induce relaxation and decrease tension in the upper torso, head and neck. The last exercises involve chanting and inflected oral reading of phrases at optimum pitch levels for speech. Nasal consonants are used to encourage forward placement of the voice.

Results/Conclusions

Cool-down exercises may be most beneficial as they raise a conscious awareness of optimum, resonant voice use which may carry over into conversational speech. The perception of improved vocal function may stem from the cool-down exercises themselves or from the carryover of optimum voice use provoked by cool downs and may be evident as much as 12-24 hours after their use.

Renee Gottliebson, PhD, CCC-SLP, Clinical Faculty, Dept of Speech Pathology and Audiology, Miami University

The Accent Method: Foundations and Applications to Vocal and Choral Pedagogy

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

The Accent Method's applicability is wide-spread, as it can be used with performers of all ages and experience levels, and for both healthy and pathologic voices. It is a "user-friendly" choice for any performer or vocal pedagogue, in particular, because it draws upon our "user" knowledge gained through years of singing and focuses it specifically on more efficient vocal production, or "more bang for the buck". It can also be used very successfully by the choral pedagogue, to improve unity of timbre and decreased vocal load for passages of increased intensity or higher frequencies. Proper implementation of this technique will help ensure safe and healthy vocal production, thus reducing the likelihood of future vocal pathologies and resulting "down" time from performance venues.

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

NOTE: I recently gave this presentation/workshop at Bowling Green State University in Ohio on Friday, October 18; and Dr. Ron Scherer asked me to offer it, once again, as a workshop at this year's Voice Foundation. He is aware that I have presented this topic before, but feels it is worth repeating once again at this point in time.

Pelvic floor support: the physiology, biomechanics and exercises for optimal voice

The pelvic floor, including the levator ani and coccygeus and supportive musculature (the transversus abdominis), make up the muscular mechanisms for support of our internal organs, but also aids in support of singing and speech. The role of the transversus abdominis in maintaining the expansion of the ribcage during singing has recently been recognized in the physical therapy literature. These groups of muscles are often used (correctly) in singing but are not spoken of directly in pedagogical literature or in vocal training in a consistent manner. However, if the pelvic floor and transversus abdominis are not used in tandem, the upper abdominals can be hyper-recruited, exacerbating both throat tension and laryngopharyngeal reflux disease (LPRD). The training of the use of this musculature and the understanding of the mechanism and its care is essential in maintaining optimal support for operatic singing in particular, but helpful for all voice production. This workshop is focused on the education of the mechanisms of support from a physiologic and biomechanical point of view (briefly) and to provide clear and helpful exercises to identify, strengthen and optimize the musculature behind support for optimal voice production.

*This workshop is appropriate for a Speech-Language Pathology category, as well.

Kate Emerich, MS, CCC-SLP, Voice Pathologist, Singing Voice Specialist, Vocal Essentials LLC

Addressing and Avoiding MTD: A Voice Teacher's Perspective

After the diagnosis of MTD, a singer often has multiple issues to address including the need to develop a more effective technique, a better understanding of their vocal health and their emotional well-being, and often a rethinking of repertoire and role choices. In today's workshop, I will be addressing specifically the vocal issues and exercises to retrain their voices although mention will be made of some of the personality issues associated with MTD. As there is great variation among individual singers, I will demonstrate 'categories' of exercises to encourage a "bottom up (grounded) system for top down singing". These three main goals include a lowered breathing pattern in order to aid in decreasing subglottic air pressure, a vertical laryngeal position which allows for a relaxed posture and position, and a top down singing approach to encourage an easier, more balanced registration and better resonance. Exercises will be shown which address MTD and also aid in its avoidance.

Jeanne Goffi-Fynn, Ed.D., Lecturer in Music, Teachers College, Columbia University

If You Hear Them, You Can Choose Them

When viewing Hubert Noe's spectrograms of great singers over the years, I can't help but think that much of what we hear is a gift of nature touched by the grace of culture.

As more people become aware of VoceVista and other spectrogram programs this will produce a markedly different generation of singers. These tools are valuable but do not replace good listening skills. If we can hear the inner workings of the sound, we stand a much better chance of altering it to our satisfaction based on the criteria that the audience lays out.

In a simplified way, the difference between German and Italian singers for example, is visible in those spectrograms and it usually is a simple change in amplification of one overtone one position up or down in the second formant region that changes a fully functional voice to a beautiful voice.

This workshop will help people to improve listening skills:

- To know better what they are listening for
- How to hear which overtones are important in the mix of all the other less relevant sounds
- How to change the filter mechanism to adjust the relevant part of the voice

We will make a stronger connection in the singer's mind between the overtones and the vowels

- Through demonstration of lip position (first formant) and tongue position. (I will first sing very clear overtones as separate tones, independent of the vowel system. Then go back to normal singing and try to help singers find the overtones within the vowels so there is awareness that every color change is a change in the balance of these overtones.)
- **And through audience participation and experimentation** - adjustment of sound using these elements alone and in combination:
 - the first formant, governed by the lips
 - the second formant, governed by the tongue
 - adjustment of the shape of the sound using a combination of both these
 - optimizing the tilt of the head during vowel production.

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Methods for Reducing the Perception of Vocal Tremor in Connected Speech

Objective: The purpose of this workshop is to present and demonstrate methods used to assess and reduce the perception of vocal tremor during speaking in those diagnosed with vocal tremor.

Methods/Design: Participants will be provided with handouts summarizing the methods of assessment and speech therapy methods used to facilitate reduced perception of vocal tremor during speaking. Preliminary information about best candidates for this treatment approach will also be presented. Finally, a patient demonstration of the methods used to evaluate the respiratory, phonatory, and vocal tract contributions to vocal tremor will be presented. In addition, methods for reducing the perception of vocal tremor during speaking will also be demonstrated.

Conclusions: Upon completion of this workshop, participants will be able to identify, discuss, and perform assessment and speech treatment of individuals with vocal tremor.

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Cough, Wheeze, Croak: Integrating Behavioral Treatment for Voice, Cough, and PVFM

Speech-language pathologists are often presented with patients who have a constellation of upper airway disorders simultaneously, including muscle tension dysphonia, chronic cough, and/or paradoxical vocal fold motion (Ryan and Gibson, 2009; Vertigan et al., 2007). It can be challenging to devise a unified treatment plan for these patients that will facilitate efficient and effective treatment for multiple disorders simultaneously, however the literature supports the use of behavioral techniques involving a combination of modalities (Vertigan and Gibson, 2012). This session will address the physiologic goals and rationale underlying therapeutic task selection (Verdolini et al., 1998; Mathers-Schmidt, 2001; Sandage and Zelazny, 2004). However, the session will focus primarily upon practice and self-monitoring during performance of selected tasks, and will address variations in tasks that might occur as a result of individual patient needs or individual clinician expertise. Participants will be able to apply the selected tasks with patients independently upon completion of this workshop, and will be able to justify task selection based on physiologic goals.

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Primitive Voice or Stenwerk (Dutch)

Stenwerk is a series of stimulations and combinations of movement and sound that invite the body to explore its limitations in the context of sounds and breath. Techniques such as: listening; physical and vocal support; and movement are also employed both in group work and individual work.

With this approach the listening process becomes primary, placing the expression as secondary. By separating the vertical voice (breath, spine, and the ground) from the horizontal one (culture, society, communication) we reproduce a natural process reconnecting to the origin of our voice. There is an angle of the (larynx, pharynx, mouth) in the vocal system, which exists also in different parts of our body with the outside (hands, feet, pelvis). The link between the vocal system and the pelvis on both a neurological level and an educational level is remarkable and developed.. From a pedagogical standpoint this work can offer school children deeper sensitivity of communication in their relationships that can considerably reduce violence and aggression.

This introductory workshop proposes a palette of exercises starting with: the sensitivity of the body (vibrations); the notion of physical listening; the development of different support (body, space, ground); and an experimentation about daring and surrendering in which we can enjoy the difference between a physical emotion and an “emotion of emotion” or psychological emotion (for example: what is a fear in front of a “fear of fear”). This last idea of secondary emotions brings us more in the direction of communication and creativity. Because this work is based on unfolding and stimulating (and not a straight forward “learning”), the effects are considerable in the hours and the days after the workshop even when the training affords a lot of surprises, discovering, and pleasures.

The specific themes of the approach are:

- Verticality & Horizontality
- Theory of angles (neck, wrist, ankle, pelvis)
- Structure of the arm / Structure of the cultural voice
- Emotion and “emotion of emotion”
- Listening instead of expressing
- Being movable in /out the voice
- Taking support (Echoes, Feed-back, Connection)
- “Taking & Being taken” instead of “Giving & Receiving”
- Breathing in voices
- Primitive voice as a base for feeling, awareness, communication, expression
- Anger as primitive language (Territory)
- Structure of the primitive voices / Structure of a body

Jean-Rene Toussaint, Autodidact (autodidact Voice since 1980), Independent in the Netherlands, Voice teacher/coach with Pig Iron Theatre and Wilma Theater

The Efficacy of Vocal Cool-Down Exercises

The benefits of cool-down following strenuous exercise have been well established in the sports physiology literature. However, opinions vary in the voice community as to the effectiveness of cooling down after strenuous singing. This presentation will examine the efficacy of cool-down exercises following a heavy vocal load. Reports of a perceptual questionnaire will be discussed. However, the majority of the workshop will be to demonstrate the cool-down vocalize protocol for the study. The workshop will present the rationale for choosing the specific vocalizes from an experiential and physiological basis.

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PhoRTE Therapy: Opportunities to Regain the Strength and Restore the Youth of an Aging Voice

As the U.S. population ages and older individuals participate in the workforce in greater numbers, effective verbal communication has become a focus of successful aging. However, age-related voice problems among the elderly have been shown to negatively impact communication effectiveness and voice-related quality of life. In fact, decreased vocal function has been associated with depression and anxiety, which may lead to social withdrawal and decreased participation in life activities. Moreover, reduced loudness, a common complaint of older individuals, poses a significant challenge to keeping elderly individuals safe. To deal with this health issue, a treatment approach known as phonation resistance training exercise (PhoRTE) therapy has emerged as a rehabilitation option for age-related voice changes. PhoRTE - a homophone to the Italian word *forte* meaning loud and strong - targets the biological bases of degenerative changes of the respiratory and laryngeal system through resistance exercise training. Preliminary data suggest that PhoRTE results in decreased vocal effort and improved quality of life in individuals with age-related voice problems. This workshop teaches clinicians how to implement PhoRTE therapy through live demonstration and hands-on experience. The theoretical basis for the PhoRTE therapy approach, a clearly outlined protocol, and clinical case studies will be presented. Opportunities to extend PhoRTE to the aging singer with a diagnosis and complaints of increased fatigue and decreased endurance will also be explained. Clinicians will leave this workshop with a clear understanding of how to help older individuals regain the strength and restore the youth of an aging voice.

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Edie R. Hapner, PhD, CCC-SLP, Associate Professor, Director of Speech Language Pathology, Emory Voice Center, Department of Otolaryngology Head and Neck Surgery

Mind, Body, and Voice: Principles of Yoga in Voice Care

Over the past decade, principles of yoga have become widely infused into contemporary voice therapy and the teaching of singing. Yoga is not only a sequence of postures and movements but also has its foundations in relaxing the body and calming the mind to help balance one's life, both physically and emotionally. This workshop will focus on incorporating the principles of yoga into warm-ups, cool-downs, range extension, vocal endurance, vocal projection strategies and articulatory movements for singers and occupational voice users. Specific attention will be on whole body relaxation, body alignment, and breath coordination in various singing and speaking tasks. Knowledge of healthy singing and the physiology of voice production will be incorporated in each exercise. This workshop will blend together knowledge of laryngeal and respiratory physiology, vocal health, pedagogy, and performance. The concepts and exercises presented will be specifically useful with hyperfunctional voices and are intended to aid in preventing vocal injury. After completing this workshop participants will have knowledge of basic yoga principles and how to apply them when caring for the professional voice.

Workshop Outline:

Basic principles of yoga: body awareness, calming the body and mind, breath control

Progressive relaxation: imagery and body mapping

Posture and body alignment: stretching and reposturing

Breath coordination: active versus passive

Reduction of articulatory tension in vocalise: distractor movements; use of visual feedback

Range extension: melismatic scales, semi-occluded vocal tract, breath coordination

Vocal projection: active expiratory forces and laryngeal configuration

Endurance building exercises: increasing vocal load

Cool down/centering exercises: progressive relaxation, reduction of articulatory and laryngeal tension, reposturing techniques

Adam Lloyd, MM, MA, CCC-SLP, Voice Pathologist and Singing Voice Specialist, Ear, Nose, Throat, and Plastic Surgery Associates

Athletic Breath for the Actor

Apneas, or holds in the breathing cycle, are an important part of human functioning. There is an inevitable apnea as the direction of inspiration and expiration reverse. It is usually a larger apnea after expiration and before a new inspiration, especially in the tidal breath of sleep and relaxation. In addition to unconscious instances, humans intentionally use apneas at times to control emotion (choking back tears) or assist thinking (hold that thought).

It is our belief that the breath of the actor has greater demands than that of a sleeping or relaxing person, and that stifling emotion and 'holding' to think make the actor less facile.

In our workshop we will explore what we call the athletic breath, with minimal pausing in reversal of breath flow. More importantly, we will look to build some experience around attaching sound immediately to that flow of breath, thus eliminating holds before speaking that lead to compressed sound, and thus experience, for the audience.

We will use a series of hands on exercises to move from breath, to a whisper count, and then to speaking. This slow progression allows for awareness and ideally more facility at each increasing level of vocal demand.

Each participant in the workshop will be asked to partake in the exercises and, while partnering with other members, 'coach' fellow participants. Being in both the role of student and leader, we hope to offer a richer experience for people in the workshop. Attendees do not need to be actors, only interested in an evolving methodology around breath, thought, intention, and doing.

Please visit our website for more information - www.MillerVoiceMethod.com.

Additional Info

This workshop will explore the core tenants of the Miller Voice Method, or mVm, which has been in development for over 11 years now. Both Graduate Acting programs at NYU Tisch School of the Arts and UNC-Chapel Hill have become the artistic homes for this development.

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Liam Joynt, MFA, BA

Treating Laryngeal Hyper-Responsiveness: So much more than just sniffing through the nose!

Laryngeal hyper-responsiveness (LHR) is a condition characterized by a number of symptoms that can defy easy diagnosis. These can include episodes of severe shortness of breath, chronic cough, chest and throat tightness, dramatic stridor, and hypersensitivity to strong odors. Relentless symptoms can persist for years, and frequent hospitalizations are common. Impact on quality of life is significant and can lead to substantial disability. Paradoxical vocal fold motion, refractory cough, and irritable larynx are related conditions that can be grouped under the hyper-responsiveness umbrella. A key component of treatment involves behavioral therapy, and it's effectiveness has been demonstrated in several randomized trials. Therapeutic methods described in the literature focus solely on the respiratory retraining. However, while it affects breathing, this is primarily a disorder of the larynx. Therefore, a fundamental ingredient of therapeutic intervention should include laryngeal training. In this workshop we will discuss etiological factors (precipitating and maintaining), as well as differential diagnosis, and goals for management of patients with chemically-induced or exercise-induced LHR. We will focus on specific laryngeal exercises specifically developed to manage symptoms. This therapeutic approach goes beyond the basics (such as establishment of abdominal breathing and slow nasal breath). There will be demonstrations of effective and specific respiratory and laryngeal exercise routines that allow patients to reduce the frequency and length of hyper-responsive episodes. Implementation of this therapeutic program ultimately restores normal laryngeal activity, until a complete resolution of the condition is achieved. Attendees to the workshop are expected to have basic knowledge of diagnosis and treatment of irritable larynx syndrome, chronic refractory cough, and paradoxical vocal fold movement. There will be hands-on practice.

Topics include:

- Identification of inefficient breathing patterns
- Identification of paradoxical abdominal movement
- Development of advanced breathing control practices, with the use of respiratory ratios, progressive slow breathing, modification of air-hunger threshold
- Development of glottic control practices
- Modifications to use by patients with exercise-induced symptomatology

Claudio F. Milstein, Ph.D., Director, The Voice Center, Associate Professor of Otolaryngology, Cleveland Clinic Lerner College of Medicine, Head and Neck Institute, Cleveland Clinic, 9500 Euclid Ave - Desk A-71, Cleveland, Ohio 44195

Acoustic and Aerodynamic Measures of the Voice in Pregnancy

Investigations of pregnancy's effects on the speaking and singing voice have been restricted to the final trimester and generally reveal limited impact on acoustic measures. The purpose of this study was to analyze acoustic and aerodynamic data collected during the course of a pregnancy. Weekly voice recordings of a 32-year old woman with no history of voice disorder were made during weeks 11-39 of her normal pregnancy. Airflow was recorded 4 times during the last trimester. Recordings were also made 5 months after delivery for comparison. Consistent with previous reports, measures of fundamental frequency and perturbation were stable within normal limits throughout the pregnancy. Unlike previous reports of decreased Maximum Phonation Time (MPT), MPT was stable near 22 seconds. Aerodynamic and glottal measures revealed some change during the last trimester. Average flow decreased. Peak Airflow was stable near .25 l/s but minimum Airflow (DC) decreased from .12 to .05 l/s, contributing to an increasing AC/DC ratio and perhaps reflecting more complete glottal closure. Open Quotient was stable near 55% but Speed Quotient gradually increased from 1.0 to 1.8 in the last 6 weeks and remained for 5 months post delivery, indicative of a shift in the open phase symmetry toward a shorter closing portion. These changes may be associated with hormone-related changes in vocal fold tissue. Acoustic measures have consistently shown limited effect of pregnancy; however, aerodynamic and glottal measures in this study warrant systematic investigation, including measures of glottal function and visual inspection of larynx during pregnancy.

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A Corpus-Based Study Regarding the Consistency of Speeches of Past American Presidents

Discovering the relationships among political speech, perceived trust/charisma, and voice inflections can be difficult for many reasons. For example, many variables can be involved, such as word choice, prosodic category, speech topic, and political party affiliation (Rosenberg and Hirschberg 2005). The study of (Touati 1993) showed that French politicians have used different kinds of pitch variation according to the type of speech they are presenting, such as a campaign or an acceptance speech. A previous study, (Guerini, Strapparava, and Stock 2008), tagged the presence of applause as an indicator of audience persuasion, and found some interesting correlations between word choice and the presence of applause.

This study expands on a few of the ideas of the previous studies by considering a concept of “vocal consistency” in the context of political speech. Approximately one thousand speeches by 14 past United States presidents, ranging from Herbert Hoover to Barack Obama, will be examined for pitch changes across large segments and words, as well as pause duration patterns and variations in intensity levels. The speeches have been downloaded from various sources, such as the Miller Center from the University of Virginia, and The American Presidency Project of the University of California, Santa Barbara.

The following questions are addressed:

1. When looking at common prosodic categories of pitch, duration, energy levels, do certain past U. S. Presidents exhibit consistent speech patterns across different kinds of speech purposes, such as campaign speech, acceptance speech, wartime speech, state of the union address, and domestic speech?
2. When looking at relationships between the average pause duration after a word, the word's proximity to the end of a phrase, and the word's part of speech, do certain past U. S. Presidents exhibit consistent speech patterns across different kinds of speech purposes, such as campaign speech, acceptance speech, wartime speech, state of the union address, and domestic speech?

Once speech consistency levels have been examined, it could be determined if audiences, when limited to one political party affiliation, gender, or age, prefer political speakers that are consistent across speech types, or political speakers that make adjustment for a particular speech's purpose. This kind of information could be useful for speech coaches who are working with neophyte politicians who want to gain their audiences' trust.

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