**Ref#: BS2**

# Variation of Fundamental Frequency in Humans When Speaking to Dogs

A dog is man's best friend. Dog owners and dog lovers frequently communicate with their dogs, and often use repeated short utterances. This study examines the shift of fundamental frequency (SF0) among dog lovers, with variables of a small vs. big dog communication setting. Ten dog owners and ten dog lovers (non-owners, but love dogs) were measured for spontaneous speech with a small dog and with a large dog, and compared to their normal SF0 when animals were not present. The impact of higher SF0 for communication with a smaller dog and lower SF0 for communication with a larger dog is important to consider when treating dysphonic patients with hyperfunctional speech tendencies.

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**Ref#: BS3**

# Exploring Tuning Strategies in Individual Choral Singers Using Synthetic Electronic Test Synthetic Quartet

Magnetic resonance imaging (MRI) data was collected for two male singers phonating a set of vowels in the words *hard, stern, neap, port* and *food* and these have been used as a basis for calculating the 3-D geometric representation of the vocal tracts for each vowel of each singer. These 3-D representations have been used for the production of two kinds of rapid prototyping replicas: (1) solid models of the airways, and (2) hollow models of the airways. The latter models have been designed with a coupling that enables them to sit on a horn driver, which can be used to diffuse an electronic source waveform. This source waveform can either be the output from an electrolaryngograph or one of a set of synthesized sources based on a pulse train, a sawtooth or the LF synthesis source model. The process of creating these models will be described and the sound output from the hollow versions will be demonstrated live.

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**Ref#: BS4**

# Singers and Psychology: How the Basic Parent-Child Relationship Can Influence the Singing Voice

The voice is the human natural instrument. Particularly among singers, it is a central means of expression. As such, it is likely to reflect emotional and psychological states, as well as more stable individual differences. Among the factors that can influence a singer's voice, there could be a fundamental one not yet explored: the mother. We put forward the hypothesis that one of the influential differences is attachment style, and conducted a study to investigate how attachment styles relate to a series of voice indicators, among singers. In this study, 25 singers (between 20 and 35 years of age) completed the Experiences in Close Relationships-Revised (ECR-R) Questionnaire (Fraley, Waller, & Brennan, 2000) to assess attachment qualities. Next, participants' voices were analyzed conducting a voice range profile (Phonetogram) and the Dysphonia Severity Index (DSI) using LingWAVES. Participants also completed the Singing Voice Handicap Index (Stern, 2007), to assess voice discomfort. The results suggest the existence of a relationship between attachment and vocal qualities. [Anxious attachment correlates with jitter (r=.483, p=.01), with irregularity/roughness (r=.402, p=.04) with maximum volume (r=-.439, p=.02) and marginally with volume dynamic (r=-.374, p=.06). Avoidant attachment correlates with jitter (r=.443, p=.02).] Findings suggest the need to explore emotional attachment in singers with elevated perturbation measures.

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**Ref#: BS5**

# Modeling Vocal Similarity in Speaker Identification: A Taxonomy of American English Male and Female Voices

Individual voices that share a common gender, age, and dialect nevertheless possess unique characteristics that allow for speaker identification by human and machine. Some speakers are relatively confusable with one another, suggesting that identities can cohere into groups based on gross vocal similarity, as reflected in such popular terms as “rich”, “droning”, or “gravelly”, without involving vocal pathology. Currently, no taxonomies of perceived voice types have been proposed for male and female voices in any language. For this purpose, perceived vocal similarity judgments, using a database of 100 young and middle aged male and female American English voices, were collected and submitted to a hierarchical clustering analysis. Nine female voice types and nine male voice types were determined. These were initially classified by nominal auditory judgments by expert listeners, who agreed on six acoustic-auditory properties: voice quality (rough/clear), nasality/orality, mean pitch, pitch variability, degree of coarticulation, and speaking rate. These judgments informed an acoustic analysis to model both taxonomies, using 23 measures of voice quality, pitch, speaking rate, and degree of hypoarticulation. A discriminant analysis successfully classified 96% of both the male voices and female voices into their respective voice types. For female voices, chronological age influenced distribution of voices into types, with younger voices grouped separately from middle aged voices, while male voice types were more heterogeneous with respect to age. Vocal age appears more salient in judging female voice type, and this observation in congruent with higher accuracy rates in estimating female vocal age in prior studies.

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**Ref#: BS12**

# A General-Purpose Fast-Processing Method for Long Tern Audio Signals: Application to Newborn and Adult Recordings

**Purpose**: Contact-less monitoring of physiological parameters is increasingly recognized in clinical settings to minimize the discomfort of long-term connection to sensors. Thus, audio signals recorded by ambient microphones are an appealing field of research with several applications: obstructive apnoea syndrome, preterm newborns, occupational disphonia, speech therapy, autism, etc.
As the recording length (even several hours) is prohibitive both for perceptual and for visual inspection of signal patterns, we present an automatic method for fast processing of long-lasting audio recordings for clinical applications.
**Material**: The new tool (Long Term Audio Analyzer - LTAA), provided with a user-friendly interface implements fast algorithms to automatically extract voiced parts only from the audio signal.
Two different clinical problems are presented: premature newborn cry (28 subjects, duration: 30'-3h), to relate crying effort and impaired auto-regulation of cerebral blood oxygenation, and nocturnal snoring of patients with obstructive sleep apnea (OSA) (18 subjects, duration: 7-8h), loud and frequent snoring being the most consistent sign of upper airway dysfunction.
**Results:** With newborn cry (30"-1'40" computing time) voiced parts amount to about 30% of the whole signal. In the case of OSA (2'-2'30" computing time), more than 80% of the recorded audio signal was disregarded. Results are comparable to those obtained with existing software tools (Praat, BioVoice) that however require much longer time for elaboration or are not even capable to deal with such long lasting recordings.
**Conclusions:** Thanks to its characteristics, LTAA could be used as the first screening in all clinical applications related to the human voice.

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**Ref#: BS14**

# Analyzing the Pitch-shift-Reflex

**Introduction:** The Pitch-shift-Reflex (PSR) is the adjustment of the pitch during phonation/articulation in response to a spontaneous pitch change of the auditory feedback. The objective of analyzing the PSR is to increase the understanding of the interaction of neurological and physiological processes of the auditory feedback control and compare them with each other regarding the processing speed. This approach broadens the perspective of previous phoniatric studies.
**Problem:** Is the combined analysis of neurological and physiological processes possible?
**Method:** The (EEG) electroencephalography is carried out synchronously with a High-speed-endoscopy (HSE) and the recording of acoustic data. The flexible endoscope is inserted nasally. The camera (Photron SA 1.1) is used with a frame-rate of 6 kHz. The processes are triggered with LabVIEW. The acoustic recording and the input of the feedback which is pitched upward by three whole steps for 300 ms during the phonation of the vowel /a/ are realized with a headset.
**Results:** The HSE frame rate is high enough to resolve pitch changes of the fundamental frequency. In spite of the nasally inserted endoscope the EEG-recordings are free of artifacts. The timing of processing the alternated auditory input and adjusting the pitch can be analyzed using EEG, HSE and acoustic recordings.
**Conclusions:** The experimental setup is suitable to analyze neurological and physiological processes regarding the PSR in combination (experimental series are in preparation). Consequently it permits to research to what extend there is an impairment of feedback mechanisms of voice- and speech disordered subjects.

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**Ref#: BS16**

# Noninvasive PGG System for Glottal Aperture Monitoring During Speech

Photoglottography (PGG) has been used to optically monitor glottal articulation during speech. The PGG is capable of recording glottal aperture signals with a simple photodetector device, while this method is known to have two problems: moderately invasive technique with the use of a transnasal fiberscope as a light source, and limitation of data acquisition for utterances with back vowels. To improve the technique, a new noninvasive PGG system has been developed and tested. Our system employs an external (noninvasive) illumination device in place of a fiberscope to be used for laboratory data acquisition for phonetics research. Infrared LEDs with an adequate wavelength are placed on the skin surface of the neck to illuminate the hypopharyngeal cavity, and they are driven by constant current pulses. Light pulses passed through the glottis are received by an AC-coupled photodetector unit, which is placed on the neck skin below the level of the glottis. Amplitude demodulation of the detected glottal transillumination signals permits us to observe the magnitude of glottal aperture with minimal effect of ambient room light. Thus, glottal aperture changes during speech can be monitored with the external lighting and sensing PGG technique (ePGG) in a laboratory with no limitation of utterances. Possible solutions for the poor SNR due to light scattering in the soft tissues will be presented with sample data for Japanese utterances having devoiced vowels.

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**Ref#: BS23**

# Can Listeners Hear Who is Singing? The Role of Onset Cues

| | |
|---|---|
| Objective/Hypothesis: | To determine the effect of onset on the ability to hear whether two sung stimuli are produced by the same singer or two different singers. |
| Study Design: | Group-design signal-detection experiment. |
| Methods: | This study employs a forced choice paradigm where listeners hear two different singers producing /a/ at the identical pitch and an unknown singer producing /a/ at a different pitch. Listeners must identify which singer is the unknown singer. Stimuli from a previous study are being used. As in the previous study offsets have been removed, but unlike the previous study, onset information is now retained. Stimuli were recorded from 2 baritones, 2 tenors, 2 mezzo-sopranos, and 2 sopranos across a 1.5 octave range. All possible pairs of singers were constructed for the lowest pitch and for the highest pitch. The unknown singer was varied across the remaining pitches. |
| Results: | Data will be compared to the previous study to determine the effect of onset on singer discrimination. Based on data obtained from a study of pitch matching accuracy in sopranos and mezzo-sopranos, where differences were seen in pitch adjustments during onsets of sopranos and mezzo-sopranos, it is expected that the onset pitch transitions will improve the ability of listeners to discriminate mezzo-sopranos and sopranos across large pitch differences. It is unclear whether onset information can also improve the ability of listeners to discriminate singers within category across pitches. |
| Conclusion: | Temporal information present in onset cues could provide additional information useful in identifying individual voices across pitch. |

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**REF#: BS29**

**The Low-Mandible Maneuver and its Resonential Implications for Singers of International Rank**

Many singers of international rank appear to frequently drop the posterior mandible while singing in order to optimize resonance production. This study investigated the physiology of the Low Mandible Maneuver through the use of MRI, ultrasound and spectrographic analysis.

The study of internationally-ranked singers has been hampered by the paucity of internal imagery and we have attempted to address this problem by utilizing portable ultrasound equipment that we could transport to the homes, studios or dressing rooms of such ranking singers. With the ultrasound and acoustic data gathered in fairly brief sessions, we were able to ascertain the resonance gains garnered from the technique's use.

The study featured two phases: I – MRI study of the maneuver and its physiological effect on surrounding structures (in collaboration of the Medical University of Graz (Austria)), and II, ultrasound investigation that studied tongue shape during the maneuver.

The Low Mandible Maneuver has rather significant ramifications for resonance production by enabling a concomitantly lowered larynx and increased resonance space in the pharyngeal and oral cavities. Its use also has a rather significant effect on the tongue shapes required for all sung phonemes. The advantage of using ultrasound for this study was to be able to produce real-time videos of the singer in action and then, through the use of stop action, precisely study both individual phoneme production and phoneme-to-phoneme transitions during the Low Mandible Maneuver.

This presentation will employ videos, acoustic analysis (spectrography) as well as stop-action imagery to illustrate the Low Mandible Maneuver.

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**Ref#: M1**

# Changes in Voice Parameters among Users of Combined Oral Contraceptive Pills: A Case Control Study

**Background**: Many studies have been investigating the effect of hormonal changes on the female larynx and vocal folds. To our knowledge, however, there have been no studies investigating the effect of oral contraceptives on the female voice in the Egyptian population
**Objectives**: to compare voice parameters in users of combined oral contraceptive pills versus controls.
**Study design**: Case control study.
**Methodology**:100 non-smoker women with no history of voice abuse nor complaints will be recruited and allocated into 2 groups: Group I (n=50): using same type of combined oral contraceptive pills, for at least 6 months, and group II (n=50): age matched-control group, not using any hormonal contraception. **A full informed consent from all subjects will be taken before starting the study.** The voice of subjects in both groups will be recorded during the production of the vowel /a/ using the MDVP. Acoustic analysis will be performed on these recordings including F0, amplitude, jitter, shimmer, and harmonic-to noise ratio (HNR).

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**Ref#: M3**

# The Broadway Child Performer: Evaluation and Treatment

This presentation compares the "typical" adult Broadway singer with the Broadway child singer. A review of differences in presenting complaints and medical evaluation by the laryngologist are explored for the young child, pre-teen, and teenage Broadway lead performer. The limitations of physiology and capacity of the child larynx will be reviewed. Medical management, role demands, and theatre issues for the child Broadway lead will be outlined using three case studies across the age spectrum for the Broadway child performer.

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**Ref#: M4**

# Pyridostigmine for Temporary Reversal of Dyspnea and Dysphagia from Botulinum Toxin Injection

Botulinum toxin (Botox) is used to treat a wide range of dystonias in the head & neck. Occasionally, patients will experience severe dysphagia or dyspnea after Botox injection and, rarely, require hospitalization for stridor and feeding tubes for dysphagia/aspiration. As there is no antidote for Botox, patients must endure these symptoms until the Botox begins to wear off. The use of pyridostigmine (Mestinon) can offer patients experiencing severe symptoms some relief until some muscular recovery occurs.

Botox blocks the release of acetylcholine at the neuromuscular junction, temporarily preventing muscle contraction. For dystonia patients, there is commonly a period of breathiness and/or dysphagia at the onset of the injection. As the muscles recover, patients are able to speak and eat more easily.

Pyridostigmine, used to reverse muscle weakness in myasthenia gravis, prevents the breakdown of acetylcholine at the synaptic site, thus allowing more neurotransmitter to be available for the muscles. This action temporarily increases muscular function in Botox patients, lessening the severity of a patient's symptoms until some muscular recovery occurs.

Pyridostigmine has been used in our practice for over 15 years to modulate severe dysphagia, breathiness or dyspnea in over 20 spasmodic dysphonia patients and has averted tracheotomy in 2 patients and g-tube in one patient. These cases will be detailed. Pyridostigmine is well tolerated. Only one significant adverse effect, bradycardia, occurred in a patient with severe cardiac disease. Given the safety and efficacy of this medication, pyridostigmine should be considered to modulate severe sequelae of Botox injection in selected patients.

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**Ref#: M5**

## New Traumatic Lesion in Adolescent Female Singers

There is increasing pressure for prepubescent children to sing in the Pop/Rock/Belting styles and develop big, relatively heavy chest voices to survive in children's theater groups and competition choirs. As these young girls attempt to sustain these styles in their vocal performance throughout puberty, injuries can occur. This paper describes a new traumatic lesion seen in two adolescent female vocalists – herniation of the laryngeal ventricular mucosa onto the vocal folds. This problem is seen often in self-trained/undertrained adults singing in the gospel and pop/rock styles, but seems now to be occurring in adolescent girls active in theater troupes and choirs focusing on the Belting/Pop/Rock genres.
Two adolescent girls, age 15 & 17, presented with this lesion and complained of pain while singing and loss of their top notes. Both have been praised for years for their big chest voices and mature sound. Both had very back focused speaking voices.
Multi-disciplinary treatment included: 1. Medical management by the laryngologist, 2. the singing voice specialist emphasizing yawn, loft resonance and reduced medial compression of the false vocal folds. The belting repertoire was then reintroduced with modifications in technique. 3. The speech language pathologist focusing on flexibility, forward focus, and breath support.
Outcome: both singers have near complete resolution of their ventricular herniation and regained the full vocal range. Both continued singing in choirs and theater groups and are preparing for college auditions as vocal performance majors. Laryngeal exam over a year post treatment shows no change in the appearance of the ventricles.

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**Ref#: M6**

# Injection Laryngoplasty Outcomes in Vocal Fold Paralysis

**Objective:** To review our experience with vocal fold (VF) injection laryngoplasty in patients with unilateral VF paralysis.
**Method:** All patients diagnosed with unilateral VF paralysis at our institution who underwent injection laryngoplasty with calcium hydroxylapatite from 2007 to 2012 were reviewed.
**Results:** Sixty eight patients underwent VF injections due to VF paralysis. 29 patients who at least had postinjection voice handicap index (VHI) score were included in this study. 55% of the patients were female, the mean patient age was 60 years old (range= 27-86). 17 patients underwent direct microlaryngoscopy with suspension, 12 patients underwent in-office percutaneous injections. The mean follow-up was 3.7 months (range=0.4-19 months). Postinjection voice handicap index (VHI) scores were between 4 to 87 (mean= 36.7). Pre- and posinjection VHI data was available for 20 patients and half of them were percutaneously injected. Average VHI in the 20 patients improved 27.9 points. Average VHI in the patients percutaneously injected improved 35.1 points, and average VHI in the asleep patients improved 20.7 points. (p= 0.29)There was worsening of 3 patients' postinjection VHI scores. One of them had esophageal and one had lung carcinoma and there was deterioration in their general health.
**Conclusion:** This study supports injection laryngoplasty both percutaneous and under direct laryngoscopy with calcium hydroxylapatite as a safe and effective intervention for patients with VF paralysis.

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**Ref#: M7**

# Laryngeal Synkinesis

## Introduction

Laryngeal synkinesis is defined by the abnormal laryngeal innervation that may exist following injury to the recurrent laryngeal nerve.

75% of recurrent laryngeal nerve fibers innervate adductor muscles, thyroaritenoid (TA), lateral cricoarythenoid and interarythenoid and 25% innervate the posterior cricoarythenoid muscle , the only abductor muscle. When a nerve disruption occurs, adductor fibers can reinnervate abductor muscles or viceversa.

Symptoms of synkinesis may extend from the asymptomatic patients to severe dysphonia or airway impairment.

## Methods

Retrospective study of 7 patients with laryngeal synkinesis diagnosed by electromyography. The variables studied were: demographics, presenting symptoms, findings of laryngeal examination and laryngeal electromyography, treatment and outcome.

## Results

Seven patients presented with vocal fold paralysis, and have laryngeal synkinesis diagnosed by LEMG. 60% of cases were unilateral paralysis. The main symptom was dyspnea, followed by dysphonia. In all cases a recruitment pattern was found in TA muscles with respiratory tasks, at least with the same amplitude than with phonatory tasks. All patients with dyspnea were treated with toxinum botulinum injections in the paralized vocal fold. Improvement of dyspnea was found in all cases, with maximum duration of one year.

## Conclusions

Laryngeal electromyography (LEMG) can be useful in the diagnosis of synkinesis, finding recruitment pattern in TA muscles with respiratory tasks.

Intralaryngeal botulinum toxin can provide temporal improvement in patients with unilateral or bilateral vocal fold paralysis presenting with dyspnea.

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**Ref#: M8**

# The Effects of Adipose Derived Stem Cells on Experimentally Created Vocal Fold Scar

Scarring disrupts the microarchitecture and impairs the vibratory capacity of the vocal fold, which can cause a significant voice handicap. No currently available treatment satisfactorily restores function. Adult stem cells can be easily harvested from adipose tissue and propagated in tissue culture. We assessed the effects of adipose derived stem cells on experimentally created scar in the vocal folds of pigs. Scars were created by excising epithelium from the vocal folds of mini-pigs, via laryngofissure, and during the same anesthesia, fat was excised. The fat was digested and cells were gated on CD105+ CD 90+ CD73+ CD34+. Cells positive for all 4 markers were propagated in tissue culture. After one month, a subepithelial tunnel was created in each scarred vocal fold. In 4 vocal folds, ADSC's labeled with BrdU and suspended in fibrin glue were implanted into the tunnel. As a control, fibrin glue alone was implanted into 4 other scarred vocal folds. After 6 weeks, animals were sacrificed and larynges were excised. On gross inspection, control vocal folds were atrophic and uneven, while implanted vocal folds appeared more normal. On histologic exam, BrdU positive cells were found in the SLP as well as the epithelium of treated vocal folds. SLP was thicker in treated vocal folds, while collagen was denser in vocal folds treated with fibrin glue alone. Immunofluorescence documented cells positive for CD34 and CD 73 in both the epithelium and SLP. RT-PCR demonstrated upregulation in hyaluronic acid production and decreased collagen production in treated vocal folds. The results indicate that implanted ADSC's may persist in scarred vocal folds and potentially differentiate into vocal fold epithelium. Treated vocal folds have a more normal architecture, with increased production of hyaluronic acid and decreased production of collagen, implying improved wound healing.

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**Ref#: M9**

# Fibroblasts Induced by Adipose-derived Mesenchymal Stem Cells for Vocal Fold Regeneration

**Objectives:** To characterize the changes in the extracellular matrix (ECM) of the lamina propria following the implantation of fibroblasts induced by autologous adipose-derived mesenchymal stem cells (ADSCs) in a rabbit vocal fold wound model.
**Methods:** In vitro experiments. Using immunofluorescence and western blot to analyze the features of ECM secretion of fibroblasts induced by ADSCs. The fibroblasts were co-cultured with hyaluronic acid gel. In vivo experiments. Right vocal folds of 42 rabbits was injured by localized resection and injected with fibroblasts complexes, ADSCs complexes, or hyaluronic acid gel, or left untreated. From 7 days to 6 months, the vocal fold shape and the characteristics of the ECM components were analyzed by immunohistochernical staining.
**Results:** In vitro, fibroblasts induced by ADSCs can secrete ECM including collagen, elastin, hyaluronic acid and fibronectin. After implanting, the collagen content was significantly increased at 40 days. Subsequently, it began to decrease and reached close to normal by 6 months. The hyaluronic acid content was increased at 15 days, but reduced to normal levels over the following 6 months. Fibronectin continued to be scattered in the lamina propria at 40 days, and then decreased over the following 6 months. At 6 months, the vocal folds had a normal surface. The components of ECM can also reach to normal level after ADSCs complexes implanting, but slightly later.
**Conclusions:** Fibroblasts induced by ADSCs can play a potential role in vocal fold regeneration, and may have the ability to regulate the generation and orderly distribution of ECM.
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**Ref#: M10**

# Pediatric Voice Handicap Index Values in Dysphonic Children

We examined Pediatric Voice Handicap index (pVHI) scores for 90 subjects who presented to our Voice Clinic with complaints of dysphonia. Subjects ranged from age 2-19, with 46 females and 44 males. Maximum available score for pVHI is 92. Average pVHI was 32.4 (range 4-72) for females, and 30.8 (range 0-79) for males. The majority of subjects had more than one diagnosis during their otolaryngologic visit. Diagnoses included mass (N=15; nodule, cyst, polyp, granuloma), scar/stiffness (N=18: scar, stenosis, web), vocal fold paralysis (N=30), MTD/functional (N=22: MTD, functional dysphonia, GERD, voice disturbance), respiratory (N=2 chronic cough, stridor), and other (N=3: laryngeal fracture, eosinophilic esophagitis, hearing loss). Average pVHI for young children (age 2-5) was 35.4. Average pVHI for child (age 6-11) was 29. Average pVHI for adolescent (age 12-19) was 32.2. We discuss average pVHI by diagnosis group and by specific age as well as general age groups. Findings suggest no significant difference in perceived severity of voice disability when comparing age group or diagnosis, but a wide range of pVHI (0-79) across all age groups.

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**Ref#: M11**

# Early Detection of Autism Spectrum Disorders from Newborn Cry Acoustic Parameters

**Purpose**: Autism Spectrum Disorders (ASD) define a set of mental conditions characterized by abnormal development of some children's ability. At present autism is diagnosed from the third year of age on, but there are evidential signs long before this age. This gives reasons for finding techniques for early diagnosis of ASD, enabling a more effective intervention of caregivers.
Recent studies support the hypothesis of a strict relationship between autism and cry, the infant's earliest form of communication. Being completely non-invasive, cry analysis is an appealing approach for early ASD diagnosis. A new method for a fully automated cry analysis is proposed that overcomes difficulties due to the high variability of such signals.
**Material**: 33 control and 9 high risk subjects (siblings of children already diagnosed as autistics) are analyzed. Spontaneous cry was recorded at home in presence of the caregiver at 10 days, 6-12-18 and 24 weeks of age. Innovative analysis methods were implemented to deal with such high-pitched, quasi-stationary signals that allow successfully identifying length and intensity of each cry-episode, fundamental frequency F0 and vocal tract resonance frequencies F1, F2.
**Results**: Significant differences were found between control and high risk subjects: lower F0, higher F1 and F2, less cry episodes with a less variable and modulated vocal repertoire were found in high-risk infants than in control subjects.
**Conclusion**: New robust analysis of infant cry is proposed allowing to differentiate high risk and control subjects, suggesting its potential use in clinical settings as an aid in early diagnosis of ASD.
This research is supported by the Italian Ministry of Health Grant (GR3), Young Researcher 2008, "Non-invasive tools for early detection of Autism Spectrum Disorders"

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**Ref#: M12**

# The Rule of Silent Reflux in the Treatment of Professional Voice User

## Myth or Reality

Patient with symptoms of LPR typically do not exhibit classic symptoms of gastroesophageal reflux disease (GERD) Therefore it is sometimes difficult to provide counselling regarding reflux guidelines for the patient. Professional singers perform singing tasks that require rapid changes of subglottal pressure and consistent use of the diaphragm, with activating the diaphragm when there is a need for a rapid decrease in subglottal pressure, which causes an abrupt and prolonged increase in intra-abdominal pressure, deep inspiration and straining. These mechanisms, repeated several times per day and over many years of professional activity, could, in theory, increase the occurrence of reflux symptoms by disabling the diaphragmatic sphincter. Therfore the silent reflux is one of the most important factors in the pathophysiologie of voice disorders in professional singers and voice users. Treatment options for LPR may include medical and behavioural management and surgical treatment in special cases. Proton pump inhibitors (PPI)plays a great role in the therapy of LPR but should be taken in an optimal manner and the counselling to optimize dietary and lifestyle modification should be started immediately. There are many Lifestyleproblemes at the vocal Artists, like: inadequate sleep, increased body weight in adulthood , dinner just before bedtime , the habit of midnight snack, lack of breakfast,lack of physical exercise, antihyperglycemic agents non-users, the habit of quick eating, lack of breakfast and dinner just before bedtime.

Methods:
In these retrospective Study 25 professional and nonprofessional Voice Users were analyzed by:

Refluxsymptomindex (RSI)
Voicehandicapindex ( VHI)
Dietary Anamnesis
Videostroboskopie
PH-Measurement by the single Probe Restech System

According to th,e the cochrane ENT group specialised register lifestyle advice was found to be the most important factor in order to reduce the subjective complaints of laryngopharyngeal reflux. The Authors will speak about individual changes of lifestyle and bad dietary habits and the rule of Restech PH-Metrie and dietary advices in professional and nonprofessional voice users.

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**Ref#: M13**

# Spectral Analysis of Digital Kymography in Normal Adult Vocal Folds

Digital Kymography (DKG) is a time-based measure that extracts vocal-fold vibratory parameter from laryngeal high-speed images. Kymography Edge Analysis is applied to DKG to obtain precise cycle-to-cycle movement of the vocal fold edges; the Kymography Edge Data (KED) is then converted into spectrum to represent a direct qualitative description of each vocal fold vibration. The current study examined spectral analysis from KEA in 6 normal adults (2 males and 4 females) producing two-second samples at modal, low, high, and loud phonation. Analysis of the spectral data reveals variations in the spectral shape depending on the frequency and normal versus loud phonation. Loud phonation results in higher spectral energy components. When comparing symmetry between the vocal folds, vibration was symmetrical across frequency and across intensity. The present results provide a preliminary data base of vocal fold spectral characteristics from which to compare vibratory characteristics of phonation gesture. Furthermore, these measures provide normative data from which similar measures obtained from dysphonic pathologies can be compared.

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**Ref#: M14**

# Office-based Pulse-dye Laser Surgery for Laryngeal Lesions: A Retrospective Review

Objectives: The 585nm Pulse-dye laser (PDL) is used for in-office treatment of recurrent respiratory papilloma (RRP), premalignant/early malignant lesions, vascular, and proliferative lesions of the endolarynx. Advantages of this technique include avoidance of a general anesthesia, improved efficiency, lower cost, and treatment of the anterior commissure with minimal web formation. Our objective was to review our experience with office-based PDL surgery for laryngeal lesions.

Methods: A retrospective review of 28 patients was conducted ranging from 2005 to the present.

Results: Twenty seven patients tolerated the procedure without complication. One patient experienced an anxiety attack and the procedure was aborted. The following pathologies were treated: RRP (n = 8), vascular lesions (n = 7), granuloma (n = 6), premalignant lesions (n = 4), amyloidosis (n = 1), anterior web (n = 1), and benign mass (n = 1). Three patients, all with vascular lesions, were successfully treated with the PDL and no trips to the operating room (OR). Thirteen patients had complete resolution of their symptoms with a combination of in-office PDL and OR. Several patients were treated for recurrent disorders (e.g. RRP and amyloidosis), requiring several trips to the OR and in-office PDL procedures. The time interval between ORs for patients who received in-office PDL and OR procedures was not affected by the inclusion of the PDL as a treatment modality.

Conclusions: PDL is a safe, well tolerated, effective, adjunctive therapy, and may function as monotherapy in the treatment of select endolaryngeal lesions.

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**Ref#:M15**

# Glottic Closure Following Pediatric RLN Reinnervation: Is Arytenoid Adduction Necessary?

Glottic insufficiency due to vocal fold paralysis (VCP) in the pediatric patient can be challenging to manage. Because VCP may be related to prior surgery as an infant (cardiac surgery, tumor resection, PDA), the patient's family may be apprehensive of elective surgery to improve glottic closure. When recurrent laryngeal nerve reinnervation (ANSA-RLN) is contemplated in the pediatric patient, a decision needs to be made whether to include arytenoid adduction (AA) during the surgery. In the adult population, the combination of ASNA-RLN and AA is often recommended. Because the pediatric larynx is continuing to grow and the arytenoid cartilages have not calcified in the pediatric patient, AA may not be necessary to obtain improved glottic closure.

Thirty-one patients were identified with unilateral VCP during Voice Clinic during the period of January 2007 to September 2012. We analyzed the voice specific characteristics in the 12 pediatric patients (age 2-13, 8 female, 4 male) who elected to undergo ANSA-RLN. Glottic closure, arytenoid position, maximum phonation time (MPT) and voicing control were assessed pre/post. Due to differences in normal MPT by age group, three age groups (young child, child, adolescent) were used to determine differences in treatment vs. non-treatment groups.

There was no significant difference in MPT controlling for age ($p=0.525$), or voicing control ($p=0.214$). There was a significant improvement in both membranous glottic closure and cartilaginous (arytenoid) positioning. Results show improved glottic closure and access to sustained voice with use of ANSA-RLN. No patients were found to need additional AA following ANSA-RLN.

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**Ref#: M16**

## Patterns of Vibration in Pediatric Unilateral Vocal Fold Immobility

Unilateral vocal fold paralysis may be managed through surgical intervention, speech therapy, or observation (no therapy, no surgery). Recurrent laryngeal nerve reinnervation (ANSA-RLN) and injection laryngoplaty (INJ) are available surgical options to manage lack of glottic closure and poor vibratory skills in the pediatric patient.

Thirty-one patients were identified with unilateral vocal fold paralysis (vcp) during Voice Clinic during the period of January 2007 to September 2012. One patient was eliminated from the data set due to additional presence of a vocal fold mass. Vibratory patterns were analyzed during flexible endoscopy examination, and compared pre/post ANSA-RLN vs. INJ.

All patients with VCP were found to have abnormal vibratory patterns. One patient who underwent ANSA-RLN was aphonic, and had complete absence of voicing. Patients who elected to undergo ANSA-RLN were not found to have significantly different closure patterns. Both surgical groups improved with glottic closure and vibratory patterns, but those in the INJ group were less likely to have long-term improved glottic closure. This suggests the need for repeat INJ in the pediatric patient, or use of ANSA-RLN which was found to have better long-term glottic closure.

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**Ref#: M17**

# Geriatric Normative Data for the KayPENTAX Phonatory Aerodynamic System Model 6600

Introduction: Aerodynamic analysis of the voice is becoming increasingly more possible and common in clinical practice. The primary purpose of this study was to establish a preliminary geriatric normative database for 41 phonatory aerodynamic measures obtained with the KayPENTAX Phonatory Aerodynamic System (PAS) Model 6600. A second purpose was to examine the effect of age and gender on these measures. Design: Prospective data collection across groups. Procedures: A sample of 85 speakers with normal voice (34 male and 51 female) was divided into three age groups (60-69; 70-79; and 80+ years). Results: Statistically significant main effects of age and gender were found. Conclusions: Because age- and gender-related changes were found, one must account for these two variables when assessing phonatory aerodynamics using the PAS Model 6600. The clinical implications of the findings for the assessment and treatment of geriatric individuals with voice disorders are discussed.

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**Ref#: M19**

# Performance of the Cepstral/Spectral Index of Dysphonia (CSID) as an Objective Treatment Outcomes Tool

*Purpose:* To examine the validity of the cepstral/spectral index of dysphonia severity (CSID) as an objective treatment outcomes measure.
*Method:* Pre- and post-treatment samples of connected speech and sustained vowel productions were elicited from 112 patients across six diagnostic categories: unilateral vocal fold paralysis, adductor spasmodic dysphonia, primary muscle tension dysphonia, benign vocal fold lesions, presbylaryngis, and mutational falsetto. Listener ratings of severity in connected speech were compared to a three-factor CSID model consisting of the cepstral peak prominence (CPP), the low-to-high spectral energy ratio, and its standard deviation. Two additional variables, the CPP standard deviation and gender, were included in the five-factor CSID model to estimate severity of vowels.
*Results:* Acoustically-estimated severity for connected speech and sustained vowels was strongly associated with listener ratings pre-treatment, post-treatment, and change observed pre- to post-treatment. Spectrum effects were examined, and severity did not influence the relationship between perceived and estimated ratings in connected speech; however, severity did influence the relationship in vowels.
*Conclusions:* The results confirm a robust relationship between listener-perceived and acoustically-derived dysphonia severity estimates in connected speech and sustained vowels across diverse diagnoses and severity levels, and support the clinical utility of the CSID as an objective treatment outcomes measure.

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**Ref#: M20**

# Voice Outcome Measures in Adults with Stable Laryngeal Papillomatosis

OBJECTIVES/HYPOTHESIS: 1. To compare perceptual and acoustic measurements in patient with stable laryngeal papillomatosis to the normal population. 2. To determine if number of surgeries, site of disease, or age of onset correlates to perceptual or objective voice outcome measures.
STUDY DESIGN: case-series
METHODS: Adults not requiring surgery for a minimum of 12 months were assessed using the perceptual (GRBAS), self-assessment (VHI-10) and objective acoustic/aerodynamic measures. Acoustic parameters included intensity and fundamental frequency range as well as perturbation measures. Phonation threshold pressure and laryngeal airway resistance were done as aerodynamic parameters.
RESULTS: Thirteen patients (8 male, 5 female) were enrolled. 78% of patients were judged perceptually to have normal voice or mild dysphonia whereas 46 % of patients judged their voice handicap index to be greater than 10 (moderate or severe impairment). Acoustic analysis showed no statistically significance difference for average fundamental frequency (F0)and fundamental frequency range . Perturbation measures in the series was either normal (jitter) or mildly elevated (shimmer). Some impairment of intensity range was observed. Patients who had undergone a larger number of surgeries were more likely to have abnormal acoustic measures. Onset during childhood were found to have the most acoustic impairment.
CONCLUSION: The results of this study suggest a mild degree vocal impairment in patients with stable RRP compared to the general population. A greater degree of impairment of voice outcome measures was found in patients with higher number of surgical procedures and earlier onset of respiratory papillomatosis

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**Ref#: M21**

# Validation of a Telephone Screening Tool for Spasmodic Dysphonia and Vocal Fold Tremor

Introduction: Diagnosing spasmodic dysphonia (SD) or vocal fold tremor requires evaluation by an experienced voice specialist (e.g., otolaryngologist, speech-language pathologist [SLP], neurologist). Many patients do not have access to such a resource. The objective of this study was to ascertain whether clinicians can reliably distinguish between SD and other voice disorders by telephone, despite this modality's limited frequency response.

Methods: Voice disordered patients with (N = 22) and without (N = 17) SD and/or vocal tremor recorded standardized utterances via landline telephone. A laryngologist and 2 SLPs blinded to the diagnoses rated each recording as YES or NO to "SD or tremor present?", and if YES categorized into adductor, abductor, tremor only, or adductor with tremor subtypes. Twenty-one recordings were presented twice at random so intra-rater reliability could be assessed. All ratings were compared to "gold standard" diagnosis by a second laryngologist who performed a full exam, including video stroboscopy, on each patient.

Results: For the comparison "SD or tremor" YES vs. NO, sensitivity = 90%, specificity = 95%, PPV = 96%, NPV = 89%. Inter-rater reliability (Cohen's kappa) compared to the gold standard ranged from 0.70 to 0.93, (substantial to almost perfect agreement). Intra-rater reliability (number matched/number inspected) was very high, ranging from 0.97 to 1.0.

Comparing gold standard and telephone rating of SD/tremor subtypes, kappa ranged from 0.48 to 0.60 (moderate agreement); intra-rater reliability ranged from 0.84 to 0.97.

Conclusion: SD and tremor can be reliably distinguished from other voice disorders over the telephone.

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**Ref#: M22**

# The Aerodynamic Characters of False Vocal Fold Phonation after Cordectomy


**Objective**

By study the differences of aerodynamic during phonation, among the bilateral ventricular fold phonation, unilateral ventricular fold phonation and the normal group, to discuss the mechanism and aerodynamic characteristics of ventricular fold phonation.

**Method**

Examed the aerodynamic parameters of 50 healthy male subjectsand male patients 6 months after cordectomy, by means of the Phonatory Aerodynamic System 6600 (PAS6600), compared the differences of the subglottic pressure (SGP), the mean airflow rate (MAR), the glottal resistance (GR), and the voice efficiency (VE) in phonation. All the subjects were excluded respiratory disease, neurological disorder, and auditory disorder. According to the history, electrolaryngoscopic exam, they were subdivided into the control group (n=25), bilateral ventricular fold phonation group (BVP, n=13), unilateral ventricular fold phonation group (UVP, n=12). The data were analysed by ANOVA.

**Results**

The SGP (14.60±2.18 $cmH_2O$), MAR (1.05±0.06 L/s) were increased, and the GR (11.79±1.59 $cmH_2O$/(L/s)), VE (12.09±4.26 ppm) were decreased in the bilateral ventricular fold phonation group compared to the normal group. The MAR (0.15±0.02 L/s) were decreased, and the GR (59.32±6.47 $cmH_2O$/(L/s)) were increased in the unilateral ventricular fold phonation group compared to the normal group. The differences were statistically significant. There were no statistically differences between two groups in the subglottal pressure and voice efficiency.

**Conclusion**

The differences of aerodynamic parameters among the BVP group, UVP group and normal group are related to the physics and structure of the ventricular folds. Comparing to the vocal folds, the vibration by ventricular folds are more difficult. In unilateral ventricular fold phonation patients, the ventricular fold is closing the glottis more than vibration.



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**Ref#: M24**

# Correlation Between Cephalometric Measures and Fundamental Frequency

**Objective:** The purpose of this study is to report on the correlation between facial skeletal measurements and fundamental frequency in a group of normal subjects.
**Material and Method**: A total of 45 healthy subjects were included in this study. The skeletal measurements of both upper and lower jaws using both sagital and vertical cephalometric views were used. These included; angles which reflect the position of the maxilla and mandible in relation to the base of skull and to each others (SNA, SNB, ANB), angles which reflect the divergence of both jaws in relation to the skull base and to each others (PP/MP, PP/H), Lower face height in relation to total face height ( LFH/TFH), length of mandible (CO-GN), and length of maxilla (PNS-ANS). All subjects underwent acoustic analysis using VISI-PITCH IV by KayPentax. The following acoustic variables were reported: fundamental frequency, habitual pitch, jitter, Shimmer, Noise to Harmonic ratio (NHR), Voice turbulence Index(VTI), Maximum phonation time ( MPT).
**Results:** Fifteen males and 30 females participated in this study after having read and signed the consent form approved by the Institution review board. The age ranged between 9 and 36 years with a mean of 15 years. The mean F0 was 220.75 Hz $\pm$ 40.01 Hz, the mean Habitual pitch was 216.99 Hz $\pm$ 43.9 Hz, Jitter 1.05 $\pm$ 0.52, Shimmer 4.0 $\pm$ 1.75, NHR 0.14$\pm$0.06, VTI 0.04$\pm$0.01, MPT 9.67 seconds $\pm$ 5.02. The means for SNA, SNB, ANB, PP/MP, and PP/H were 80.753$\pm$3.20, 77.409$\pm$3.64, 3.336$\pm$2.57, 26.04$\pm$6.38, -1.667 $\pm$4.3 respectively. The mean of the ratio of lower face height to total face height was 54.282%$\pm$2.77. The mean length of the mandible and mean length of the maxilla were 104.28 mm$\pm$7.94 and 50.29 mm$\pm$3.94 respectively. There was a significant negative correlation between the length of the mandible (CO-GN), fundamental frequency and habitual pitch ($p<0.00$, $r2=0.279$ and $p<0.00$, $r2=0.33$ respectively). Similarly there was a significant negative correlation between the length of the maxilla ( PNS-ANS), the fundamental frequency and habitual pitch ( $p=0.001$, $r2=0.224$, and $p<0.05$, r2-0.269 respectively).
**Conclusion:** There is a negative correlation between the length of upper and lower jaws and the fundamental frequency and habitual pitch.

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**Ref#: M25**

# Hyperfunctional Vocal Behaviour: a Phenotypic Characteristic of Children Affected by ADHD


**Introduction**

Attention-deficit/hyperactivity disorder (ADHD) is an illness characterized by inattention, hyperactivity, and impulsivity that affects about 3-5% of school-age children. These children present talkativeness and due to their impulsive behaviour they may scream, yell, and shout often. They might abuse their voice more often than others and this might be a risk factor for dysphonia, vocal lesions and hyperfunctional vocal behaviours that influence negatively in their communication. There are few studies about vocal characteristics in these children and none has evaluated the aerodynamic characteristics of their voices and vocal pathology. The purpose of this study is to detect specific vocal aerodynamic patterns in these patients and to define a possible new phenotypic feature of this disorder that must be diagnosed and treated.

**Subjects-Methods**

68 children aged 7–13 years were recruited. 36 children with speech problems and ADHD and 32 controls matched according to age and gender participated.

All children were evaluated endoscopically and in the Voice Laboratory. Each subject repeated several times, sustained vowels, syllables, words and sentences. Intra oral pressure, transglottal flow, microphone, electroglottograph were recorded and analyzed.

**Results**

The endoscopic physical examination showed vocal nodules in 31 (86%); high intraoral pressure, high laryngeal resistance, and hyperfunctional vocal behaviour in 36 (100%) of ADHD children.

**Discussion**

We proposed that every children with ADHD disorder must be evaluated from a laryngeal point of view (Otolaryngologist and Speech Therapist) as an important part of the diagnosis and global treatment.



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**Ref#: M26**

# The Efficacy of N-acetyl Cysteine in Laryngopharyngeal Reflux Disease; a Randomized Controlled Study

Objective: Laryngopharyngeal reflux (LPR) is a common disorder in otolaryngology patients in which the stomach contents go up into the pharynx and then down into the larynx. LPR cause a wide spectrum of manifestations mainly related to the upper and lower respiratory system such as laryngitis, postnasal drip and asthma. Because of mucosal dryness and mucus thickening in reflux laryngitis, we conducted a prospective study to evaluate the effects of N-acetyl cysteine on laryngopharyngeal reflux symptoms.
Method: Between 2009 and 2011, patients with a reflux symptom score of more than 10 were selected and underwent endoscopic examination. Patients were randomly allocated into 4 groups and received either omeprazole, N-acetyl cysteine, both of them or only placebo. Patients were followed for 3 months, and examination was repeated after 1 and 3 months.
Results: one hundred and twenty patients entered the study (30 patients in each group). Sixty-two of them were male, and 58 were females. The reflux symptom score improved after treatment but the difference was significant in omeprazole plus N- acetyl cysteine group. After 3 months of treatment, the endoscopic findings score improved in treatment groups, but this change was significant also in group 3 (omeprazole plus N-acetyl cysteine).
Conclusion: Our study showed that combination of omeperazole and N-acetyl cysteine had a better influence on patients' symptoms and endoscopic findings in reflux laryngitis comparing to these drugs individually or placebo. All patients completed the treatment course very well without any major side effects.

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**Ref#: M27**

# Catathrenia: a Vocal Sound


**Introduction**

Catathrenia (nocturnal groaning) is a rare and relatively little-understood parasomnia characterized by monotonous irregular sounds that occur during sleep. Sometimes, catathrenia has been confused with expiratory snoring. For some authors, catathrenia is a particular form of parasomnia; for others, a variant of snoring or a respiratory problem. It is unclear whether the groaming sound has its origin in the pharynx or in the larynx. The goal is to establish whether or not catathrenia may be regarded as an expiratory vocal sound. An attempt was made to classify the origin of this sound according to its acoustic analysis.

**Subjects-Methods**

We present the sound analysis of six patients with clinically diagnosed catathrenia and we compared them with the analysis of snoring. We use the usual acoustic and spectrographic analysis that are used to study voice and evaluated voice problems.

**Results**

The analysis of the catathrenia samples demonstrated that these signals are type 1, regular or almost periodic signals, according to Tize. However, snoring is a type 3, a non-periodic signal.

**Discussion**

The vocal, glottic, nature of the sound was confirmed, and several significant differences to some snoring sounds were discovered.

The oscillogram and the spectrogram show that the origins of the catathrenia sounds are clearly different from snoring: catathrenia is laryngeal, while snoring is guttural. Catathrenia cannot be considered as expiratory snoring it is a vocal sound.



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**Ref#: M28**

## Fiberendoscopic Evaluation of Singing

It has been more than 30 years Jo Estill and Yanagisawa began studies about the endoscopic visualisation of the larynx and vocal tract during singing. This landmark had been important to start understanding the laryngeal movements during vocalizations. Nowadays the matter is still object of scientific interest as it has been studied by means of imagenology in the field of singing voice physiology. But the endoscopic evaluation of singing has been out of studies for many years.

The fiberendoscopic functional evaluation of the larynx and vocal tract during singing (FEFELVTS) can show us relevant data regarding the singers' physiology and pathology, once it allows the clinician to examine HOW various vocal tasks have been done, distributed in the extremes of acute-low tones, in pianíssimo-fortissimo loudnesses, in different vocal brightnesses of obscure-bright/metallic, in evaluating the secondo passaggio, in demonstrating HOW every single musical tone of a singer in sustained or scaled voicings towards the hyperacute tones.

Having done every step described above, it helps us also in evaluating properly the songs with difficulty in tone and in loudness. The recording material permits the clinician to show the singer how the loudness, brightness and tones have been managed and start determining what could be addressed in the voice therapy AND in the singing classes, thus providing also self-biofeedback and individualized directions for the therapy. Artistically, allow us also medically indicate whether specific voicings are healthy or risky regarding possible vocal trauma, giving the singer options or alternative ways to maintain his/her astistic liberty.

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**Ref#: M29**

# Gray's Minithyrotomy for Treatment of Vocal Fold Mucosal Defects in the Pediatric Patient

Purpose of study: Treatment of mucosal vibratory defects, such as sulcus vocalis and vocal fold scar, in children remains challenging. While injection modalities can provide temporary improvement in symptoms related to glottal insufficiency, durable treatment options to restore vocal fold pliability are lacking. Gray's minithyrotomy has been described as a viable technique to improve voice in adult patients with severe sulcus vocalis and scar. Utilization of this technique has not been described in the pre-pubescent population. Methods: A retrospective review of two pre-pubescent patients, ages 7 and 12) with severe sulcus vocalis who underwent Gray's minithyrotomy was performed. Results: In both children who underwent Gray's minithyrotomy, the procedure was successfully performed. Due to the small size of the pre-pubescent vocal folds, each patient underwent the procedure under general anesthesia using spontaneous ventilation and insufflation technique. Neither patient experienced intraoperative or postoperative airway complications. Partial improvement in phonotory function without resection of developing vocal fold mucosa and disruption of thyroarytenoid muscle was acheived in both patients. Conclusions: Gray's minithyrotomy is a feasible, safe surgical treatment option in the treatment of mucosal vibratory defects of the vocal fold in pre-pubescent children.

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**Ref#: M30**

# Correlation of Otologic Complaints in Soldiers with Speech Disorders Following Traumatic Brain Injury

Objectives/Hypothesis: Voice disorders following traumatic brain injury (TBI) require careful evaluation and therapy. In the Armed Forces, the source of traumatic brain injury may also impair hearing and balance. Communication barriers secondary to hearing loss or severe tinnitus can inhibit effective therapy for speech and language disorders.
Study Design: Cross Sectional Study
Methods: All subjects with documented traumatic brain injury from a convenience sample of more than 300 charts previously evaluated for dysphonia including more than 1.3 million health records of active duty U. S. Army soldiers with no history of dysphonia queried for new voice disorder diagnoses over a 3-year period. In those with traumatic brain injury, documentation of hearing complaints, hearing loss, tinnitus, or vertigo was further reviewed for type of otologic complaint, job title, past medical history, and TBI severity.
Results: More than 70 Soldiers were identified from the sample with traumatic brain injury and a diagnosis of a voice disorder. Of these Soldiers, otologic complaints were common, occurring more than 65% of the time. Tinnitus and hearing loss were the two most common findings. While the vast majority of these hearing complaints were identified through the Department of Defense's hearing conservation program, time until an otolaryngologist evaluated these Soldiers varied widely.
Conclusions: Otologic manifestations are common in Soldiers with documented speech disorders and traumatic brain injury. Careful consideration of communication impairment from otologic dysfunction in those with speech disorders following traumatic brain injury is warranted.

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**Ref#: M31**

# Arytenoid Chondroma

Objective: To present a case of arytenoid chondroma and discuss the management.

Methods: Case report and literature review (PubMed 1957-2012)

Results: A 33-year-old women presented with a two-month history of episodic aphonia and shortness of breath. On examination, she had left arytenoid fullness and left vocal fold hypomobility. Laryngeal electromyography revealed a 40% left superior laryngeal nerve paresis and 20-30% left recurrent laryngeal nerve paresis. A MRI of neck with and without gadolinium showed a mildly heterogenous mass arising from the left arytenoid and extending into the false vocal fold. She underwent micro-direct laryngoscopy with excision of the cartilaginous mass along the medial aspect of the arytenoid. Pathology revealed mature hyaline cartilage consistent with chondroma without malignant changes. Follow-up imaging at six month showed no interval re-growth. She had no dysphonia or shortness of breath eight months following surgery, and no laryngoscopic evidence of recurrence.

Chondromas are benign and account for less than 1% of laryngeal tumors. They usually arise from the cricoid cartilage. Chondromas are usually small (< 2 to 3 cm) and occur in children and young adults, while chondrosarcomas usually are larger and occur later in life. It is important to distinguish between these two tumors through biopsy. For chondromas, complete excision and close follow-up are recommended; chondromas have a high incidence of local recurrence.

Conclusions: To our knowledge, there is only one other reported case of arytenoid chondroma (1957). This case report highlights the diagnosis and management of this rare disorder.

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**Ref#: M32**

# Degree of Dysplasia Based on Virus Typing in Patients with Recurrent Respiratory Papillomatosis treated with Cidofovir

**Objectives/Hypothesis:** Recurrent respiratory papillomas (RRP) usually are attributed to human papillomas virus (HPV) types 6 and 11. Recent studies have not evaluated HPV types when analyzing degree of dysplasia following cidofovir injection. Our study evaluates the degree of dysplasia following injections while documenting HPV typing.
Study Design: Retrospective chart review
**Methods:** Demographic data, operative reports and pathology results were reviewed from 24 patients with RRP who had cidofovir injections.
Results: Of these patients, 44 sub-sites sufficient for analysis were identified. All patients included had adult onset RRP, no history of immunosuppression, well-controlled laryngopharyngeal reflux and no current smoking history. Ten patients had low risk types. Eight patients were negative for both high and low risk types, and one patient had both high and low risk types. Three patients HPV typing changed over time. No patients progressed to carcinoma or carcinoma *in situ*. Average follow-up was 65.9 months. Most sites had a transient increases in dysplasia but eventually progressed to no evidence of RRP or no to mild dysplasia. Only three sites had progressive dysplasia at the conclusion of the study. Of the three that had progression, all were low risk types.
**Conclusions:** To our knowledge this is the only study looking at degree of dysplasia while documenting HPV types. None of our patients had malignant transformation. In the one patient that had high-risk types HPV, there was no evidence of increased dysplasia at the conclusion of the study. Additional research is needed to evaluate patients with high-risk HPV along with longer follow-up.

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**Ref#: M33**

# Muscle Tension Dysphonia Is Rarely a 'Standalone' Diagnosis


Introduction

Chronically dysphonic patients are often referred for voice therapy with the nonspecific diagnosis of muscle tension dysphonia (MTD). MTD is the chronic, abnormal use of supraglottic and extrinsic vocal tract musculature to improve glottic closure during phonation. MTD is often considered 'functional' or 'primary' when no underlying cause is evident. 'Secondary' MTD is diagnosed when underlying glottic insufficiency (GI) is identified. GI is the inappropriate gross or subtle escape of air from the glottis during phonation.

Materials and Methods

A retrospective review of a prospectively maintained database was performed on 1226 consecutive patients presenting to our tertiary care voice center for evaluation. Subjects were identified whose diagnoses included primary or secondary MTD on flexible laryngovideostroboscopic examination. Frame-by-frame analysis was routinely used to identify cases of subtle GI with short but complete phase closure. Underlying etiologies were recorded.

Results

70.1% of all patients were diagnosed with primary or secondary MTD. Of these, 94.8% of subjects were diagnosed with secondary MTD due to GI. Underlying diagnoses causing GI included true vocal fold atrophy, motion impairment, scar, and mass lesions. Primary MTD (without underlying GI) was seen in only 5.2% of subjects.

Conclusions

Primary MTD is rare. When a patient presents with symptoms of MTD, suspicion for GI should be high. Mass lesions remain controversial as to their being a cause or result of secondary MTD, or a result of primary MTD. Comprehensive treatment may require both behavioral techniques to address muscle tension and appropriate surgical intervention to improve glottic competence.



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**Ref#: M34**

## Can Cryotherapy Help to Accelerate Healing of Vocal Fold Tissues?

Whole-body cryotherapy is a physiotherapeutic method which has been used during the last three decades, e.g., to accelerate healing of microtraumatic injuries in sports medicine. The therapy consists of short-time exposition (1-3 minutes) of unclothed body to temperatures of 100-140 centigrades below zero. It evokes a systemic reaction causing vasoconstriction and termination of bleeding with anti-edematic and anti-inflamatic effects and leads to accelerated healing of submucosal and muscular lesions. The goal of this study was to investigate whether cryotherapy can be used to accelerate healing of vocal fold tissues in voice professionals.

Material and Methods: 35 voice professionals (33 female and 2 male) suffering from dilated vocal fold vessels (34%), venectasias or small hemorrhages (38%) or hematoma (28% ) served as subjects for this study. 21 of these were subjected to cryotherapy while the rest served as controls. All of the subjects were asked to keep voice rest and were treated by medications (venotonic drugs, antiedematous therapy). The vocal fold status was evaluated daily or once per two days by strobovideolaryngoscopy. The subjects were considerered healed when tissue pathologies disappeared and simultaneously the patient self-evaluated her/his vocal function to be back to normal.

Results: The average time of healing was 8±2 days in subjects subjected to cryotherapy and 17±4 days in controls. Positive effects were found already 24 hours after the start of cryotherapy.

Discussion and conclusion: This study brings first evidence that cryotherapy can be used to accelerate healing of vocal fold tissues. The time needed for healing shortened more than twice when compared to the controls. In contrast to sports medicine where up to 10 cryotherapeutic sessions are recommended, in patients with vocal fold lesions 3-4 cryotherapeutic sessions were found sufficient. We therefore recommend including cryotherapy as an additional therapeutic method for traumatic vocal fold injuries. Since vocal use in voice professionals can be considered analogous to physical activities in athletes in that it leads to large loading of soft body tissues.

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# Comparison of Parent-Reported Vocal Symptoms with Pediatric Voice Handicap Index Scores in Children with Vocal Fold Lesions


**Objectives:**
The purpose of this study is to compare parent-reported vocal symptoms on an intake history form to a parent-proxy survey (Pediatric Voice Handicap Index (pVHI)) in children presenting with vocal fold lesions.

**Methods:**
Thirty-five children with vocal fold lesions (mean=7.5(2.0) years) were recruited for this study. All children were seen for a complete voice evaluation. The intake history included the following parent-reported vocal symptoms: occurrence of abnormal voice characteristics related to hoarseness, breathiness, effort, and fatigue (ranked: always, sometimes, never). Additionally, the caregiver completed the pVHI survey. An analysis of variance was performed to examine the association between measures of parent-reported vocal symptoms with the pVHI physical subset score. Tukey's HSD post-hoc test examined differences in group means for pVHI physical and overall severity scores.

**Results/Conclusions:**
Hoarseness and breathiness were not associated with the pVHI physical subset score, but increased effort to use the voice ($p=.002$) and fatigue during/after voice use were associated with the pVHI physical subset score ($p=.008$). Higher mean pVHI physical subset scores were associated ($p<.05$) with increased effort to use the voice for the responses of always [pVHI = 23.2 (6.2)] vs. never [pVHI = 23.2 (6.2)]. Higher mean pVHI overall severity scores were also associated ($p<.05$) with increased fatigue during/after using the voice for the responses of always [pVHI = 27.7 (2.1)] vs. never [pVHI = 13.7 (7.2)]. These initial findings indicate that pVHI scores may be sensitive to some, but not all vocal symptoms common among children with vocal fold lesions.



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**Ref#: BS1**

## Sound Production Mechanism in Elephant Infrasound Vocalizations

The sound production of most mammals can be explained by one of two fundamentally different sound production mechanisms: According to the myoelastic-aerodynamic (MEAD) theory of sound production, the primary sound source is generated by flow-induced self-sustaining oscillations of the vocal folds. In an alternative mechanism, sound is created by active muscle contractions (AMC). Here, a regular pattern of EMG bursts (e.g. 20–30 Hz for cat purrs) causes the intrinsic laryngeal muscles to modulate the respiratory airflow.
Elephants are the largest land mammals. They produce low-frequency vocalizations in the infrasonic range (fundamentals below 20 Hz). Both AMC and MEAD have been suggested in the literature as sound production mechanisms, but to date no physiologic evidence for either case has been produced.

Using high-speed video, acoustic and electroglottographic recordings, we documented flow-induced, self-sustaining oscillations of the vocal folds of an excised elephant larynx (*Loxodonta africana*) at fundamental frequencies below 20 Hz. We also observed a range of nonlinear phenomena, which are directly comparable to those documented in humans and other mammals. Due to the absence of any neural signals in the excised larynx setup, the AMC mechanism can be rejected for elephant infrasound vocal production. Rather, sounds are produced in a manner directly paralleling human speech or song.

We conclude that the same physical principles of voice production apply to mammals of various sizes (i.e. bats, humans, elephants), and that the myoelastic-aerodynamic theory extends across a remarkably wide range of body sizes and vocal frequencies (more than four orders of magnitude).

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**Ref#: BS7**

# The Effect of Singers` Positions on Vocal Tract Configurations during Professional Singing

**Introduction:** Previous studies using dynamic real-time MRI in order to analyse vocal tract configurations in singers are limited by the fact that the image acquisitions were performed in the supine position. The aim of this study was to examine differences of vocal tract shape in professional tenors between supine and upright positions. **Material and Methods:** The vocal tract profiles of 9 professional classically trained tenors were analysed using a rotating MRI scanner (0.25T). The singers performed sustained tones in an ascending scale from C4 (262 Hz) to A4 (440 Hz) on the vowel /a/ in supine and upright positions, starting in modal register and continuing to their stage voice above passaggio or changing to falsetto register, respectively. **Results:** Many articulators such as lip opening, jaw opening, tongue position and uvula position were not affected by the subjects` positions. However, the larynx was found to be higher ($p<0.001$) and the jaw more protruded ($p<0.001$) for the supine position. The general changes associated with pitch and register were not affected by these systematic differences. **Conclusions:** The effect of supine vs. upright position on the vocal tract shape is considered to be rather small in professional tenors. The modifications in the vocal tract associated with register and pitch are not affected a great amount by the position.

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**Ref#: BS9**

**Aging Induces Severe Metabolic and Contractile Dysfunction in the Rat Posterior Cricoarytenoid Muscle**

Sarcopenia is the decreased muscle mass and weakness associated with aging and a major cause of morbidity and mortality in the elderly. The extent non-locomotive muscles are susceptible to this condition is unclear. We examined how age alters the functional characteristics and gene expression profile of posterior cricoarytenoid (PCA), an intrinsic laryngeal muscle compared to that of a typical fast skeletal muscle, extensor digitorum longus (EDL). Muscles from Fischer 344-Brown Norway F1 hybrid rats (6-, 18- and 30- months) were used for cDNA microarrays, light and electron (EM) microscopy, and in vitro contractile function. Histological analyses demonstrated a ~40% increase in mean PCA fiber size with age. EDL muscles display hypertrophy and an increased type I fiber activity. There was also evidence of ragged-red fibers in PCA, a hallmark of mitochondrial dysfunction. Mitochondrial volume density was significantly higher in PCA muscles at 30 months (43% vs. 21% at 6 months) and higher than EDL. EDL only increased 5% with age. In vitro function from PCA muscles showed a decreased velocity of unloaded shortening at 30 months, which was greater than that of EDL. Finally, cDNA microarrays demonstrated a transcriptome shift in PCA muscle compared to EDL muscles with age. Gene classes with the largest changes were: enzymes, signal transduction, and transcription factors. These data demonstrate that PCA muscles are significantly altered by age. The observed changes in muscle fiber size, mitochondrial content and gene expression profile suggest that the aging PCA diverges from that seen in more typical skeletal muscles.

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**Ref#: BS10**

# Vocal Training Mitigates the Effects of Age on Rat Vocalizations and Laryngeal Neuromuscular Junctions


Intro

Denervation-like changes at the neuromuscular junction (NMJ) likely contribute to age-related declines in muscle mass and strength. In the limb musculature, exercise has been shown to reverse some of these age-related changes at the NMJ. However, our understanding of aging and vocal exercise on laryngeal NMJs is limited by the small size and relative inaccessibility of the laryngeal muscles. These limitations can be overcome using an animal model of vocal aging and vocal exercise: training rats to increase their production of ultrasonic vocalizations (USV). This study examined the effects of age and vocal training on both USVs and NMJs of rats.

Methods

Young adult and old rats were either vocally trained or given no intervention. USVs were evaluated using acoustic measures of duration, amplitude, frequency, and complexity. Morphology of NMJs in the medial and lateral portions of the thyroarytenoid muscle was evaluated using qualitative signs of pre-synaptic denervation and automated quantitative measures of post-synaptic motor endplate instability.

Results

Young adult and old groups differed in the duration, amplitude, and frequency of their USVs at baseline. Vocal training increased the vocalization rate in both age groups and eliminated the age difference in amplitude. At the NMJ, the old group had increased measures of pre-synaptic denervation and post-synaptic motor endplate instability relative to young. Vocal training reduced motor endplate instability in the lateral TA. Additionally, vocal training decreased variability of NMJ measures in the old group.

Discussion

Vocal training in old rats mitigated age-related changes in both vocal behavior (USVs) and laryngeal neurobiology (NMJs). The implication of this is that increasing voice use is beneficial to reduce the effects of aging on the laryngeal muscles.



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**Ref#: BS11**

**Predictive Value and Discriminant Capacity of Cepstral and Spectral-based Measures during Continuous Speech**

Individual cepstral and spectral-based acoustic measures are strong predictors of dysphonia severity, yet less is known about their relative contributions in multidimensional predictive models, and the optimal combination of measures for discriminating voice quality types. The purpose of this study was to determine the relative strength of various cepstral and spectral-based measures for predicting dysphonia severity and differentiating voice quality types. Continuous speaking samples from twenty-eight dysphonic speakers (14 with a predominant voice quality of breathiness and 14 with a predominant voice quality of roughness), along with 14 normal speaker samples were acoustically and perceptually analyzed. Linear regression was performed to determine the predictive value of these measures for dysphonia severity, and a discriminant analysis determined the combination of variables that best differentiated the three voice quality types. Results demonstrated that a four-factor model which incorporated the cepstral and spectral-based measures produced an *R* value of 0.899, explaining 81% of the variance. Cepstral peak prominence (CPP) showed the greatest predictive contribution to dysphonia severity in the regression model. The discriminant analysis produced two discriminant functions that included both CPP and its standard deviation (CPP sd) as significant contributors ($P < 0.001$). Although the overall classification accuracy of the combined functions was strong (79%), classification accuracy differed according to voice quality type, with the highest accuracy for normal (100%) and dysphonic-breathy voice qualities (79%), and the lowest accuracy for dysphonic-rough voice quality (57%).

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**Ref#: BS13**

# What Are the Softest Levels of Human Voice?

While dynamic vocal ranges are commonly investigated, e.g., via voice range profiles, the look at the results published in the literature reveals considerable discrepancies, especially in the sound pressure levels of the softest voice. We suspect that ambient noise levels caused inaccuracy in the measured levels of many studies. This study therefore aims at carefully measuring the softest levels of human voice to obtain reliable normative data and to formulate recommendations on the maximum ambient noise levels allowing these measurements.

**Method:** The softest sustained phonations of vowel [a:] were investigated in 80 healthy untrained subjects (40 males and 40 females) using a sound level meter at 30 cm distance and a head-mounted microphone. An acoustically damped room with ambient noise level of 23 dB(A) was used to eliminate the influence of background noise.

Results: The A-weighted 1s-equivalent softest sound levels were found at 30 cm to be 42,3±5,3 dB and 47,5±4,5 in males and females, respectively, with the extreme levels of 31,8 and 32,9 dB, respectively. When unweighted, the 1s-equivalent softest sound levels were found at 30 cm to be 55,1±4,8 dB for males and 55,3±4,0 dB for females.

**Discussion and conclusion:** The results indicate that the previous recommendation on 40 dB(A) ambient noise level appears insufficient. Considering the need of at least 10 dB signal-to-noise ratio, for accurate softest level measurements the ambient noise levels should be below 36 dB(A) and simultaneously a head-mounted microphone close to the mouth should be used.

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**Ref#: BS15**

# Influence of Supraglottal Structures on Subglottal Pressure and Acoustics in Excised Human Larynges

**Introduction:** The presence or absence of supraglottal structures exerts influence on laryngeal subglottal pressures and acoustics. Studies concerning the supraglottal structures were executed on numerical models, artificial larynx models, excised canine larynges, human hemi-larynges with artificial vocal tract as well as the in vivo phonation, confirming these assumptions.
One element of the supraglottal structures are the false vocal folds. Their effect was thoroughly investigated for canine larynges and numerical models suggesting a substantial influence. Comparable studies about the effect of false vocal folds for human larynges are still missing. We present first data of an in-vitro experiment from larynges with and without supraglottal structures.

**Methods:** Measurements were executed on human larynges including the false vocal folds and ones with those removed. Phonation was generated through an airstream which was infused into the larynx. The subglottal pressure and the acoustic signal were recorded. Simultaneously the motion of the vocal folds was acquired by high-speed imaging.

**Results:** The series of experiments show the influence of the presence of supraglottal structures on the spectrum of the acoustic signal e.g. fundamental frequency, and the vocal intensity. The impact on the laryngeal flow resistance was also recognizable. Within the presentation, results will be discussed in detail.

**Conclusions:** The gained data offer more detailed information about the retroactive effect of supraglottal structures on the motion of the true vocal folds during phonation and the resulting variation of the acoustic signal.

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**Ref#: BS19**

# Norm-based Coding of Voice Identity in Human Auditory Cortex

Social interactions rely on the ability to differentiate and identify other conspecific individuals. Humans routinely perform these tasks based on facial information but can also individuate other persons from their voice. While the cerebral bases of facial identity processing have been extensively investigated, those of speaker identification are less well understood. Cerebral areas sensitive to speaker identity exist in the human temporal lobe but identity coding mechanisms in these areas remain unknown. Here, we show using fMRI that voice identity is coded in voice-sensitive areas of human auditory cortex as a function of acoustical distance to an internal voice prototype. Voices more distant from a prototypical voice generated by averaging together via morphing a large number of same-gender voices are perceived as more distinctive, and elicit greater neuronal activity in voice-sensitive cortex, than closer voices—a phenomenon not merely explained by neuronal adaptation. Moreover, explicit manipulations of distance-to-mean by morphing voices towards (away from) the prototypical voice elicit smaller (greater) neuronal activity. These results indicate that voice-sensitive cortex integrates acoustical features extracted by lower cortical levels into a complex representation referenced to an idealized voice prototype. This coding mechanism minimizes energy consumption in response to natural auditory stimulation. It provides an elegant solution to overcome the problem of different speech contents and transformations associated with e.g., noisy backgrounds or vocal ageing. More generally, these results bring to light remarkable similarities in cerebral coding mechanisms for facial and vocal identity across sensory modalities.

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**Ref#: BS26**

# In Vivo 3D Tongue Muscle Anatomy Based on High-Resolution MRI

**Objective:** To obtain an in vivo 3D representational model of tongue intrinsic and extrinsic, and floor of the mouth muscles from high resolution static MR images.
**Methods:** Three-dimensional high resolution static MR images were acquired from a 3.0 Tesla Siemens scanner (Erlangen, Germany) from five normal subjects. Manual segmentation and labeling of the intrinsic and extrinsic muscles from the volumes were obtained using the ITK-snap software.
**Results:** Three tongue extrinsic muscles, genioglossus, styloglossus, hyoglossus, two intrinsic, superior and inferior longitudinalis, and three floor of the mouth muscles, geniohyoid, mylohyoid and anterior digastrics were segmented and labeled yielding 3D representation models. The model allowed interactive visualization and understanding of the spatial distribution of the muscles in relation to other surrounding muscles and bony structures, such as the mandible, maxillary and palatal, hyoid and muscular process. In this study, we were able to determine for the first time the posterior sling of the styloglossus muscle. The role of the posterior sling will be discussed in this presentation.
**Conclusion:** This is the first in vivo study showing the intrinsic and extrinsic muscles from MR images, which allowed a 3D representational model of muscles of the tongue and floor of the mouth. This model has the potential to provide anatomical substrate to speech and swallowing physiology, radioncological planning, registration of images pre- and intra-operatory for transoral robotic surgery, and mathematical modeling framework.
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**Ref#: BS27**

## Predicting Breathiness Using Estimates of Pitch Strength

Recent efforts to model the voice quality perception of vowels has shown that measures made from an internal representation of the vowel spectrum accounted for significantly greater variance in the perceptual ratings of breathiness than measures computed from the acoustic signal itself (e.g., Shrivastav, 2003; Shrivastav & Sapienza, 2003). In this research, breathiness was observed to be directly related to *noise loudness* (NL) and inversely related to *partial loudness* (PL). Both NL and PL are computed from an auditory processing model that attempts to predict the loudness of a complex sound by estimating it's representation in the auditory pathways (Moore et al., 1997). Shrivastav et al, (2011) showed that perceptual judgments of breathiness were best fit as a power function of the ratio of NL to PL (η). The power of this function was also related to the vowel fundamental frequency *(*$f_0$). To further improve the accuracy of this model, subsequent research investigated the inclusion of "pitch strength" as a parameter in the model. Pitch strength refers to the salience of pitch sensation in a sound, and was found to be highly correlated (r = 0.99) with the magnitude of breathiness for a small number of stimuli (Shrivastav et al., 2012). In the present experiment, the model to predict breathiness in vowels is modified by inclusion of a new pitch strength variable as well as substituting $f_0$ with an estimate of pitch.

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**Ref#: BS30**

# Voice Lab: Nuts and Bolts

**Abstract:** With evidence-based practice and healthcare reform, it is necessary to objectively document voice disorders and treatment outcomes. However, there are a staggering number of measurement systems for accomplishing this. A team of clinicians and researchers will address the pros and cons of high and low cost solutions for voice measurement.

**Summary:** In this age of evidence-based practice and healthcare reform, it is more important now than ever to provide consistent, objective documentation of voice disorders as identified via diagnostic evaluation and treatment outcomes as a comparison of measures pre- and post-treatment. However, there are a staggering number of measurement systems for documenting voice disorders. This makes choosing the optimal instrumentation overwhelming to clinicians attempting to make practice decisions. This problem is reflected by the volume of posts to the Voice Listserv requesting information on which type of instrumentation to use.

The number of measurements to fully capture the severity of a voice disorder is magnified by the multi-dimensional, multi-system nature of voice disorders. It is common that a voice disorder is reported using measures from: laryngeal endoscopy, acoustic analysis, aerodynamic analysis, and auditory perceptual judgments. These instruments are used in evaluations, during treatment and to document treatment outcomes. Along with these standard categories of instruments in the voice clinic there are new instruments that are being developed and growing in popularity such as respiratory trainers, apps and amplification devices. Given the number of instrument systems and the importance of documentation, it is no wonder that choosing the best options for a clinical practice becomes overwhelming.

The goal of this session is to provide clarity and information to clinicians so that they 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. We will compare and contrast these products on topics including: function, cost, reimbursement, and clinical relevance. To do this, we have invited speakers who use this instrumentation in both clinical practice and research. Dr. Ronald Scherer will provide the introduction and speak on measurement concerns. Dr. Heather Bonilha will discuss laryngeal endoscopy. Dr. Wendy LeBorgne will discuss acoustic analysis and amplification systems. Dr. Susan Baker Brehm will discuss aerodynamic assessment and respiratory trainers. Dr. Eva Van Leer will discuss the use of apps for treatment compliance. Sarah Schneider will provide the conclusions.

Introduction: (3 mins)
Endoscopy: Dx vs Tx (10 mins)
Acoustic (and amplification): Dx vs. Tx (15 mins)
Aerodynamic: Dx vs. Tx (includes respiratory trainers) (12 mins)
Apps: Adjunct Dx and Tx compliance (10 mins)
Measurement Concerns (8 mins)
Conclusions: (2 mins)

**Outcomes:**

1. As a result of this activity, the attendee will explain the rationale behind using measurement systems for documenting voice disorders.

2. As a result of this activity, the attendee will describe the 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.
3. As a result of this activity, the attendee will list possible measurement concerns to be aware of when using measurement systems for documenting voice disorders.

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**Ref#: BS-P3**

# The Effect of Mucus Bridges on the Electroglottogram

Electroglottography is a potentially valuable tool for voice clinicians. However, the interpretation of the electroglottogram (EGG) has been based on theoretical principles. Precise validation of the EGG on human data has been technologically challenging. In a previous study, we used High-Speed Videoendoscopy (HVS) images temporally synchronized with EGG signals to validate the morphological features of the EGG related to onset of vocal-fold contact, maximal contact, and offset of contact of laryngeal tissues. The results indicated that the presence of mucus may have an effect on the "offset of contact" morphological feature. The purpose of this study is to investigate the temporal correspondence of the 'offset of contact' feature of the EGG, to the offset of contact between the vocal folds, and to the breakup of mucus bridges.
EGGs from 14 normophonic speakers (7 male; 7 female) were precisely time-aligned to the corresponding HSV images. Using custom-designed software, the temporal locations of the a) pre-identified EGG 'offset of contact'; b) offset of contact between the vocal folds; and c) breakup of mucus bridges; were identified by frame numbers, and the temporal differences between these frames were measured and statistically analyzed.

Central tendencies for the offset of contact of vocal folds and moment of breakup of mucus bridges closely occurred with the "offset of contact" EGG marker. However, measures of variance indicate that in the presence of mucus bridges, the EGG is more sensitive to the moment of breakup of mucus bridges than the offset of contact of the vocal folds.

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**Ref#: BS –P4**

# Kinematic Characterization of Vocal Fold Motion Impact Stress in Typically Developing Children

**Introduction:** Quantitative measurement of vibratory function is critical for assessment of treatment outcomes and for the development of age-specific models for early identification of children with voice disorders; which are not well understood.
**Objective**: To elucidate the nature of age-related differences in vibratory motion between children and adults.
**Methods**: High speed imaging was obtained from 54 children (5-11 years) and 39 adults (21-45 years) without voice disorders, for sustained /i/. Kinematic features representing - velocity (average opening phase velocity, peak opening phase velocity, average closing phase velocity, peak closing phase velocity, ratio of average opening to closing velocity), - acceleration (peak opening phase acceleration, peak closing phase acceleration, closing- to-opening acceleration ratio), speed quotient, stiffness index, and peak amplitude to length ratio were calculated using custom developed image processing tools. One way ANOVA along with a step-up Bonferroni-Holmes post-hoc procedure was used to compare mean and standard deviation among adult males, females, and children.
**Results:** Children significantly have larger peak displacement, average opening phase velocity, peak opening phase velocity, average closing phase velocity, peak closing phase velocity, closing to opening velocity ratio, peak opening phase acceleration, peak closing phase acceleration, and speed quotient compared to adult female. Compared to adult males, children exhibited higher values of average closing phase velocity, closing-to-opening velocity ratio, speed quotient, and stiffness index. Children exhibited larger cycle-to-cycle variability in vibratory motion compared to adults.
**Conclusions:** Typically developing children differ in vibratory motion compared to adults; especially in the closing phase of the glottal cycle.

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**Ref#: SLP2**

# Adductor Spasmodic Dysphonia and Muscle Tension Dysphonia – Objective and Subjective Measurements

Muscle tension dysphonia may be confused with Adductor spasmodic dysphonia because of the similarity in symptoms. Aim of the study was to differentiate adductor spasmodic dysphonia from muscle tension dysphonia using acoustic measurements and also to correlate the severity of dysphonia evaluated perceptually with the acoustic parameters. Perceptual as well as acoustic analysis of the voice of eleven patients diagnosed as Spasmodic dysphonia (5 females and 6 males) and eleven patients with Muscle tension dysphonia (6 females and 5 males) ranging in age from 30 to 64 years was done. Correlation of acoustic measurements with severity based on perceptual evaluation was also done. The study showed that adductor spasmodic dysphonics differed from muscle tension dysphonia in the acoustic parameters of voice break, harmonic to noise ratio, maximum phonation time and jitter. Voice breaks was found to be more sensitive in discriminating adductor spasmodic dysphonia from muscle tension dysphonia . Correlation of the acoustic parameters with severity judgement of adductor spasmodic dysphonia showed that voice breaks presented a high positive correlation of 0.95 , whereas harmonic to noise ratio (-0.91) and maximum phonation duration(-0.63 )showed a high negative correlation. Correlation study of severity judgement of muscle tension dysphonia with acoustic parameters showed that harmonic to noise ratio (-0.68) and maximum phonation duration (-0.86) presented a high negative correlation.

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**Ref#:SLP4**

# Efficiency of Self-Assessment of the Voice Disorder Protocols and Cutoff Values as Screening Tools: V-RQOL VHI, VHI-10, VPQ and VoiSS

The aim of the present study is to assess the applicability of 4 different self-assessment instruments, Voice-Related Quality of Life (V-RQOL), Voice Handicap Index (VHI), Vocal Performance Questionnaire (VPQ), Voice Symptom Scale (VoiSS) in the screening diagnostic of voice problems; moreover, to analyze differences between the VHI original version and its reduced form, the VHI-10. All these instruments were originally developed in English and were fully validated into Brazilian Portuguese. The original data from 975 subjects, 486 with voice disorders and 489 vocally healthy individuals were submitted to ROC analysis, in order to obtain a cut-off value to identify patients with voice problems. The most efficient questionnaires are VoiSS and VHI (both with efficiency=1.0), followed by VHI-10 (efficiency=.991; specificity=1.0; sensitivity=.981), VR-QOL (efficiency=.905; specificity=.877; sensitivity=.933) and finally VPQ (efficiency=.828; specificity=.824; sensitivity=.831) The cut off values for the instruments are VoiSS – 16 points, VHI – 19 points, VHI-10 – 7.5; V-RQOL 89,6 and VPQ = 20.5. The cut off values are important information for screening large populations and also for clinical purpose. The VPQ was the least efficient protocol, probably due to its nature; different from the others, this questionnaire requires a clear perception of the voice prior to the voice disorder; which is not always easily accessed by patients with behavioral dysphonia.

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**Ref#:SLP6**

# New Treatment Option for Phonotraumatic Voice Disorders: Skin Surface Stimulation of Acupoints

**Introduction:** Acupuncture has been shown to be efficacious for the treatment of vocal nodules/polyps (Yiu et al 2006; Kwong et al 2007). This study will report a double blind randomized control trial that aimed to determine the effectiveness of acupuncture on the vocal function and healing of the vocal fold lesions in subjects with vocal nodules or polyps (N=121). Incidentally, the study also found that dysphonic subjects who received sham acupuncture with stimulation on the skin surface around the voice-related acupoints demonstrated improvement in vocal function over time.
**Methods:** Forty dysphonic subjects with phonotraumatic vocal fold lesions received genuine acupuncture at acupoints Renyin (St9), Lianquan (Ren23), Lieque (Lu7), Hegu (Li4) and Zhaohai (Ki6). Another 41 dysphonic subjects were made to believe that they also received needles at these acupoints but in reality the needles did not penetrate the skin. Only needle stimulation on the skin surface was provided. There was also a control group (N=37) who received no acupuncture. No vocal hygiene or voice therapy was given to these participants during the study. The examiners who assessed the outcomes at different time points were not aware of the type of intervention (genuine, sham or no acupuncture) the subjects received.
**Results:** The genuine acupuncture groups showed significant improvement in the vocal functions (voice range) and reduction in the lesion size following the acupuncture. The group which received skin-surface stimulation (sham acupuncture) demonstrated significant improvement in the vocal function as well. The improvement in the vocal functions lasted for more than two months following the completion of the acupuncture or the skin surface stimulation.
**Conclusions:** The double-blind randomized control trial showed that stimulation on the skin surface around the appropriate acupoints is as effective in improving the vocal function. It is suggested that the acupoint skin surface stimulation protocol, which is a no-invasive procedure and can be well-tolerated by individuals, could be considered as a supplementary option to behavior voice therapy.

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**Ref#: SLP7**

# Do Teachers Change Coping Strategies to Deal With Dysphonia After Voice Therapy?

**INTRODUCTION:** Teachers are at risk of developing dysphonia and little is known about the coping strategies they use deal with their voice problem. **PURPOSE:** To investigate changes in coping strategies reported by teachers after eight sessions of voice therapy. **METHODS:** 23 teachers participated in the study. The procedures performed were: eight-session treatment program, administration of the Voice Disability Coping Questionnaire, administration of the Voice-Related Quality of Life Questionnaire and perceptual analysis pre and post-treatment. **RESULTS:** There was no change in the degree of voice deviation after treatment (p=0,111). The teachers reported perceiving better quality of life related to voice after the completion of the eight sessions of voice therapy (p=0,001). The teachers also reported using more problem-focused strategies both before and after treatment (pre-treatment p=<0,001 and post-treatment p=<0,001). There was a positive correlation between self-reported voice-related quality of life and coping strategies (pre-treatment p=0,004 and post-treatment p=0,007). There were no changes in the amount of coping strategies reported by the teachers after treatment (emotion-focused p=0,223 and problem-focused p=0,216). **CONCLUSION:** Teachers reported using more problem-focused strategies, both before and after treatment. The worse voice-related quality of life is perceived, the more coping strategies are used.

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**Ref#: SLP8**

**Voice Problems of Group Fitness Instructors: Incidence of Self-Reported Sensory-Perceptual Voice Change and The Need For Preventative Education**

The aims of this project were to **(**1) determine the incidence and nature of both acute and chronic voice problems experienced by group fitness instructors (GFIs), and (2) gather information about the level of education currently being received by fitness professionals, the source of their education and their opinion on mandatory voice training in order to highlight potential training needs. A total of 361 group fitness instructors (81 males, 280 females), aged between 18 and 67 years currently active in the Australian fitness industry completed a self-completion questionnaire distributed via SurveyMonkey. The incidence of self-reported acute and chronic voice symptoms was high at 78.95% and 70.91% respectively. Partial voice loss and hoarseness whilst instructing was experienced most often (57.62%), followed by partial voice loss and hoarseness immediately after instructing (46.81%). Aphonia as a result of teaching was less frequently reported (9.97%). Over 25% of the total cohort reported chronic voice symptoms of increased hoarseness (39.61%), difficulty with high notes (31.58%), strained voice (32.13%), and limited singing range (27.7%). Only 30% of GFIs reporting having received any voice education, with even fewer respondents (10%) receiving any practical voice training, despite 98.06% agreeing that formal voice education should be covered as a standard topic in all official GFI training. The results of this study confirm that voice problems represent a significant occupational hazard for GFIs. Speech pathologists and other voice professionals should consider taking a proactive stance in understanding the vocal demands of the profession and engage in training for instructors in order to prevent both acute and chronic voice problems.

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**Ref#: SLP10**

# Laryngeal and Pharyngeal Activity During Semi-occluded Vocal Tract Postures in Subjects Diagnosed With Hyperfunctional Dysphonia

High vertical laryngeal position (VLP), constriction of the vocal tract, and compression of the larynx are common features associated with hyperfunctional voice disorders. The present study aimed to observe the effect on VLP, pharyngeal width and laryngeal compression of different vocal tract semi-occluded postures in twenty subjects with hyperfunctional dysphonia. During the observation with flexible endoscope, each participant was asked to produce four different semi-occluded exercises: lip trills, hand-over-mouth technique, tube phonation into the air, tube phonation into de water. These phonatory tasks were performed by all subjects twice. Participants were required to produce each exercise at three loudness levels: habitual, soft, and loud. To determine the laryngeal height, anterior-posterior constriction, and pharyngeal width, we conducted human evaluation tests with 3 external judges. This group of blinded judges consisted of laryngologists with more than 10 years of experience in voice disorders. All audio signals were removed from video samples before performing the assessment in order to avoid the possible effect of voice quality on the judge's ratings. Judges were asked to rate the three endoscopic variables using a 5-point scale. For vertical laryngeal position (1 = very high, 5 = very low), for anterior-posterior constriction (1 = very opened, 5 = very constricted), and for pharyngeal width (1 = very constricted, 5 = very opened). Intra and inter-rater reliability analysis was performed. Most semi-occluded techniques produced a lower VLR and a wider pharynx. More prominent changes were obtained during tube into the water and narrow tube into the air.

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**Ref#: SLP12**

**Effects of Sample Duration on Cepstral/Spectral Measures of Continuous Speech**

The purpose of this study was to determine if the sample length and sound structure of an elicited continuous speech sample affects phonatory behavior differentially in normal vs. dysphonic speakers. Recordings of "We were away a year ago" were obtained from 10 treatment-seeking individuals diagnosed with dysphonia vs. 10 non treatment-seeking normal controls. Cepstral/spectral analysis of the sample was performed using the *Analysis of Dysphonia in Speech & Voice* (ADSV, KayPentax, Montvale NJ) voice analysis software, with the first four syllables of the recorded sentence ("We were away…") isolated and analyzed separately from the second four syllables ("…a year ago."). Results focused on a multidimensional objective index of dysphonia severity referred to as the *Cepstral Spectral Index of Dysphonia (CSID)* that incorporates cepstral and spectral measures of the voice. Results indicated that estimated vocal severity (as measured via CSID) was significantly reduced in the 2nd half of the sentence compared to the 1st half of the sentence when produced by the dysphonic group, with no significant difference in estimated vocal severity from 1st to 2nd sentence half in the normal speakers. Mean CSID was significantly greater in dysphonic vs. control subjects regardless of sentence section.

Results indicate that single measures of mean signal harmonicity (as measured via cepstral analysis), spectral energy concentrations, or acoustically estimated dysphonia severity computed across an entire sentence or other continuous speech utterance may not adequately capture the characteristics of variable dysphonias. Results and implications will be discussed.

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**Ref#: SLP13**

# The Syndrome of Vocal Fatigue

**Objective:** Vocal fatigue is a complex clinical phenomenon. The purpose of this study is to determine the vocal habits, vocal complaints, the vocal characteristics, and objective vocal quality in patients with vocal fatigue. Moreover a comparison with the normative data from the European study Group of Voice Disorders was performed.
**Methods:** To determine the vocal quality subjective (videostroboscopic and perceptual evaluation), and instrumental objective techniques (aerodynamic, vocal range, acoustic measurements, Dysphonia Severity Index (DSI) were used. Two hundred and eight subjects (42 males with a mean age of 40.37 years and 146 females with a mean age of 35.23 years) with vocal fatigue and a control group of 27 subjects without complaints of vocal fatigue participated in this study.
**Results:** Analysis of the data showed that the patient with vocal fatigue is a 35 year old female professional voice user having vocal complaints during the last 6 years. Sixty two percent presented with a benign mass lesion. The vocal behavior is characterized with frequent vocal abuse (throat clearing and coughing) and effort to phonate. The complaints of hoarseness, vocal weakness, instability of the voice and laryngeal dryness increase after prolonged phonation. Consensus perceptual evaluation revealed a G1R1B1A0S1 and a significant difference for the Maximum Phonation Time, highest frequency, lowest intensity and jitter between the vocal fatigue group and the control group. Significant difference were also found for the DSI value in both males and females between the vocal fatigue (DSI value < 1.6) and the control group.
**Conclusion:** The results of this study allow a better understanding of the characteristics of vocal fatigue. Detailed analyses in a great number of subjects may help further clarify the cause of vocal fatigue.

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**Ref#: SLP15**

# Social Competence and Behavior Problems in the Pediatric Population with Voice Disorders

Impairment in verbal communication can affect the social competence and quality of life of the speaker. The objective of this research was to examine the relationship between vocal complaints, competence indicators and behavior problems in children and adolescents. 103 parents/guardians of children/adolescents aged 6-18 years answered the validated Brazilian version of the Pediatric Voice-Related Quality-of-Life (PVRQOL) and the Inventory of Behaviors for Children and Adolescents (CBCL/6-18). This research was approved by the UFES's Ethical Committee and the Informed Consent Term was signed by all participants. Reduced scores in the PVRQOL, especially in the physical field, were found in subjects with vocal complaints. As for the Competences measured by the CBCL, participants with and without vocal complaints differ in regard to Activities by presenting, respectively, non-clinical profile and borderline profile. The group with vocal complaints presented borderline profile for Anxiety/depression and Somatic complaints as opposed to the non-clinical profile of the group without vocal complaint, and showed higher T Scores in Internalizing, Externalizing, and Total Scales. Children and adolescents with and without vocal complaints differed in T Scores in Internalizing, Externalizing and Total Scales, as well as in Syndrome Scales: Anxious/depressed, Somatic complaints, Social, Thought and Attention problems, Rule-breaking and Aggressive behavior. Children with vocal complaints presented borderline profile for Somatization, and adolescents with vocal complaints were classified as borderline for Anxiety/depression and Somatization. All findings reinforce that voice problem should be early diagnosed and treated to minimize impacts on development that extend to the affective, social, and behavioral areas.

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**Ref#: SLP17**

**Brain, Mind, and Voice: Advances in Cognitive Science and Implications for Voice Practitioners**

Dr. Nelson Roy commented in a 2010 interview on National Public Radio that "Functional dysphonias … [straddle] the territory between mind and body, and that's the territory medicine has a difficult time with right now." If the mind-body interface is where many dysphonias "live", then it is where SLPs work—a territory we are obliged to study and understand.

Fortunately, such understanding is now supported by advances in cognitive neuroscience and in an even newer field called interpersonal neurobiology, both based on imaging of the brain. This presentation will summarize brain-mind findings that show direct implications for voice clinicians.

Topics include the role of mirror neurons in nonverbal learning, the embodied nature of consciousness and the self, and the proven relationship between embodied-sense and empathy in therapeutic relationships. Further: a new 'polyvagal' theory clarifies mechanisms by which brainstem nuclei of the vagus nerve regulate sympathetic/ parasympathetic balance; this theory links vocal function to the individual's experience of safety vs. threat in the interpersonal environment.

Specific recommendations that follow from these findings include preferred verbal and nonverbal cueing strategies for teaching new vocal behaviors; the importance of body-awareness practices for clinicians; and the power of an emotionally safe, empathic environment combined with the right amount of challenge to provoke lasting reorganization of the patient's embodied self.

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**Ref#: SLP20**

# Self-regulation and Vocal Behavior: The Challenges of Consciously Controlling the Voice

Self-regulation (SR) is the ability to voluntarily control one's thinking and behavior and may be an important construct operating in the mastery and generalization of skills taught to patients in voice therapy. Prior research indicates that SR resources can be depleted through use. Research questions investigating SR depletion can be addressed by having participants complete an initial task that requires a high or low degree of self-regulation (e.g. writing a story without restrictions versus without using the letters “a” or “n”) followed by a final task of interest (e.g. modifying vocal behavior). SR depletion is detected when significant differences are found on the final task between the low and high groups. Specifically, if participants who originally restricted their writing, modified their vocal behavior significantly less than those who did not, this finding would be attributed to SR depletion. To investigate whether the ability to modify vocal behaviors is impaired due to SR depletion, we randomized 105 participants into a high SR condition or a low SR condition. After performing an unrelated high or low SR writing task, all groups were instructed to inhibit the Lombard effect during reading and speaking tasks. Preliminary analysis indicates that, during the speaking task, participants in the high SR condition controlled their vocal intensity significantly less ($p<.05$) than those in the low SR condition. No significant differences were found between groups on the reading task. These findings indicate that SR depletion may present challenges to the generalization of vocal modifications in everyday speech.

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**Ref#: SLP21**

**Vocal Impact of a Prolonged Reading Task at Two Intensity Levels: Perceptual Analysis**

Our goal is to evaluate the impact on voice of both duration and intensity level of 2 hours of continuous oral reading. Fifty normophonic women underwent two sessions of voice loading in which the required intensity level of voice varied: 60-65 dB(A) for the first session, and 70-75 dB(A) for the second session. Objective measurements and subjective self-ratings were presented in a previous study (Remacle, Finck, Roche & Morsomme, 2012). Here are the results of perceptual analysis based on comparative judgments.

Ten expert listeners evaluated the pressedness and the breathiness of one sentence recorded before and after each loading session. Pairs of stimuli were presented randomly to listeners who were asked to designate the most pressed sample at a first listening and the most breathy sample at a second listening. Each pair of stimuli was presented twice in order to evaluate the reliability.

Results indicate that inter-judges and intra-judges reliability was poor to fair.
Concerning the duration effect of vocal loading, results showed a significant decrease of breathiness but no change of pressedness after reading in both sessions. The decreased breathiness represents a voice improvement which could be interpreted as an adaptation of voice to loading. When comparing the two intensity levels, no difference was found for breathiness and pressedness after vocal loading. Similarly to objective measurements and self-ratings, perceptual assessments suggest that the duration of vocal loading has more effects on voice than its intensity level.

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**Ref#: SLP22**

# Voice Characteristics in Teachers and Non-teachers with and without Voice Disorders

The aim of the study was to determine differences of objective voice parameters between the groups.
Voice evaluation was done in three groups: teachers with voice disorders (n = 20), teachers without voice disorders (n = 21), and non-teachers – medical staff (n = 20).
The methods of auditive-perceptual (GRBAS), aerodynamic (MPT, PQ), acoustic (MDVP, VRP), and EGG evaluation, also subjective rating by the individual (VHI) were used in the study.
We found a significant differences between groups in the following parameters: (1) mean score of parameters of GRBAS scale ($p < 0.01$); (2) MPT ($p = 0.01$); (3) PQ ($p < 0.01$); (4) F0 ($p = 0.001$); (5) Jitter ($p = 0.01$); (6) PPQ ($p = 0.01$); (7) Shimmer ($p = 0.025$); (8) APQ ($p = 0.005$); (9) VHI ($p < 0.001$).
The lowest median score of Dysphonia Severity Index (DSI) was observed in the group of teachers with voice disorders (Me 2.65). We found significant difference between the groups in the median values of DSI ($p = 0.001$).
The parameters of noise (NHR, VTI, SPI), also parameters of VRP ($F0_{min}$, $F0_{max}$, $INT_{min}$, $INT_{max}$) and Contact Quotient in EGG didn't demonstrate significant differences between all groups.
We found significant correlation between DSI and overall grade of hoarseness in the group of teachers with voice disorders ($r = -0.71$, $p < 0.001$).
Conclusions: (1) teachers with voice disorders have objectively justified worse aerodynamic, perceptual and acoustical parameters of voice than teachers without voice disorders and non-teachers; (2) a professional vocal load affects a voice quality. Teachers without self-assessed voice disorders have significant differences in MPT, PQ, F0, Jitter and PPQ to compared with non-teachers; (3) Dysphonia Severity Index is most sensitive indicator of voice disorders in population of teachers.

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**Ref#: SLP24**

# Examination of Vocal Hygiene and Adherence to Home-practice on Therapy Outcomes in Children with Bilateral Vocal Fold Lesions

**Objectives:** The purpose of this study is to examine factors that influence improved voice quality following voice therapy in children with bilateral vocal fold lesions.

**Methods:** Forty children with vocal fold lesions between the ages 5 and 17 years who are candidates for voice therapy are being recruited for this study. All of the children undergo an instrumental evaluation of voice and perceptual analysis (CAPE-V). The occurrence of vocal abuse/misuse and the completion of assigned exercises are tracked at home during the first 8 weeks of therapy. Therapy plans vary by child, but all children in the study complete Vocal Function Exercises (VFEs). An assessment of vocal function is completed after 8 weeks of therapy including another CAPE-V analysis. Preliminary analysis of a portion of the data was completed for 8 of the children (3 females; 5 males, average age = 6.9 years).

**Results/Conclusions:** Mean percent occurrence of vocal abuse/misuse of the behaviors tracked was 26% and the mean percent of VFE assigned homework completionwas 89.3%. CAPE-V Overall Severity scores decreased by a mean of 17.9. A repeated measures mixed effect model revealed a significant association between lower percent of vocal abuse/misuse and decreased Overall Severity score ($p = .002$); however, a second repeated measure analysis revealed that the percent of compliance was not significantly associated with a change in Overall Severity score ($p = .46$). Additional analyses are planned that examine the influence of other factors that may impact changes that occur with therapy, such as age, gender, and onset/presentation severity.

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**Ref#: SLP25**

# Contemporary Management Approaches in Paediatric Vocal Health: A Cross-Cultural Comparison

The management of childhood vocal health and voice disorders continues to be an area of controversy both in the literature and in clinical practice. Some suggest a wait-and-see approach, with the view that maturity will reduce behaviours associated with phonotrauma thereby resulting in spontaneous resolution of structural changes (e.g., nodules). However, others note the numerous potential aetiologies of paediatric vocal change and negative impacts on quality of life, encouraging multi-disciplinary approaches with laryngeal observation. Anecdotal evidence suggests that management practices in paediatric vocal health may vary according to individual clinician preference, within different service delivery providers, and according to the availability of resources.

The present study investigated contemporary management approaches in paediatric vocal health in Australia and Hong Kong. Speech-language pathologists (SLPs) currently providing services to paediatric clients within Australia and Hong Kong were invited to participate in the study. A questionnaire survey was completed either online or in paper version. The questionnaire covered areas related to management approaches in paediatric vocal health: service delivery model and availability of resources, voice assessment protocol (instrumental and perceptual techniques), use of laryngeal imaging, involvement of other multi-disciplinary team members, treatment protocol, and clinician involvement in community education in the field of voice.

This presentation will compare and contrast current practice of Australian and Hong Kong SLPs in the management of paediatric vocal health and discuss these in relation to the literature. Knowledge of current practice will assist in the development of protocols for pediatric voice caseloads.

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**Ref#: SLP28**

# Perception and Acoustic Measurement of Good Voice Quality for Radio

**Purpose:** Significant differences between voices of radio performers and controls have been reported in previous literature. Despite this, listener responses to voices on radio are likely to vary as voices need to suit the station/product. This paper examined whether a) voices could be reliably categorised based on how good they were for radio and b) these perceptual categories could be predicted using acoustic measures.
**Method:** Twenty-four male radio performers (mean age = 36 years, range = 20-52 years) and 24 age-matched male controls performed the 'Rainbow Passage' as if presenting on radio. In Study 1, the voice samples were perceptually rated using a three-stage paired-comparison paradigm by 51 naive listeners. Reliability data (Cronbach's Alpha/ICCs) were used in forming perceptual groups. In Study 2, the same voice samples were analysed for measures of: Fundamental Frequency, Long Term Average Spectrum, Cepstral Peak Prominence and pause/spoken-phrase duration.
**Results:** In Study 1, Good inter-judge reliability was found for the perceptual ratings of best 15 voices (good for radio group, 14/15=radio performers) however agreements for ratings of remaining 33 voices (unranked group) were poor. Discriminant function analyses in Study 2 showed that Standard Deviation of Sounded Portion Duration, Equivalent Sound Level and smoothed Cepstral Peak Prominence predicted membership of good for radio and unranked groups with moderate accuracy ($R^2$=0.328).
**Discussion:** Although some voices on radio could be perceived and agreed upon as having good quality for radio, current acoustic analyses can detect only some of the acoustic signal properties of these voices. Further research on perception of good voice quality for radio and acoustic measures that sensitively reflect good voice quality is warranted.

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**Ref#: SLP34**

## Laryngeal Measures in Monozygotic Twins

Human voice is a carrier of personality and identity. It is also called as emblem of the speaker. Every mature voice has a unique character dependent upon the structure of head, neck and face of the individual. Just as no two faces are the same, neither are two voices. The physical characteristics like laryngeal mechanism and phenotypic similarities elsewhere in the vocal mechanism are genetically determined and it is supported from twins studies. This may be true for their voices also. Though voice is unique to individuals, studies involving listener's perception and quantitative measures of voice showed similarity in monozygotic twins but without major evidence from genotype similarity. Also, the results of earlier studies on voice characteristics in monozygotic twins are not consistent. In this context, the present study investigated laryngeal similarity in monozygotic twins using DNA fingerprinting as a genotype similarity. Participants included 34 monozygotic twins or 17 monozygotic twin pairs (11 female & 6 male) in the age range of 17-21. Seventeen age and gender matched normal subjects were taken as unrelated peers. In each of the twin pair first twin was called T1. The co-twin was called T2. Age and gender matched normal subjects was called as N1. As laryngeal measure, S/Z ratio, maximum phonation duration, frequency and intensity measures, multi-dimensional voice profile, Dysphonia Severity Index were considered. Pearson's Correlation coefficient was used to find out the correlation between T1 and T2, T1 and N1, and T2 and N1 on all measures. Mann Whitney 'U' test was performed to find differences in gender on raw scores and absolute differences between twins and normals. Discriminant analysis (DF) was used to find the distance between the twins in comparison to unrelated peer groups. The results revealed several points of interest. Firstly, a significantly high positive correlation was noticed within MZ twins. Also the significant gender differences on fundamental frequency related measurements for the raw scores were noticed. DF analysis showed frequency related parameters had more importance than other laryngeal measures. The results of the present study showed that several of the laryngeal measures were similar in twins. However, some amount of dissimilarity was present even in monozygotic twins. The results have contributed to the area of voice characteristics in twins. The results are strengthened compared to those of earlier studies as it is based on DNA analysis. The results of the present study are also useful in speaker identification task.

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**Ref#: SLP38**

# Validation of the Singing Vocal Health Knowledge Questionnaire

Background: Although a suitable questionnaire for general voice care knowledge exists (*Voice Care Knowledge Questionnaire* (*VCKQ),* H. Fletcher, 2005), there is no appropriate questionnaire assessing perceived vocal health knowledge among singers. In our previous studies, "Does 'Glee' Culture Get It? Assessing Vocal Health Awareness and Experience Among College Students Involved in Extracurricular Singing Groups," and "House Calls: Vocal Health Education for Singers in a National Touring Company," we piloted a non-validated assessment tool comprised of the *Singing Voice Handicap Index* (*SVHI-10*, S. Cohen, 2009) and a modified version of the *VCKQ*. Results of the study revealed exclusive areas of inadequate vocal health knowledge in these populations. The information yielded warrants finalization of questionnaire content and validation of the tool for assessing vocal health knowledge in various singer populations, ultimately providing vocal health professionals greater means of tailoring voice care for singers.
Method: A literature review examined the evidence base for factors affecting the voice. Based on these results, several factors used in our previous study were eliminated due to poor evidence base and/or redundancy, and several factors were added to increase specificity for singing voice health. The finalized questionnaire will be piloted on singers and non-singers to ensure ease of use, then validated by a group of voice clinicians. The validated questionnaire will be administered to non-singers and singers of various backgrounds. Statistical analysis will be performed on collected data.
Results: This study is currently underway.
Conclusions: Pending study results.

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**Ref#: SLP39**

# Vocal Intensity and Self-Ratings of Communication in People with Parkinson Disease (PD) Before and After Intensive Voice Treatment (LSVT®), Articulation Treatment, or No Treatment

Over many years, intensive voice therapy (LSVT®) has become the established treatment for rehabilitating voice and speech in people with PD, improving both hypophonia and speech articulation. It is unknown, however, whether other forms of equally intensive speech treatment would benefit people with PD. This is the first study designed to examine the effects of a novel, intensive speech therapy designed to match LSVT in treatment *mode* (intensive dosage physical exercise) while modifying the *target* (articulation versus loudness). In this controlled study, we compared the effects of LSVT to a new articulation treatment (ARTIC) on three measures of communication: sound pressure level (SPL), voice handicap (VHI), and communicative effectiveness (CETI-M). Data were collected on 64 individuals immediately before and after one month of intensive treatment or one month with no treatment. Twenty two participants with PD received LSVT, 20 received ARTIC, and 22 remained untreated. Following treatment, both LSVT and ARTIC groups significantly increased SPL from baseline ($p<0.05$) for tasks ranging from phonation to conversation, with the LSVT group demonstrating a significantly larger mean pre-post increase (+5.9 dB [SD 1.8]) compared to the ARTIC group (+1.2 dB [SD 0.7]). Significant within group improvements also occurred in VHI for LSVT (-8.5) and ARTIC (-4.5), and CETI-M (+13 LSVT, +9 ARTIC). Results suggest that while both types of intensive therapy may positively impact communication in PD, LSVT appears to improve a variety of communication domains to a greater extent and may be considered more effective in treating voice and speech in PD.

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**Ref#: SLP44**

# Development of the Voice Catastrophization Index: A Preliminary Investigation

Objective: Catastrophization is a form of cognitive distortion which causes an exaggerated negative mental set to arise during painful experiences causing feelings of rumination, magnification, and helplessness. No studies have been done to define the extent of catastrophization experienced by patients with voice disorders. A catastrophization scale has been validated in both the pain and the vertigo literature and used to direct therapy and other treatments. With this information we hope to learn more about the nature and motivation of patient complaints, and the relationship between extent of voice disorder and patient quality of life.
Method: A 13-item questionnaire was developed based on the pain and dizziness catastrophization scales. The instrument is being validated in both disordered populations and normals for construct validity, discriminate validity, test-retest reliability. In this study, we will compare scores on the Voice Catastrophization Scale (VCS) with scores on the VRQOL and the clinician rated CAPE-V.

Results: Face validity was performed amongst a panel of laryngologists and speech-language pathologists. We hypothesize that the VCS will be elevated in individuals where quality of life impairments paradoxically exceed the voice impairment that is perceived by the clinician.

Conclusion: Research has shown a weak correlation between clinician rated severity scales (CAPE-V) and quality of life scales (VRQOL). 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.

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**Ref#: SLP46**

# Development and Preliminary Validation of a Tool to Measure Perceived Singing Voice Function (EASE)

Most voice self-rating tools are disease-specific measures and are limited in the application to the healthy voice-user. Based on qualitative data previously gathered from healthy singers regarding the effect of heavy vocal load on the vocal mechanism, a new self-assessment survey instrument, Evaluation of Ability to Sing Easily (EASE) was developed and its psychometric properties assessed.

In the item generation phase of the study, a series of 74 descriptors regarding singers' perception of the current physical status of their singing voice were generated from interview and survey data gathered in a previous study (ref). These vocal health descriptors were reviewed by 25 currently performing music theatre singers and refined to 42 items using a consensus technique via two rounds of electronic survey following the Delphi Method. The initial item pool of 42 items regarding singers' perception of the current physical status of their singing voice was then completed online by 291 professional music theatre singers. Principal Component Analysis was undertaken to evaluate dimensionality and identified two subsets of items. Rasch analysis was used to evaluate and refine these sets of items to form two 10-item subscales. Both subscales showed good overall fit to the Rasch model, no differential item functioning by sex or age, and good internal consistency reliability. The two subscales were strongly correlated and subsequent testing supported their combination to form a single 20-item scale with good psychometric properties.

The EASE was developed to provide a concise, easy to use clinical tool to assess singer's perceptions of the current status of their singing voice. EASE may prove a useful tool to measure changes in the singing voice as indicators of the effect of vocal load. Further, it may offer a valuable means for the prediction or screening of singers 'at risk' of developing voice disorders.

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**Ref#: SLP48**

# The Relationship between Working Conditions and Prevalence of Voice Problems in Primary School Teachers

The first study on voice problems in primary school teachers was published by this author, who reported on the the prevalence and impact of voice problems in this population.
The working conditions of primary school teachers are unique and they are particularly at risk of developing a voice problem. Their typical working day is characterised between 5 and 6 hours of continuous teaching with little opportunity for vocal rest. This contrasts sharply with the working day of high school teachers whose day is characterised by 45 minute teaching periods with opportunity for long periods of vocal rest.
An 85-item questionnaire was administered to 550 primary school teachers in the greater Dublin area. This study reports on working conditions, class size, absence of voice training, duration of a voice problem, and the impact of these variables on work and voice. Teachers reported on the conditions in teaching that they perceived to cause a voice problem and on the adequacy of Health and Safety assistance available to them when required. Absenteeism induced by a voice problem and it's impact is also discussed.
The results of this study are discussed with particular reference to including this population in Health and Safety policy for teachers. At present the vocal health of teachers is not included in Health and Safety Policy in Ireland. Recommendations for future research are made with particular reference to occupational medicine.

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**Ref#: SLP49**

## Potential Occupational and Personal Factors Associated with Voice Problems in Teachers

Studies investigating occupational and personal risk factors for voice problems in teachers are needed to better establish the relationship between the teaching context and voice problems. The teaching environment and teaching approaches differ across countries, thus risk factors may also differ. This study aimed to investigate the occupational and personal predictors of voice problems in New Zealand teachers using a self-report questionnaire. This research constitutes the second phase of an epidemiological study involving a large sample of primary and secondary teachers. 634 teachers were included in the study (response rate of 77.7%). The survey investigated a range of predictors such as voice use patterns, acoustic and air quality features of the teaching environment and teaching style. Standardized questionnaires were used to evaluate psychological factors such as stress, depression, coping style, engagement and self-efficacy. Teachers with self-reported voice problems presented with significantly higher mean scores for stress, depression, and anxiety as well as lower scores on emotional stability. Teachers with self-reported voice problems rated their classrooms as having difficult acoustics and poor air quality. Results from regression models used to delineate predictors will be presented and discussed.

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**Ref#: SLP50**

# Vocal Loading among Teachers with Self-reported Voice Problems

Studies involving practical and objective measures in field conditions are needed to better characterise teachers' daily voice use, to identify potential causal factors for voice problems and to examine the effects of vocal load on teachers' voices. In this study, primary and secondary teachers (males and females) with self-reported voice problems (SVP) and matched-controls (by gender, age and ethnicity) without SVP had their vocal dose assessed during two typical teaching days using the Kay Pentax Ambulatory Phonation Monitor (APM). Self-assessment questionnaires, auditory perceptual and acoustic analyses of voice, endoscopic evaluation of the larynx, and environmental measures of background noise during teaching day (using a dosimeter attached to teacher's shoulder), reverberation time and room dimensions were conducted. Teachers also answered a self-assessment questionnaire before and after classes, and filled in a voice diary. Preliminary data from 6 teachers with SVP have shown teachers phonate approximately 22% of teaching day, with speech levels averaging 80 db SPL. We divided the day's recording into three parts of equal time to examine change in voice and dosimeter values over the day. Overall F0 and Voice SPL measured with APM increased from start to mid and end of day. Teachers' voice levels increase over the day despite the dosimeter levels indicating a drop in classroom noise levels over the day. The change in voice ratings (comparing end-of-day and start-of-day) was correlated with middle ($R_s$=0.94) and end of day ($R_s$=0.83) F0 values ($p<.05$). More teachers have been assessed and full data will be presented and discussed.

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**Ref#: VP2**

# The Effects of Three Singer Gestures on Acoustic and Perceptual Measures of Choral Singing

The purpose of this investigation was to assess the potential effects of three singer gestures on performances of choral singers ($N$ = 31). Each song ("Over the Rainbow" with low, circular arm gesture; "Singin' in the Rain" with pointing gesture; "Hawaiian Rainbows" with arched hand gesture) was sung seven times: Baseline (without singer gesture), five iterations of each song paired with a singer gesture, and a posttest (without singer gesture).

The experiment measured acoustic (long-term average spectra) and perceptual (pitch analysis, expert panel ratings, and participant perceptual questionnaire) differences in choral sound across conditions. Results indicated a significant increase in mean signal amplitude in sung gestural iterations with the low, circular gesture and pointing gesture. Intonation differences were significant between baseline and the low, circular gesture, baseline and posttest for the pointing gesture, and between the arched hand gesture and posttest. Expert panel ratings were highest during gestural conditions across song selections, and the majority of participants gave positive comments regarding use of gesture during choral singing.

Results were discussed in terms of singing pedagogy, limitations of the study, and suggestions for further research.

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**Ref#: VP3**

**Vocal Pedagogy at the End of the Twentieth Century: Revealing the "Hidden Instrument"**

The teaching of singing remained remarkably stable until, at the end of the twentieth century, advances in the understanding of voice science stimulated dramatic changes in approach to vocal pedagogy. Previously, the technology needed to accurately measure physiologic change within the larynx and breath-support musculature during the process of singing simply did not exist. Any prior application of scientific study to the voice was based primarily upon auditory evaluation, rather than objective data accumulation and assessment. After a centuries-long history, within a span of twenty years, vocal pedagogy evolved from an approach solely derived from subjective, auditory, evidence to an application grounded in scientific data.

By means of analysis of significant publications by Richard Miller, Robert Sataloff, and Ingo Titze, as well as articles from *The Journal of Singing* and *The Journal of Voice*, I establish a baseline of scientific knowledge and pedagogic practice ca. 1980. Analysis and comparison of a timeline of advancement in scientific insight and the discussion of science in pedagogical texts, 1980-2000, reveal the extent to which voice teachers have changed dramatically their method of instruction. I posit that voice pedagogy has undergone a fundamental change, from telling the student only what to do, via auditory demonstration and visual imagery, to validating with scientific data how and why students should change their vocal approach. The consequence of this dramatic pedagogic evolution has produced singers who comprehend more fully the science of their art.

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**Ref#: VP4**

# Electroglottographic Analysis of Actresses and Non-Actresses' Voices in Different Levels of Intensity

Electroglottographic analysis (EGG) was used to investigate the contribution of the glottal source to the projected voice by comparing actresses and non-actresses' voices in different levels of intensity. 30 actresses and 30 non-actresses sustained vowels in habitual, moderate and loud loudness. Actresses were instructed to project their voice during recordings and one of the authors perceptually controlled the effectiveness of this task. EGG variables were Contact quotient (CQ), Closing (QCQ) and Opening (QOQ). Other variables were sound pressure level (SPL) and fundamental frequency (F0). Variables were inputted in a general linear model. Actresses showed significantly higher values for SPL in all levels, and both groups increased SPL significantly while changing from habitual to moderate and further to loud. There were no significant differences between groups for F0 and EGG quotients but from habitual to loud there were differences between levels for F0 and CQ for both groups. SPL was significantly higher among actresses in all intensity levels but these results weren't support by the EGG findings. This apparently weak contribution of the glottal source for the actresses' voices might be due to a higher subglottal pressure or perhaps, greater vocal tract contribution in SPL. Results from the present study suggest that trained subjects did not produce a higher SPL by increasing the cost in terms of higher vocal fold collision and hence more impact stress. Future researches should explore the difference between groups by aerodynamic measurements in order to evaluate the relationship between physiologic and the acoustic and electroglottographic data.

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**Ref#: VP5**

# A Preliminary Survey of Vocal Technique Training and Pedagogy in the Choral Rehearsal

Abstract: Little information is available in the choral community regarding the use of technical vocal training and pedagogy in a choral rehearsal. The purpose of this preliminary study was to begin to gather data from choral conductors and music educators regarding the type, amount and use of vocal technique training, and to investigate pedagogical attitudes of those using this training, in a choral rehearsal in a variety of choruses. Two hundred (200) participants from across the United States were surveyed through a web-based survey, with respondents representing a wide range of choral educators in elementary, middle and high schools as well as university, community and professional choirs.

In this 40-question, digital survey participants were asked about their vocal education, the terminology they used in rehearsals and their knowledge of vocal health issues which may arise in chorus members. The results of this survey indicate there is a wide range of the type and amount of vocal instruction taking place in choral rehearsals, a diverse mix of skill levels when applying vocal function exercises and a great variety of choices about the specific use of vocal technique training in a choral rehearsal. The study reveals that all vocal technique training and pedagogy parameters are highly variable and not standardized in any way.

It is hoped that this study will encourage further research in the choral community into vocal technique training to help determine the most efficient ways to integrate it into a choral rehearsal. This survey appears to indicate that the choral community is presently without any clearly defined set of parameters regarding the teaching of vocal skills (range, breathing, vowel sounds, etc.) versus choral skills (musicianship, expressiveness, and sectional or overall balance or blend), and opens the door to the possibility that further research will inspire choral educators to begin creating basic guidelines of standards and practices in that regard.

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**Ref#: VP6**

# The Mixed Register in Contemporary Practice

Ever since Garcia made direct observations on vocal fold behavior during singing, the application of science to the singing voice has focused primarily on the operatic or classical voice. Recent years have brought more scrutiny to other styles of singing, particularly those where amplification is a given, reducing the need to produce a powerful sound that can be heard above an orchestral accompaniment. Practitioners of these styles commonly refer to a mixed register, a kind of voice production that differs from the simple registers of the voice source, usually labeled "chest" and "falsetto." This study attempts to describe objectively the essential features of such mixed registers by means of the non-invasive microphone and EGG signals. Varieties of "mix," as well as male-female differences, are considered.

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**Ref#: VP7**

# The Effect of Conductor Prepatory Head, Shoulder, and Hand Movements on Singer Extrinsic Laryngeal Muscle Engagement During Initial Phonation

This study is the second in a series that utilized surface electromyography (sEMG) to examine singer muscular responses to varied nonverbal conductor behaviors. In the first, Manternach (2012) measured singer extrinsic laryngeal muscle engagement during inhalation, as well as obtaining various acoustical parameters of singers' initial phonation. The present study examines singer ($N$ = 23, $n$ = 15 experienced, $n$ = 8 naïve) extrinsic laryngeal muscle engagement during the first second of phonation.

Participants sang the first phrase melody of Mozart's *Ave Verum Corpus* eight times in five different orderings while following a videotaped conductor who displayed the following fully-crossed preparatory gesture conditions: (a) upward moving or downward moving arm, (b) upward moving head with intentional posterior neck and shoulder tension or neutral head positioning, and (c) clenched fist with intentional arm tension or open palm. Surface electromyographic (sEMG) electrodes measured singer muscle responses in the suprahyoid (SH), posterior neck (PN), upper trapezius (TR) and sternocleidomastoid (SCM) muscle regions during the first second of phonation of the initial [a] vowel. Results were discussed in terms of efficiency of voicing resulting from certain conducting gestures.

(N.B. Data analysis is currently in progress)

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**Ref#: VP8**

# The Development of Metacognition in Vocal Warm-up Exercises (VWUE): A Comparison of Expert and Novice Strategy Use and Achievement

Experts musicians practice efficiently, using a sophisticated knowledge of their own technical function to select targets and strategies to optimize their cognitive and motor learning. By contrast, novices tend to form superficial or inappropriate procedural connections and to favor run-throughs and rote repetition. In vocal warm-ups, this propensity can lead to counterproductive, inefficient work and increase student frustration, leading to a pedagogical challenge. However, research in educational psychology suggests that along with providing the extensive content knowledge base needed for expert pattern recognition, teachers can directly develop and influence their students' ability to be efficient self-directed learners in the practice room.

The purpose of this study will be to identify the underlying procedural and psychological schemas that guide expert singers' work in order to clarify points which might then be explicitly addressed through lesson format and assessment. Four professional sopranos and eight undergraduate sopranos will participate in a pretest, VWUE session, and post-test. Immediately following this task and assessment, they will view a video of their VWUE session and verbalize their goals and decision-making processes and participate in a semi-structured interview. Practice behaviors will be divided into rehearsal frames, notated, and analyzed with SCRIBE 4.0 software. Verbalizations and interviews will be coded qualitatively for strategy use and metacognitive themes. Correlations between acoustic and duration measures (MPT, mean- max- and average intensities) will be drawn with qualitative findings in order to examine the relationship between self-regulation, strategic practice behaviors, and effect on vocal function.

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**Ref#: VP10**

## Ethno-historical Barriers to a Contemporary Commercial Music Voice Pedagogy

In 2008, the American Academy of Teachers of Singing issued a statement *In support of Contemporary Commercial Music (Nonclassical) Voice Pedagogy* that presents scientific arguments for a separate and unique approach to CCM voice pedagogy.

Non-classical singing styles on the professional stage date to 1866 when *The Black Crook* was performed on Broadway. In the intervening one hundred and thirty-seven years, only two American graduate programs have been developed for CCM voice pedagogy. Significant cultural barriers continue to prevent the integration of CCM voice pedagogy into collegiate training programs.

This paper examines the development of college-level musical training and concurrent developments in commercial music (e.g. "coon shouting," crooning, and rock 'n' roll). Demographic and historical influences will also be discussed. Reviewing the ethno-historical developments of music and voice training illuminates persistent prejudices in our field and can help us move forward in advancing scientific knowledge.

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**Ref#: VP11**

# Analysis of Current Casting Trends in Musical Theatre

According to the National Association of Schools of Music and the National Association of Schools of Theatre, there are approximately sixty-one schools offering a Bachelor of Fine Arts in musical theatre. Few of these programs have integrated CCM (contemporary commercial music) voice training. Graduates from these programs are facing an increasingly competitive job market, with a wide range of vocal demands. Evidence gathered from "Playbill" and other online databases suggests that 85% of recent productions nominated for the Tony Award for Best Musical require pop/rock vocal capabilities. Collegiate voice faculty members need to be aware of these market trends in music theatre in order to properly prepare students for successful careers.

This paper will present an analysis of current casting trends of elite music theatre productions and national tours. The resulting database of vocal requirements gleaned from online musical theatre audition announcements will be cross tabulated by voice type, range, vocal quality, and style in order to better understand the vocal demands of CCM singers in the current job market. Implications for collegiate voice pedagogy programs will be discussed.

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**Ref#: VP15**

# Different Glottal Configurations and the Laryngeal Mechanisms During the Performance of Messa di Voce – a Pilot Study

Introduction and aim: Current studies on laryngeal mechanisms describe the typical transition phenomena in the singing voice, but do not research the phenomena related to the perceptually smooth transition mastered by trained voices. Here we investigate the glottal configurations of classically trained professional singers during their performance of *messa di voce*, and compare them to the typical configurations found in laryngeal mechanisms M1 and M2. Method: Three classically trained professional singers, two female and one male, were studied with a high speed imaging videolaryngoscopy equipment (HS Endocam 5560, Richard Wolf GmbH, Knittlingen, Germany), running at 2000 fps, while performing *messa di voce* on the pitch F5 (704Hz). Results: We observed that the louder the subjects sang the greater the engagement of the vibrating mass of the vocal folds, but that there were no breaks in frequency or sudden discontinuities on their vibratory patterns. Configurations with greater mass vibration were correlated with high vocal intensity and strong upper partials whereas the opposite ones correlated to low vocal intensity and weak high partials. Antero-posterior constriction was present during the intensity peak on two of the singers. Conclusion: The collected data indicate that there were various intermediate glottal configurations during the *messa di voce*, probably still corresponding to the scientific definition of M2, but thus reinforcing the usual pedagogical concept of "mixed voice". Further investigation on this kind of phenomena with a greater number of subjects and simultaneous EGG measurements should be done to confirm the results.

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**Ref#: VP16**

# The Effects of Varying Non-verbal Behaviors by Multiple Conductors on the Vocal Sound of Singers Performing a Previously Learned Choral Composition

Choir directors often find themselves in the position of conducting ensembles where singers have learned repertoire under another director's tutelage. Prior research suggests that non-verbal conducting behaviors can affect the sound of a choir in time-efficient ways. But how amenable are singer vocal production habits established under one conductor to non-verbal stimuli by different conductors?

This study investigated the effects of varying non-verbal conducting behaviors exhibited by multiple conductors ($N = 5$) on acoustical (LTAS) and perceptual (pitch analyses, singer survey, expert listening panel) measures of the conglomerate vocal sound of an established female chorus ($N = 28$) singing an already learned a cappella choral composition. We employed a variety of visual measures (grid overlay analyses, facial affect inventory, gesture and 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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**Ref#: VP18**

## Multi-factorial Model of Soprano Voice's Sub-classification

Classifying a voice is a matter of great importance to classical singing: it defines a singer's repertoire and career. However, voice classification is sometimes controversial and different systems exist. Voice science has attempted to unveil the underlying complexity, testing various explanations. Acoustical, morphological and physiological differences have been found between different voice categories; however, within the same voice category, the understanding of the factors crucial to *Fäch* differentiation is still far from complete.

Eleven sopranos were recorded using a hybrid system for audio, electrolaryngograph, intra-oral pressure and air flow. Singers were asked to: (i) perform the aria "*O mio babbino caro*", by G. Puccini, (ii) sing a diminuendo while repeating the syllable /*pae*/ at different pitches. Acoustical, physiological and aerodynamic aspects of voice production were measured. Excerpts of the aria were presented to a panel of 19 expert listeners, who rated the voices along a visual analogue scale, with the extremes *soubrette* and *dramatic soprano*. The relationship between the ratings and the voice data were analysed using multiple regression analysis. The model that best predicted the perceptual ratings included equivalent sound level and phonation threshold pressure for the note B4. Using that model to predict the ratings yielded a correlation of 0.87. The results support the assumption that B4 is a particularly important pitch in the classification of soprano voices, an assumption that merits further investigation.

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**Ref#: VP19**

# Factors Related to Choral Singing Well Being in Amateur Singers

BACKGROUND: Choral singing is a popular vocational pastime across cultures. The potential health benefits associated with choral singing, including positive effect on well-being, are a topic of interest in health research. However, anecdotal reports from voice professionals suggest that the unique demands of choral singing may enforce unhealthy singing habits. Deleterious vocal behaviors sometimes associated with choral singing include singing outside comfortable pitch range, singing too loudly, and singing too softly for blend. METHODS: The relationships between vocal warm-ups, common unhealthy choral singing habits, vocal fatigue, and singing-related wellbeing were assessed via a 14-item questionnaire with Likert-response format. 196 attendees of the international World Choir Games participated in this study. The final study group consisted of 53 male and 143 female international amateur singers ages 10-70. RESULTS: Results indicated a positive correlation between vocal fatigue and unhealthy singing behaviors ($p<0.0001$). Participants who did not engage in unhealthy singing behavior experienced increased singing-related well-being ($p=.00019$). Warming up was not related to vocal fatigue or singing wellbeing. 67.36% of participants preferred choir to solo singing. CONCLUSION: Putatively unhealthy choral singing behaviors may result in vocal fatigue and reduction of choral singing wellbeing, and should therefore be considered when examining the effect of choral singing on singing-related wellbeing and health effects. Future research will compare the amateurs' perceptions of choral singing with perceptions from professional singers.

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**Ref#: VP24**

## Perceptions of Conglomerate Choral Sound According to Auralization and Listening Condition

Vocal and choral research often employs a perceptual listening component in order to determine listener preference. The purpose of this study was to explore listener ($N$ = 30; $n$ = 15 experienced choral musicians, $n$ = 15 non-musicians) preferences of listening conditions (on-ear headphones, near-field loudspeakers, loudspeakers spaced 10 ft. apart and from listener) to determine the best mode for listeners to distinguish between auralizations of choral performances in 2-channel recordings of two contrasting room conditions developed using EASE 4.3 software and anechoic choir recordings. Among the controls instituted were use of a listening room with a low reverberation time tested in octave bands, consistent sound pressure level for all listening modes, listening loudspeakers tuned to produce flat frequency response with pink noise input, and consistent listener distance from sound source. Results were discussed in terms of listening conditions, listener perceptions of choral sound, implications of auralizations of choral sound, interactions between anechoic choral recordings and room acoustic conditions, and directions for future research.

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**Ref#: VP25**

# Muscle Tension Dysphonia: Are Singers Getting the Help They Need? (Phase II)

Muscle tension dysphonia (MTD) is an occupational hazard for both professional and amateur singers. The demands of performance are such that performers are frequently faced with situations that may contribute to the development of the disorder. As MTD can have a significantly negative impact on a performer's career and confidence, early detection and treatment is a necessity for the singing voice. Our previous research, presented at last year's symposium, provided data which helped us better understand the challenges of addressing MTD within the singing voice community. Suggestions included providing better information to singers, teachers, and medical professionals, as well as better collaboration between professionals. Additionally, we found that when singers received help, they generally improved; compliance did not seem to be as much of an impediment as the general lack of knowledge concerning MTD.

Therefore, in phase two of our study, we intend to 1) survey an expert group of singing voice professionals, specializing in treatment of MTD, to reach a consensus on aural qualities in the singing voice that would suggest potentially problematic issues where a medical referral might be recommended; and 2) allow participants from the broader singing voice community to review a range of audio examples of healthy and disordered phonation, to determine whether singers and teachers – particularly those who are less experienced with MTD – are able to aurally recognize the previously determined potentially problematic qualities.

Findings are presented with the aim of contributing to current understanding of the level of MTD awareness in the singing community.

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**Ref#: VP26**

# Effects of a Tapered Rehearsal Schedule on Voice in Choir Singers

Singers generally increase rehearsal time prior to a performance. Although obviously beneficial for improving performance, this practice may have a negative effect on vocal quality. This practice differs from that of athletes, who generally rest or taper prior to an event in order to increase overall performance. Given that young female choral singers have reported symptoms of vocal hoarseness, chronic fatigue, and insomnia, periods of high voice usage prior to a performance may exacerbate these conditions and contribute to vocal fatigue and poor vocal quality. The purpose of this study, then, is to examine if a tapered period of voice usage prior to a show or recital enhances vocal performances.

Twenty undergraduate students majoring in vocal music education and vocal performance will serve as participants. The students participate in two choir performances during a semester. For the first performance, 10 of the students (Group 1) will follow a regular, high voice usage schedule of practice and rehearsal prior to the performance. The remaining 10 students (Group 2) will follow a tapered protocol, e.g., reduced rehearsal time and increased vocal rest periods. For the second performance, the students in Group 1 will follow a tapered schedule will the students in Group 2 will follow a regular, high usage schedule.

Baseline voice recordings, laryngostroboscopic assessments, and subjective ratings will be obtained at the beginning of the semester, 2 weeks prior to each scheduled performance, immediately prior to the performance, and 24 hours following the performance. Data collection and analysis is currently underway.

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**Ref#: VP27**

# Developing a Searchable Database of Vocal Repertoire for the Beginning Voice Student with Expanded Analysis of Tessitura

The choice of repertoire is one of the most critical decisions voice teachers must make. Several factors need to be considered, including the vocal and musical demands and artistic factors of a song. Many sources attempt to catalog and/or classify a broad range of vocal repertoire. Graded repertoire lists assign a difficulty level, but often do not adequately define "difficulty." Vocal music indices allow one to view all songs in a particular collection, but lack the breadth of information provided in other resources.
A challenge with these resources is that none are electronically searchable. The ability to electronically index/catalog vocal collections focused on literature for the young or beginning student would be particularly helpful for the beginning teacher in searching for and becoming familiar with this repertoire.
Another challenge is that very few of these resources include an assessment of tessitura. Those that do include it most often describe tessitura simply as low, medium, and high. To date there has been no easy way to quantify the tessitura of a song.
The purpose of this research/teaching project is to assist in the search for and selection of repertoire for the beginning voice student by developing a prototype of an electronically searchable database of beginning vocal repertoire. The information provided for each song will consist of various characteristics that identify the musical, artistic, and vocal demands of the music, including a process by which the tessitura and other aspects of vocal demands of each song can be analyzed and quantified.

Jennifer Sharp, B.S., B.M., M.M. candidate, B.S. Electrical Engineering, B.M. Vocal Performance, M.M. (Candidate) Vocal Pedagogy, Student/M.M. Candidate, Shenandoah University, 1460 University Drive, Winchester, Virginia 22601

Philip Sargent, B.M., M.M., DMA, Associate Professor of Music, Shenandoah University, 1460 University Drive, Winchester, Virginia 22601

**Ref#: VP29**

# The Effect of Two Heel Heights on Head Position and Acoustical Measurements of Female Singers

Much anecdotal advice exists concerning what type of shoes females should wear while singing and whether heel height could have an impact on vocal production. Many studies have shown a detrimental impact of high-heeled shoes on posture. Only one study (Rollings, 2012), has addressed the effects of shoe heel heights on various postural alignment and acoustical measures of sung performances by female vocalists ($N$ = 5). Results indicated intriguing associations between shoe heel heights, head postures, and objective measures of vocal sound. The purpose of this present study was to investigate potential effects of two heel heights (barefoot and high- heeled shoes) on head position and acoustical measurements acquired during sung performances by female ($N$ = 30) soloists performing the same song. Results were discussed in terms of advice that might be given to female singers about appropriate shoe heel heights for performances, and the direction of future research in this area.

Amelia Rollings, BM Music Education, BM Vocal Performance, MM Voice Performance and Pedagogy, Ph.D. Vocal Pedagogy candidate, Graduate Teaching Assistant, Vocal/Choral Pedagogy Research Group, The University of Kansas, Murphy Hall, 1530 Naismith Drive, Room 448, Lawrence, KS 66045-3103

**Ref#: VP30**

# The Effect of Vocal Warm Up Exercises (VWUE) on Sung Vibrato as Seen in Acoustic Measures and Instantaneous Frequency (IF) Vibrato Trace Modeling

Vocal Warm Up Exercises (VWUE) are considered essential for healthy singing technique. The use of VWUE may produce perceptually and musically significant changes to the voice that are difficult to detect with common voice measurements. Vibrato is an important vocal quality in many forms of music, but its effect on the vocal signal is not fully understood. Data in previous studies suggest that vibrato and VWUE both boost the intensity of the vocal signal, but the interaction of VWUE and the vibrato signal has not been examined.

This study will investigate changes in the vibrato wave that may reflect an enhanced systemic coordination following the use of VWUE.

Twenty undergraduate voice majors 18 to 24 years of age will be selected and instructed in a standardized VWUE technique at prescribed pitch levels. Sixty-four samples per subject will be gathered over four recording sessions: eight samples per session pre-VWUE, and eight samples post-VWUE.

These 1280 samples will be recorded and digitized for acoustic analysis. Vibrato measures will include extent/rate and the periodicity of the AM/FM vibrato wave as measured with Instantaneous Frequency (IF) Vibrato Trace Modeling. Intensity measures, spectral measures, and duration measures will be examined to determine if significant correlations exist between these measures and the pre- post-VWUE state.

David Meyer, DM, Associate Professor of Voice and Voice Pedagogy, Shenandoah Conservatory, 1460 University Drive, Winchester, VA 22601

Philip Sargent, DMA, Associate Professor of Music, Shenandoah Conservatory, 1460 University Drive, Winchester, VA 22601

Peter Pabon, Teacher, Voice Scientist, Institute of Sonology, Royal Conservatory, Stolberglaan 1, 2595CA The Hague, The Netherlands

**Ref#: VP31**

# The Effects of Single Arm vs. Mirrored Conducting on Vocal Sound

The purpose of this study was to examine the effects of two nonverbal conducting stimuli (single arm gestures vs. mirrored gestures whereby two arms do the same thing but in opposite directions) on the conglomerate vocal sound of an SATB choir performing a homophonic motet. While singing, the choir viewed in random, counterbalanced order three videotaped conductors, each of whom employed single arm and mirrored conducting. Choir recordings were analyzed acoustically (LTAS, timing of vocal onset), perceptually (intonation analysis, expert listener preferences), and behaviorally (grid analysis). Results were discussed in terms of relationships between nonverbal conducting gestures and choir sound, efficient singing, conducting pedagogy, and directions for future research.

James F. Daugherty, Ph.D., Associate Professor, Director of Vocal, Choral Pedagogy Research Group, The University of Kansas, 1201 Jana Drive, Lawrence, KS 66049

**Ref#: VP33**

# The Physiological and Pedagogical Basis for Vocal Cool-Down Exercises

The benefits of cool-down exercises following strenuous exercise have been well established in the sports physiology literature. The use of vocal-warm-up exercises (VWUE) is common in voice pedagogy, but the efficacy of cool-down exercises for the voice has not been demonstrated. As a result, opinions vary in the voice community as to the effectiveness of cooling down after a period of strenuous singing.

This presentation, supported in part by the 2012 Van L. Lawrence Fellowship, will examine the efficacy of cool-down exercises for the voice following a heavy vocal load. The protocol is a single subject crossover design wherein six classically trained female singers will perform a 55 minute vocally fatiguing task daily for two consecutive 5-day periods. At the end of the task, 3 of the singers will be assigned to a control group and will be dismissed for the day. The remaining 3 will perform a predetermined cool-down protocol of semi-occluded vocal exercises such as lip trills, straw phonation, humming, and glides. Tasks will balance thyroarytenoid-dominant and cricothyroid-dominant laryngeal configurations. In the second week the control and treatment groups will be alternated. Acoustic and aerodynamic measurements will be taken at the beginning and end of each of the 5-day periods with video stroboscopic ratings and subjective evaluations. Although limited to a small number of subjects, we hope to determine whether there are benefits of cool-down exercises on the singing voice and thus indicate the value of further research in this area.

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Martin Nevdahl, MS, CCC-SLP Lecturer and Clinical Supervisor, Speech and Hearing Sciences, 1417 NE 42nd St., Seattle, WA 98105

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**Ref#: VP36**

# What Every Researcher Needs To Know About Broadway and Professional Music Theater

The purpose of this paper is to facilitate clear communication between the various voice disciplines so that research done on singing in today's contemporary commercial styles might be more solidly based on market-driven requirements.

Broadway in New York City and the West End in London are unique places in the world of professional singing. Both locations generate the majority of professional music theater productions in the world and over many decades both locations have frequently shared productions.

Music theater requires vocalists to sing in specific styles and vocal qualities in order to get a job in a musical show. This is unique in all of professional singing, as all other CCM vocalists sing as they choose and classical singers must understand a role or a part through other criteria. All casting notices (job listings) for singers in professional Broadway or West End music theater productions typically have statements describing the vocal quality and pitch requirements for each role. Phrases such as "must belt to C", "must mix to D", "must sing 'legit' to A" will be part of the casting notice and performers auditioning for roles are expected to be familiar with and knowledgeable about the definitions and sounds of these terms. There are also descriptions of various styles of music in these notices such as "must be power rocker", "must be big traditional belter", "must be able to sing in an authentic jazz style". Nowhere else in the music industry are there requirements of this kind. Those who are not in professional music theater may not be familiar with these specific parameters that are crucial to those who work on Broadway and in the West End.

Understanding the auditory vocal and musical components is important to those who do research on singers in these styles or to those who would teach them. This paper will present the actual casting descriptions of Broadway shows and recorded examples of the voices of performers who have the roles in various productions. It will present recorded examples from the three basic vocal qualities as found on Broadway including traditional belting, traditional "mix", and "legit" (or classically based sound). Performers will have been chosen by casting directors who have decided that any given performer fits the verbal description of the casting notice.

Jeannette LoVetri, Director, The Voice Workshop, New York, NY, 317 West 93rd Street, New York, NY 10025

**Ref#: SLP53**

# Pediatric Voice Therapy: The 21st Century[1]

As with voice therapy in the adult population, traditional pediatric voice therapy has centered on voice conservation and a series of "do" and "don't" instructions surrounding voice hygiene. Recent advances in knowledge surrounding the biomechanics of voice production, the biology of wound healing, motor learning, and social science, as well a clinical data, call into question the utility of this approach in the 21st century. This presentation will provide a brief overview of traditional practices in pediatric voice therapy, and will describe highlights in research scientific advances that inform emerging pediatric therapy programs. Of particular relevance are novel programs that focus on (a) classroom-based instruction on vocal health (b) conflict resolution ("Talk it Out"); and (c) training safe, loud voice ("Adventures in Voice"). Available data for these programs will also be presented.

Specifically, the classroom-based vocal health program was designed to complement health, psychosocial, and literacy teaching objectives. Arguably, both classroom students and teachers potentially benefit from learning how their voice works and what happens when high intensity voice use occurs as well as offering alternative strategies for taking care of the voice. However, the progression of studies during which this program was developed determined that the "Talk it Out" program that typically preceded the incorporation of the Preschool and Kindergarten Vocal Health instruction appeared important for achieving the reduction in occurrences of yelling in children within the classroom. The "Talk it Out" program was developed by Barbara Kiernan, PhD for use in the Wings on Words Preschool associated with the Department of Speech, Language, Hearing Sciences at the University of Arizona. This preschool is unique in that the majority of children have speech and language disorders requiring a language-intensive preschool program. Dr Kiernan determined that communication impairment is frequently associated with emotional outbursts associated with frustrations occurring during the typical day of a child. The "Talk it Out" program was developed to provide a step-by-step strategy by which children identify they are in conflict with another child, engage in a scripted dialog to talk about it, and select win-win options for its solution. Adults serve to facilitate the resolution of the conflict by
encouraging children to listen and use their words. They do not, however, serve as the problem solver. The implementation of this program in addition to the Vocal Health teaching unit was determined to be of high interest and value to school-based SLPs and teachers in the preschool and kindergarten classrooms in which it was tested. In addition, the other unique contribution of this program is that it simultaneously contributes to classroom learning objectives established by most states within the US.

The "Adventures in Voice" (AIV) program is grounded in the notion that, rather than attempting to train vocally exuberant children – probably the majority of children in voice therapy – to reduce amount and loudness of phonation as in the traditional approach, our job is to discover ways to train them to express their personalities in an unencumbered fashion that is vocally healthy. Biomechanical, biological, and learning data were used to generate the AIV program, which is currently undergoing a randomized clinical trial.

Katherine Verdolini Abbott, Ph.D., CCC-SLP, Professor, Communication Science and Disorders, McGowan Institute for Regenerative Medicine, Otolaryngology, University of Pittsburgh, Center for the Neural Basis of Cognition, Carnegie-Mellon University and University of Pittsburgh

Barbara Kiernan, PhD. Director, Child Language Center, Wings on Words Preschool, University of Arizona, Tucson, AZ

Julie Barkmeier-Kraemer, Ph.D., CCC-SLP, Professor, ASHA Fellow, Department of Otolaryngology, Voice, Speech, & Swallowing Subdivision, University of California – Davis

**Ref#: W1**

# Bel Canto / Can Belto: Teaching Singing from Both Sides of the Fence

Penn State voice faculty colleagues Mary Saunders–Barton and Norman Spivey have spent many years observing and learning from one other. They have built on their interests in musical theatre and classical singing by working together with students, offering a joint special topics course, and now have launched a new MFA in Voice Pedagogy for Musical Theatre – the first academic program of its kind.

In this workshop, Saunders–Barton and Spivey will work with students interested in developing as flexible singing–actors – pursuing optimum vocalism in both musical theatre and classical styles.

Mary Saunders–Barton, Associate Professor of Voice, Penn State School of Music, 233 Music Building, University Park, PA 16802

Norman Spivey, Professor of Voice, Penn State School of Music, 233 Music Building, University Park, PA 16802

**Ref#-W2**

**"Teaching Abroad – Be Back in an Hour" – Mastering Online Delivery of Voice Lessons in a Global Market**

Studio Technology
Topics covered will include:

1. Setting up Your Environment - How to Configure your studio for optimum Online delivery
2. Hardware options - Webcam options, Microphone options, Speakers and/or headphones, Modems & Routers
3. Developing your "on camera" eye - What's in the Shot & What to avoid
4. Video / VoIP Applications - Individual vs. group sessions (ooVoo, Skype, WebEx, GoToMeeting)
5. Software Options (for music & singing voice studios) –
    a. Building your Mp3 library (iTunes, KaraokeVersion.com, YourAccompanist.com, MyRehearsalPianist.com, YouTube.com, Video2Mp3.net, The Amazing Slow-Downer
    b. Online Sheet music sources – building your PDF library (Sheetmusicdirect.com, Musicnotes.com, imslp.org)
6. Payment Processors - (PayPal.com, 2checkout.com, Merchantwarehouse.com, Paysimple.com, Paymentonline.com)
7. Advertising Strategies for a global market - Search Engine Optimization, Google Ad Words (Ad Words Express), Yelp, Facebook, YouTube, Foursquare, OSP/OTP
8. Strategies for delivering an effective online session
9. Troubleshooting - Monitor Resolution, VoIP Settings, Assigning your mic and speakers
10. Links to recommended products.

Universities and Conservatories throughout the world have moved into online formats in almost every curriculum offered. This is due, in part, to the emerging technologies that allow this type of educational delivery, as well as the financial necessity of every institution to widen its reach and attract students in geographically diverse locations.
In contrast, the independent studio industry has not fully and effectively been able to make use of these online delivery methods to expand its geographical reach and attract new students, until now!

David Sabella-Mills will guide participants in this session through steps to ensure that their studio is equipped and optimized for online delivery of lessons, and will demonstrate a live online lesson in real time using various VoIP technologies. Participants will come away with concrete information regarding Studio Configuration, Hardware and Software options, online payment processors, advertising strategies to reach a global market, and effective techniques for optimum online delivery of private voice instruction.

David Sabella-Mills, Sabella-Mills Voice Studios

**Ref#-W3**

# Mend the Glottic Gap: Safe Therapy for Incomplete VF Closure

Symptomatic complaints related to glottic gap (insufficiency) include vocal fatigue, diffuse muscle aches, and inconsistent onsets in the higher range. Clinical findings may include a visible gap, lateral and/or medial compression above the true folds, mild arytenoid sluggishness or slight paresis. The voice may sound breathy, thin, and/or pressed into low pitch speech. Mid-cord swelling or pre-nodules can co-exist, arising from compensatory effort.

The patient commonly presents with base of tongue tension and is at high risk for overuse of extrinsic muscles in the jaw, neck, shoulders, and abdomen. Frustration and self-blame arise when vocal coaches' repeated instructions to relax, or to engage more vigorous breath, make the voice sound or feel worse instead of better.

Come learn a direct, reliable approach to solve the mechanical problem of glottic gap. A preparatory regimen helps to dilate the supraglottic region and enhance proprioception for the strengthening program. Precise, non-phonatory closure exercises, then minimize the gap while avoiding vibrational wear-and-tear injury. These silent strengtheners, based on a familiar airway reflex, are also recommended as preventative therapy for aging singers concerned about thinning cords and/or increasing "wobble."

Joanna Cazden, MFA, MS-CCC, Cedars-Sinai Medical Center, Los Angeles,

**Ref#:W5**

## Vocal Fold Paralysis: A Structured Voice and Swallowing Approach

The goal of the present workshop is to discuss with the participants a structured voice and swallowing approach for patients with vocal fold paralysis. The vagus nerve paralysis is the most common neurological disorder. Depending on the level that the lesion occurs, it can involve one single branch or multiple branches of the nerve; therefore it may affect voice, respiration, deglutition and airway protection. We are going to present an overview of 7 different paralyses, but targeting only the ones in which voice and swallowing intervention are applicable and effective. A chart with the level of the lesion, effect on vocal folds, phonation, soft palate, resonance, associate signs and unilateral and bilateral approach will be presented and discussed. Voice and swallowing treatment options will be provided separately and overlapping aspects will be outlined. The rationale for voice rehabilitation will be based on the following objectives: 1. reduction of translaryngeal airflow; 2.increase of vocal fold flexibility; and 3.increase of glottic resistance. The rationale for swallowing rehabilitation will be based on the following objectives: 1. improve airway protection and eliminate laryngeal penetration and aspiration risk; 2. introduce compensatory swallowing maneuvers and 3. improve overall pharyngeal and laryngeal function for swallowing. Several voice and swallowing techniques and exercises will be demonstrated and practiced with the participants.

Gisele Oliveira, PhD, Professor, CEV, University of Wisconsin, Rua Machado Bittencourt 361, Sao Paulo, Brazil

Gaetano Fava, MS, CCC-SLP, Speech-Language Pathologist, Columbia University Medical Center, Phelps Memorial Hospital Center, 622 W 168th St, VC10, room 1001, New York, NY

**Ref#: W8**

# "Mommy! Why is my air gray?": SLP Methods and Materials for Evaluating and Treating Pediatric PVFM

Pediatric patients with VCD/PVFM challenge the SLP to use age-appropriate methods and materials for evaluation and treatment. In this workshop Dr. Wicklund will present an overview of paradoxical vocal motion causes, diagnosis and treatment methods. Pediatric breathing and voice evaluation methods will be discussed. Recovery and diaphragmatic breathing methods, as well as stress management and relaxation techniques for children will be trained. Collaborative case studies from Dr. Wicklund's and Dr. Newhall's practices (Chicago Center for Professional Voice and Chicago Children's Hospital) will be presented.

Karen Wicklund, DM, MHS CCC-SLP, SVS, Director, Chicago Center for Professional Voice,
410 S. Michigan Ave., Suite 941, Chicago, IL 60605

**Ref#: W10**

**Discover a More Vibrant Voice: How to Use Externally Applied Vibration as a Tool in Vocal Development**

In this workshop we will explore the simple concept of using vibration to stimulate vibration.
The technique involves the use of a small hand-held vibrator that, when applied to points on the neck and jaw, helps to reduce tension that may lead to or result from vocal stress; it may also be extremely useful for those who suffer from TMJ issues. The vibrator can be used directly on the larynx to augment laryngeal massage and, if used while humming, may help stimulate more dynamic vocal fold vibrations. Humming while placing the vibrator on specific points on the skull helps to clarify placement, increase overtones, and develop resonance.
This technique has been used in workshops and classes across Canada, including Voice classes at The Stratford Festival, and the response has been overwhelmingly positive. People who have never been able to figure out forward placement or mask resonance have been able to find it through this technique. Actors, who often face abusive vocal demands that lead to fatigue, find the technique easy to apply and extremely helpful in maintaining their vocal health and freedom.
In the workshop, I will have several vibrators on hand so everyone will be able to both hear and experience the difference a little external vibration can make.

David Ley, MFA, Professor, University of Alberta, Department of Drama 3-122 Fine Arts Building, 116 St. and 85th Ave., Edmonton, Alberta T6G 2R3 Canada

**Ref#: W11**

## 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., Professor, Speech Pathology, Bloomsburg University, Centennial Hall, 400 East Second St., Bloomsburg, PA 17815-1301

**Ref#: W14**

# Technology in the 21st Century Voice Studio

Since the publication of Nair's book, *Voice-Tradition and Technology* (Singular Publishing, 1999) and the advent of affordable, computer-based real-time spectrographic software, the biofeedback resources for voice teachers and students has been greatly enhanced. Garyth and Angelika Nair will present a hands-on workshop that will include two kinds of acoustic analysis, the **spectrograph** (for diction and tonal matters) and the **power spectrum** (for vowel identity problems). We will use singers from the audience to show the multitudinous kinds if vocal problems that can be observed on the monitor and then move on to show how the visual feedback of the monitor can be used to accelerate the singers learning. In addition, the Nairs' are now pioneering the use of **ultrasound** in the voice studio as a way for students to study their own tongue behavior during phonation. This new use of technology greatly aids students in learning proper tongue positioning. Other subjects that will be touched on in this workshop include:

· **IPA flashcard system** -- a computer-driven IPA flashcard system to help students quickly and efficiently learn IPA
· **warm-up system** for voice lessons and student practice that provides a structured system of learning vowel/consonant joins, reinforces the learning of IPA, and simultaneously produces safe and effective warm-ups
· **keyboard remapping program** for IPA – inexpensive software that allows one to type IPA with great ease and speed.

Join us to explore just some of the possibilities for the 21st century voice studio!

Garyth Nair, MA, Professor of Music, Affiliate Artist Voice Teacher, Drew University, 36 Madison Avenue, Madison, New Jersey

Angelika Nair, PhD**,** Adjunct Professor of Music, Affiliate Artist Voice Teacher**,** Drew University
36 Madison Avenue, Madison, New Jersey

**Ref#: W15**

## Musical Theater Rocks! Coaching Advanced Refactory Skills

This workshop provides pedagogical tools for training singers whose genre of origin is not rock to present as credible rock performers. Adjusting genre-of-origin filters and acquiring a vocabulary of rock skills will allow the student to appreciate nuanced choices of others' performances and apply these skills to stylize their own performances. Basic rock skills (e.g. employing a more natural vocal production and deemphasizing classical virtuosity in matters of pitch, vibrato, structure, and rhythm) are easily acknowledged by the unfiltered ear, easily trained into a technical repertoire, and easily incorporated into rock performances. While a performance grounded by these techniques will yield a general impression of "rockiness," developing more advanced techniques greatly increases both the performer's artistic and vocal capacities for delivering rock songs and the audience's perception of the performer as authentic. Three advanced skillsets will be taught in this workshop: organic delivery, theatrical pitch nuances, and "with it" ornaments. Organic delivery includes the skills of placing an unstressed syllable on the beat, obfuscating the beat with the pick-up trick, and tailoring novel chew rates to suit the song. Theatrical nuances include changing pitch with fall-ups ("You love me 'cause I'm fragile") and exploring the four kinds of thirds. "With it" ornamentation trains performers to de-emphasize the accessory notes in an ornament so that they sound more "with it." With more advanced skill sets, students will present as credible performers of the rock genre. Musical Theater Rocks! demonstrates how to teach complex rock skills that are ordinarily resistant to training

Neal Tracy, D.M., Adjunct Associate Professor, The University of the Arts, 320 South Broad St., Philadelphia, PA

**Ref#: W16**

## The Golden Voice: Singing Voice Rehabilitation Therapy for Age-Related Voice Problems

Age-related singing voice changes are well-documented (Sataloff and Linville, 2006, etc.). Physiologic changes that contribute to problems with aging voice include vocal fold atrophy, thickening of SLP/loss of elastic fibers, stiffening of laryngeal cartilages, decreased lung volume, decreased muscle elasticity in the vocal tract, oral dryness/thick mucus, hormonal changes, spinal column/bone changes and hearing loss. These factors may contribute to voice changes such as loss of agility, decreased vocal stamina, voice breaks, register difficulties, breath support changes, loss of range, and unsteady vibrato, among others.

Many singers feel they have to give up singing as their voices become more unreliable. This can have an impact on income, self-image and self-esteem. For avocational singers, singing can be a significant element of their quality of life, and giving up singing represents a devastating loss of musical enjoyment, social interaction, physical and mental activity. However, with appropriate neuromuscular retraining, joy in singing can continue for many years. The technique that worked when the singer was younger may need revising for the Golden Years of singing. Often this requires voice rehabilitation to retrain register stabilization, dynamic and vibrato control, pitch range, and vocal stamina.

In this workshop, the instructor will explore and demonstrate intervention strategies to ensure that the voice is receiving adequate and appropriate exercise to effectively compensate for age-related voice changes. These principles will be explored primarily via hands-on demonstration with singers, but also through case examples and audience interaction.

Leda Scearce, MM, MS, CCC-SLP, Singing Voice Specialist and Director of Performing Voice Programs and Development, Duke Otolaryngology of Raleigh, Duke Medicine, Duke Voice Care Center, 3480 Wake Forest Road, Suite 404, Raleigh, NC 27609

**Ref#: W17**

# Integrated Balance, Alignment and Self Care for the Singer

This workshop will review the principles of skeletal alignment and balance control and their interrelationships to the intrinsic vocal apparatus. We will explore how variations in balance control and alignment can lead to holding patterns that can eventually lead to vocal dyphonia in the singer. Specific etiological mechanisms that are common in this population will be reviewed in relationship to minor as well as major muscle dysphonia that can lead to degradation of the singing voice.

Basic alignment and balance techniques in the Dynatonic™ Muscle Balance program for the voice will be discussed in relation to muscle dysphonia. Specific self care exercises that can be easily taught to students will be demonstrated. Common dysfunctional patterns and imbalances will be discussed and retraining paradigms reviewed including hands on, verbal and visual techniques.

Sean P. Gallagher BFA, PT, CFP, CPT, EMT , Owner/Director Performing Arts Physical Therapy, 311 West 43rd Street. Suite 405 New York, NY 10036

**Ref#: W20**

**‘Fitzmaurice Voicework®**

Demonstration and practical experience of

1. Destructuring: Offering relief from chronic holds and habits that interfere with vocal resonance and volume.

2. Restructuring: Revitalizing healthy functioning.

Catherine Fitzmaurice, M.A., Founder & Director, Fitzmaurice Voicework®, New York / Los Angeles

**Ref#: W22**

**Rehabilitation of the Injured Singing Voice**
**Working with Indian Classical and Bollywood Singers**

Singing Voice specialists work with many genre types. To the western trained singer, the form/genres of Indian Classical Singing and Bollywood are not well understood. In order for the SVS to be equipped to work with these genres, it is necessary to understand the basics of the musical form and practice of these genres since it is the 'language' needed to converse in. While anatomy is anatomy is anatomy, the practice of the musical form and sounds of a genre and language not typical to the western ear may be confusing. The more the SVS understands of the musical genre/form, language, style and performance practice of the Indian Classical Singer and the Bollywood singer, the better the SVS can communicate with the singer of these genres. The goal, of course, is to bring the 'systems balance' back into alignment so that the singer is able to access the instrument for his/her desired use with longevity. This workshop will give practical exercises and approaches for working with these genres. Both Indian Classical Singers and Bollywood singers will be discussed here.

Sharon L. Radionoff, Ph.D., Singing Voice Specialist/Director, Sound Singing Institute, 2303 Sul Ross, Houston, TX 77098

**Ref#: W23**

# Interrelationship Between Manual Assessment of Vocal Tract and Voice Placement in Pop Singers

Introduction:
Backward voice focus is one of the most common technical errors among popular singers. Voice focus is directly related to some singing capabilities such as vibrato and performing of high pitch tones. Some singing teachers use special exercises to enhance vocal abilities, but, some biomechanical restrictions of phonatory mechanism in extralaryngeal joints and muscles may restrain them to work properly.
Manual and palpatory skills are one of the effective methods to assess vocal tract comfort/discomfort and to predict subsequent voice quality.
Author would like to share his experiences in this field with other colleagues.
The workshop will consist of clinical experiences of the author to show procedure of finding of focal points of tension and tenderness of phonatory mechanism.

Proposed workshop program:
It is proposed to conduct a live session to work on procedure of finding some culprit points of tension and tenderness, such as anterior bellies of digastric muscles, cricothyroid visor and hyoid plane orientation of one or more patients to show their vocal consequences. According to author's experiences, some vocal attributes of voice are changed due to the correct palpation of trigger points. The changes usually lead to sense of comfort during singing and change of voice placement toward forward focus.
*Prevoius ducuments of such manipulations by the author are available to send for more analysis.

Abolfazl Salehi, PhD SLP, Clinician, USWR, University of social welfare and rehabilitation, Evin, Tehran, Iran

**Ref#: W25**

# Bringing the Song to Life

One of the challenges voice teachers face is helping the student bring a song to life vocally. 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.

The singer should be able to switch back and forth between registers and make different interior shapes to allow changes in the resonance to serve the song style as well as the character.
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 bring the song to life.

Edrie Means Weekly, M.M., Associate Professor of Voice, Contemporary Commercial Music Vocal Pedagogy Institute, Co-Founder, Shenandoah University and Conservatory of Music, 1460 University Ave., Winchester, VA 22601

**Ref#: W26**

## The Dante Pavone Breathing Exercises

Developed by the internationally renowned singing instructor Dante Pavone, the Pavone Breathing Exercises are based on the Italian appoggio technique and are designed to establish abdominal and lower back breathing, an advanced level of expiratory breath control and an optimal raised rib posture for singing. The protocol consists of three breathing exercises which are practiced in a particular sequence over a specific period of time. The exercise protocol, when performed as directed, provides for easy generalization of posture and breath control techniques to stage and studio and is appropriate for all styles of singing. Dante was especially known and appreciated for his instruction in commercial singing techniques.
The workshop will include 1) a discussion of the anatomical and physiological rationales for the Pavone Breathing Exercises, 2) demonstration of and instruction in the exercises with workshop attendees, 3) discussion of applications and modifications for the singing studio and voice clinic, and 4) most important , group participation !!!!

Handouts will be provided.

Karen Kochis-Jennings, Ph.D., CCC-SLP, Assistant Professor, California State University, Department of Communication Disorders and Sciences Monterey Hall #321, 18111 Nordhoff Street, Northridge, CA 91330

**Ref#: W27**

## Soul Ingredients™: Pedagogy of Soul

This workshop will introduce some of the basic components that comprise a soulful expression in the performance of folk-based African American music genres (i.e. Blues, Jazz, Gospel, and Rhythm & Blues). Each component will be discussed in its most abstract/generic sense, and then will be discussed in terms of how to approach the development and execution of these various components in the vocal studio. Five areas of musical expression will be discussed:

- Melodic Improvisation
- Rhythmic Improvisation and Tempo
- Textual Improvisation
- Vocal Qualities and Nuances
- Dynamics and Emotional Intensity

Typically, the manner in which these aspects are executed in song are dependent upon the vocabulary established by the musical culture of the specific genre, combined with the manner of expression chosen by the singer. For example, a jazz singer may express sadness by slurring the words to the song with a breathy, vibrato-less tone. A blues singer might slur words and sorrowfully moan in between the phrases.

Soul Ingredients™ is a pedagogic methodology that teaches emotional communication through song. This methodology uses the lyrics of a song as an initial platform for gaining the student's own emotional perspective when performing. Then, using the specific improvisatory structure determined by the genre of choice, the student is guided in learning to musically articulate, develop and integrate the five areas of musical expression into their own personal interpretation.

Trineice Robinson-Martin, Ed.D.C.T., Ed.M, M.M., Soul Ingredients™, Senior Lecturer, University of the Arts, 320 S. Broad St. Philadelphia, PA 19102, Rider University, Lawrenceville, NJ

**Ref#: W28**

# "Caro mio ben" Won't Fly on Broadway – Crossover Pedagogical Strategies for Music Theatre and Classical Voice

There is a general consensus that one technique does not fit all voice students. This is especially true for music theatre singers. According to the American Academy of Teachers of Singing statement *Contemporary Commercial Music (nonclassical) Voice Pedagogy*, there are sufficient stylistic, acoustic, and physiologic differences between classical and CCM singing to justify a specific CCM pedagogical approach. Simply said, a classical, resonance-based approach is not appropriate for singers pursuing careers in CCM performance. Luckily, there are specialized training programs and workshops such as Somatic Voicework™ – the Lovetri Method, Lisa Popeil's Voicework®, the Masters of Music in CCM Voice Pedagogy at Shenandoah Conservatory, and the Master of Fine Arts in Voice Pedagogy for Musical Theatre at Penn State University. This workshop will work with singers to demonstrate the technical commonalities and areas of divergence in CCM and Classical voice pedagogies. Various CCM voice exercises and resources will be explored.

David Meyer, DM, Associate Professor, Shenandoah Conservatory, Associate Professor of Voice, Shenandoah Conservatory, Director of Voice Pedagogy Research, Janette Ogg Voice Research Center, Voice Foundation Advisory Board, NATS Voice Science Advisory Committee, 1460 University Ave, Winchester, VA 22601

Kathryn Green, DMA, Professor of Music, Shenandoah University, 1460 Universtiy Drive/Winchester/VA/22602, Director of CCM Vocal Pedagogy Institute, Director of Vocal Pedagogy Graduate Program

**Ref#: W29**

# Vocal Production and Proprioceptive Movement

**Workshop Objective**

The objective of the workshop is to instill an awareness of the function of vocal production with the use of proprioceptive movement to unlock psycho-physiological blocks.

**Background**

The awareness of vocal production is triggered through movement by "sensory information from certain proprioceptors (receptors in joints, tendons, muscles), particularly those in muscles and tendons used by the motor system as feedback to guide postural adjustments and control of well-practiced or semiautomatic movements such as those involved in walking." The development of one proprioceptive movement exercise for voice training involves a student executing randomly free movements (involving the legs, arms, head, torso), as he/she communicates specific words (taken from assigned contemporary and classical texts) that provoke images related to a student's proprioceptive movement patterns from childhood, adolescence, and/or young adulthood, which may have caused a student to repress certain emotional responses due to psycho-physiological blocks. Once a student is engaged in the exercise, his/her eyes are closed (but not limited to this action) as the exploration of movement and text occurs to prevent preplanned and self-conscious movements. The key to unlocking repressed emotions stems from the repetition of certain sounds in specific words through movement and rhythmic breath pulses associated with acoustic patterns, phonemic cues, consonants, and vowels. In addition, students also develop the ability to perceive the communication of language by repeating what they have comprehended with a particular word image.

**Workshop**

The workshop will allow participants to engage in effective vocal production and communication of language through the exploration of simple proprioceptive exercises to unlock psycho-physiological blocks. Participants will also gain an awareness of physical tensions and inhibitors that directly relate to a performer's pattern of chronic muscular tensions, which result in the loss of breath support, breath replacement, and clear articulation during the communication of language.

**Methods of Exploration**

Proprioceptive Exercises with the use of consonant and vowel exploration and imagery analysis
Implementation of all the above in "text and response" in an actor-audience relationship
Workshop Requirements
Space for twenty-five to thirty participants

Tamiko Washington, MFA in Acting, Associate Professor of Theatre, Chapman University, One University Drive, Orange, CA 92866

**Ref#: W30**

**Scoring an Accent: Teaching an Accent by Transposing its Intonation Pattern on to a Musical Score to Use as a Primary Learning Tool**

"Scoring an Accent" is an innovative technique that aims to demonstrate the possibility of learning an accent by using a musical score. This score has been created based on the innate speech and intonation patterns of an accent with both phonetic and orthographic translations underneath. During the workshop, this score will be tested on three participants with the hope to improve their rhythm, intonation and fluency of the accent.

The workshop will spend fifteen minutes on each participant which will be divided as follows:

1. There will be a brief vocalise, using the specific vowels used in the accent.
2. The participant will hear a measure played on the piano
3. They will then then sing that measure along with the piano with the score to guide them
4. They will then speak the same measure as the piano continues to play to get the transition from singing to speaking.
5. When they are comfortable with that measure, they will begin the next one and build the score up in this fashion.
6. When they are comfortable they will speak the text without the assistance of the piano.

Each volunteer will have five measures to attempt and afterwards a recording of the accent will be played to demonstrate how effective the process has been.

This process is a development of the MA research conducted by Wallace which was loosely based around ideas raised by Joshua Steele. All are welcome as the technique has shown promise with both musically and non-musically trained actors.

William Wallace, MA , Professional Voice Practice, BA Drama and Ethnomusicology, Voice, Text and Dialect Coach, New House Farm

**Ref#: W31**

# Lip Flutters or Voiced Continuants: Which Should You Use?

Tonal placement exercises, semi-occluded vocal tract exercises, respiratory support exercises, and subsystem coordination exercises are all familiar to voice clinicians and voice teachers. The question as to when to use lip flutters (vibration therapy) and when to use voiced continuants /m,n,v,z/ depends on the observed muscle compensations, balance of tonal placement, and voice complaint. This workshop addresses the strengths and weaknesses of these familiar exercises, and provides additional options to optimize vocal tract function and reduce laryngeal hyperfunction (or hypofunction) during use of these treatment exercises in both the adult and pediatric population.

Linda M Carroll, Phd, Private Practice**,** 424 West 49 Street, Suite 1, New York, NY 10019

**Ref#: W32**

# Tools of the Trade: Creating Kinesthetic Awareness in Singers

This session will demonstrate teaching functional singing by utilizing tools to provide experiential knowledge. Kinesthetic learning, one in which the student learns through physical activity, is very useful in teaching singers to explore and understand the sensations we ask of them. These kinesthetic learning aids will help illicit a positive response in the singers technique effectively and quickly. It will help bridge the gap between using imagery or traditional techniques alone. They can be a valuable adjunct. Additionally, the singer has a concrete way to successfully practice on their own without the benefit of their teacher's ears. The workshop will demonstrate in a master class format these tools as appropriate with each singer.

Kari Ragan, DMA, Voice Teacher, University of Washington, Seattle, WA 98195

**Ref#: W34**

## Pilates-Alexander Voice Workshop

This workshop is designed to lead participants into a healthier, more resonant relationship to the Voice through spinal alignment, imagery and core exercises. The basis for the spine and core work is a combination of Alexander technique and Pilates, and the vocalizations used with the exercises are Linklater based. It is an ideal physical/vocal warm up for an ensemble of actors and has been utilized by Magis Theatre Company in their training and workshops since 2005.

The overriding goal is to rid the body and therefore the voice of excess tension and to begin to balance along the spine itself, utilizing the body's inherent energy rather than muscling through movement or speech. Exercises will be demonstrated and practiced with the audience.

Sample Exercises:

1. Breath of Integration.

Goal: To find ease in the body, ground the feet and put the actor in a state of readiness.

2. The Art of Balancing: a. bones, b. feathers, c. the domes of the body.

Goal: To bring the body into play; move further away from **freeze** and into a willingness to communicate and express.

3. Toe taps on Stability Ball

Goal: To find ideal relationship of hips and lower back, connecting core muscles to the voice and breath.

Margi Sharp Douglas, MFA, Alexander/Pilates/ teacher, Magis Theatre Co., 306 11th St. Brooklyn, NY 11215

**Ref#: W35**

## Practical Work with the Synthetic Electronic Test Synthetic Quartet

We have developed a synthetic four-part quartet system written in pure data (PD), which is commonly used by those working in the area of music technology for synthesis development. This system enables basic aspects of voice control by an individual singer in a quartet to be controlled in real-time by means of gestural controllers including x-box controllers, floor pads, squeezy bulbs, switches, potentiometers and strain gauges. Real-time variable parameters include coarse (notes) or fine (intonation) control of fundamental frequency, vibrato rate and depth, volume and vowel (either by symbol or via direct formant frequency and bandwidth control). This system has been used in public sessions to illustrate the main elements of the acoustic output from a singer and how these relate perceptually to the overall sound of a vocal quartet. Delegates will have the opportunity to 'play' the synthesizer by controlling one or more individual parts, and for each part control can be shared between one or more delegates. The purpose is to demonstrate the importance of being able to make fine degrees of change in the context of the overall sound of a four-part quartet.

David M Howard, PhD, BSc (Eng), Personal Chair in Music Technology, Association of Affiliation : University of York, Department of Electronics,, University of York, Heslington, York, YO10 5DD, UK

**Ref#: W37**

**A Collaborative Approach to Releasing Tongue and Jaw Tension: Head to Foot**

Voice Teacher Martha Randall, Physical Therapist Jodi Barth, and PTA Gincy Stezar collaborate to address muscular imbalances that cause tongue and jaw tension. This is a continuation of the 2012 workshop and will include the role the feet play in these tensions. Exercises include tongue stretches in addition to the ones commonly employed, and the use of the Nuk brush to release tension in the internal pterygoid and increase jaw mobility. Workshop participants will have the opportunity to do the exercises and Nuk brushes will be supplied. One or two singers will be given individual attention for the benefit of the class, including assessment of the whole body. Handouts will describe the exercises used, and when the voice teacher should refer to a licensed physical therapist. This is a true synthesis of two different disciplines to add to pedagogical tools.

Martha Randall, BM, MM, Adjunct Graduate Faculty, University of Maryland, sNATS, President 2006-08, Member, American Academy of Teachers of Singing

Jodi Barth, BS, MS, Regional Manager, NRH Regional Rehab, 6001 Montrose Rd., Ste. 101, Rockville MD 20852

Gincy Stezar, BS, AAS , Clinic Coordinator, NRH Regional Rehab, 6001 Montrose Rd., Ste. 101, Rockville, MD 20852

**Ref#: W38**

## YogaVoice

YogaVoice is the application of the Eight-fold path of Classical Yoga for lives and work of classical singers. This workshop will be facilitated by Mark Moliterno, Adjunct Associate Professor of Voice at Westminster Choir College and Founder of YogaVoice. Mark will work with singers in a masterclass setting, using yoga postures and breathing techniques to remove blockages that inhibit free, authentic singing. YogaVoice workshops have been successfully conducted at Westminster Choir College, Lehigh Valley NATS, and at various locations around the country. Response to the workshop has been consistently positive.

Mark Moliterno, MM, Voice Faculty, Westminster Choir College of Rider University, Princeton, NJ,, Instructor, YogaLife Institute , Devon, PA

**Ref#: W40**

# Performance Skills Targeted in the Smith Accent Technique

Teaching voice clinicians how to provide and assess voice therapy is not a simple task. Several basic steps are essential such as a solid understanding of the anatomy and physiology of phonation, an appreciation of the holistic nature of voice production, a well trained auditory perceptual system that detects minute changes in the vocal output, and an ability to demonstrate how manipulation of one's vocal subsystems affects one's vocal output. Once these basic skills are established the new clinician needs to be very clear about which performance skills are they targeting in voice therapy and how are they going to evaluate the acquisition of these newly learned skills. The "Smith Accent technique" of voice therapy is one of the holistic voice therapy techniques that promotes optimum use of all vocal subsystems to produce the most efficient vocal output. At the heart of its training program is a significant focus on optimizing breath support during phonation. Up till now there has been no consensus regarding the definition of breath support or how to measure it in a valid and reliable way. Most voice clinicians successfully using this technique, evaluate breath support in an overall collective fashion (poor, fair, good, etc), which makes it very challenging for new clinicians to consider such a technique for voice therapy. In this session the instructor will help define and demonstrate performance skills that are targeted in this well founded voice therapy technique as well as suggest a simple way to evaluate skill acquisition.

Aliaa Khidr, MD, PhD, Professor of Phoniatrics,, University of Virginia, USA and Ain Shams Medical School, Egypts

**Ref#: W41**

# The Consonant Orchestra

Arthur Lessac created an orchestra made solely of consonants that correlate to the instruments played today in the symphony. This will be an on-hands experiment using the Lessac consonants. It is believed that through the instruction of the consonant orchestra students/performers will understand the purpose and the sound of the instrument (the voice) to a higher degree. At the end of this session we will perform a consonant scat using all of the instruments through the sole use of our articulators.

Troy Clifford Dargin, PhD Student, University of Kansas, Speech-Language-Hearing: Sciences and Disorders, 1000 Sunnyside Ave., 3023 Dole Human Development Center, Lawrence, KS 66045-7555

**Ref#: W42**

## Primitive Voice or Stemwerk (Dutch)

Stemwerk 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

**Ref#: W45**

**Release of Jaw Tension Through Efficient Consonant Articulation**

During the workshop, the singers will learn to use aspects of various physical and mental approaches, including Alexander and Feldenkrais Techniques, peak performance principles, and brainwave states, to release interfering physical tensions and detrimental mental habits in a conscious, consistently repeatable way. By understanding and practicing these specific techniques, the singer can achieve an easy, relaxed focus that allows the voice to flow freely because of the increased physical awareness and mental calmness that is developed through the exercises. This simple, accessible training of the mind and body brings about the ability to control anxiety, negative self talk, and micro-managing of the voice, and to shift into a state of confidence and self-trust that results in an optimal vocal performance state.

Irene Gubrud, Soprano, Voice and Peak Performance Teacher, Adjunct faculty
Brooklyn College Conservatory

**Ref#: W46**

# The Light Focus: A New Placement for Transgender Voice

Resonance placement is found by this author to be one of the key features in effective re-creation for voice production. This workshop will begin by explaining the theory of "Light Focus", and will briefly reference supporting research. Next, using audience interaction, various resonance placement vocalizations will be practiced with the goals being to secure understanding of the features of resonance vocalization and the perceptual cognizance associated with receiver impressions. Following this, the strategies for attaining the production for light focus will be practiced using audience participation and materials designed by the author to promote effective achievement of the strategy. Finally, questions and individual experience will be invited in open format.

In addition, patient tapes demonstrating effective training will be available as appropriate.

Mary Elizabeth (Tish) Moody, MA, CCC-SLP, Speech-Language Pathologist**,** Private Practice, GWU, MC**,** 308 Inspiration Lane**,** Gaithersburg, MD. 20878**,** Washington, D.C., Rockville, Maryland

**Ref#: W48**

**Use of Singing Voice Exercises for Development of Speaking Voice for Transgender Women and Men**

Dr. Anita Kozan will present singing voice exercises that have been successful in her work with speaking voice development in women and men who are transgendered. She will focus on exercises drawn from Somatic Voicework (SM): The LoVetri Method, exercise physiology principles including interval training, and her extensive experience with healing the injured voice in singers and actors.

Anita L. Kozan, BS, SLP, MA, PHD, Director, Kozan Clinic for Voice, Speech and Spirit, LLC**,** Minneapolis, Minnesota**,** Speech and Language Pathologist**,** St. Paul Public Schools**,** St. Paul, Minnesota**,** Private Practice: Kozan Clinic for Voice,**,** Speech and Spirit, LLC**,** 2912 - 39th Avenue South**,** Minneapolis, MN 55406

**Ref#: BS6**

# Objective Voice Analysis and Gender Variation


Background

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

Materials and Methods

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

Results

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

Conclusions

All in all there are many reasons for differences between acoustic parameters of males and females. We would think that some of these differences definitely are based on physical sex and general differences in the vocal organs of men and women. But we also think that there are additional aspects based on social gender.

Therefore, In light of the differences that emerged for acoustic measurements between males and females, a person's gender should be taken into account when applying spectral analyses to research or clinical situations.



Ali Dehqan, PhD student of speech therapy, Lecturer, Zahedan University of Medical Sciences, Zahedan, Iran

Maria Mirzadeh , Computer Software engineering , Lecturer, Zahedan University of Medical Sciences, Zahedan, Iran.

**Ref#: BS17**

# Dependency of F0 and Sequence Length on Perturbation Measures of the Acoustic and EEG-Signal

**Introduction:** Within the diagnostic of voice disorders an objective analysis of measured parameters from acoustical, EGG, or visual signals is desired. Not every clinical measurement can count as objective analysis tool due to missing standardization and unknown stability of the clinical parameters. Aim of this study is to investigate the robustness of measured clinical parameters of the acoustic- and EEG- signal to ensure a reliable objective analysis. Particularly, the influence of $F_0$ and of the sequence length on the perturbation measures will be analyzed.
**Methods:** 74 young healthy women produced a sustained vowel /a/ and an upward triad with abrupt changeovers. Different sequence lengths (100 ms, 150 ms, 500 ms, 1000 ms) of the sustained phonation and the triads (100 ms, 150 ms) were extracted from the acoustic and EEG-signal. In total, 11 parameters including Harmonic Index (HI) and several variations of jitter and shimmer were analyzed. Statistical analysis was applied to identify stable parameters for different phonation conditions and sequence lengths.
**Results:** Jitter, Jitter $_{11p}$ and Jitter $_{PPQ}$ of the audio signal as well as $Jitter_{mean,}$ Shimmer, $Shimmer_{11p}$ and $Shimmer_{APQ}$ of the EGG-signal are unaffected by sequence length and $F_0$.
**Discussion:** Influence of pitch and sequence length on perturbation measures of the acoustic and EGG-signal were identified. For an objective clinical diagnosis unaffected variations of jitter and shimmer should be preferred and applied to enable comparability of different recordings, examinations, and studies.

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**Ref#: BS21**

# VAT of Sustained Vowels with Different Pitch Levels in Mandarin

This paper is concerned with the VAT (vocal attack time) of sustained vowels and a nasal at 5 pitch levels in Mandarin which has 4 basic tones, and 20 diatones. The concept and technique of VAT was proposed and developed by Orlikoff et al. (2009). With this method, the VAT in some tonal languages, such as Cantonese, had been studied (Ma et al. 2011). In the present study, the speech and EGG (electroglottograph) signals of the sustained vowels /a, i, u/ and nasal /m/ were recorded simultaneously with a sampling rate of 44.1KHz in 16 bits from 100 Mandarin speakers, 50 males and 50 females. From each speaker, 40 samples were obtained, because the 4 speech sounds with 5 pitch levels were captured twice. The parameters of VAT, F0 (fundamental frequency) and FOM (figure of merit) were extracted by using the VAT program. After statistical analyses, we have found that the VAT of male speakers has a negative correlation with their F0, and for female speakers, the VAT contour first decreases gradually, and then rises. The conclusion is that VAT has a relationship with different pitch levels in sustained vowels and labial nasal /m/ in Mandarin, and can be used as a basic vocal parameter to explain Chinese tones.

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Zhang Ruifeng, MA, Lecturer, Peking University, Department of Chinese Language and Literature, Peking University, Beijing (100871), P.R. China

**Ref#: BS24**

# Formant Bandwidth Variation as Manifest in the Voice Range Profile

In loud voice, harmonic-formant tuning can provide an increase in sound intensity, but is this harmonic emphasis mechanism also active at moderate levels or in soft phonation? Instead of testing bandwidths per formant, a harmonic prominence measure was defined that estimates the effective Q-factor that is seen when a harmonic passes through a resonance

This harmonic prominence was tested for harmonics number 2, 3 and 4. The material used were average Voice Range Profiles (VRPs) of groups of trained singers and untrained, male (50/20) and female (46/46) voices. The sustained vowel /a/ was used throughout.

As expected, highest prominence (Q-factor values 12..19) was generally found, centered on the second harmonic interacting at high SPL (110 dB) with the first formant at around 750 Hz. At lower SPL, the corresponding Q-factor rapidly decreased to stabilize at values around 4, indicating greater damping of the first formant resonance. Surprisingly, when the SPL decreases, the frequency connected to the harmonic prominence gradually increases. Below 65dB SPL (approaching the threshold of phonation) Q-values rise again (above 8), connected to harmonics peaking around 1200 Hz, the frequency area connected to the second formant.

This paper will also discuss the generality of the observed effects, examine links to other voice parameters, and reflect on the possible mechanisms that could explain the observed patterns.

Peter Pabon, Teacher, Voice Scientist, Institute of Sonology, Royal Conservatory, Stolberglaan 1, 2595CA The Hague, The Netherlands, (+31) 703151478. Affiliation(2): Student at Dept of Speech, Music and Hearing, TMH, CSC, KTH. Stockholm, Sweden

**Ref#: BS25**

## Acoustic Features and Skin Vibration of Mandarin Broadcasters

Introduction: Broadcasters generally have voice quality perceived as appealing or better than average speakers(e.g. Bele, 2007). It is contended that these broadcasters may have a better control of voice production as a result of self-awareness or training (Schneider & Sataloff, 2007).Although it is not clear what exactly a better control of voice production means, it is hypothesized that it involves an easy phonation with a good resonance. This study investigated whether professional broadcasters showed a higher degree of resonatory vibration in the head and neck areas when compared with novice.

Method: Thirty two broadcasters (17 males and 15 females, aged from 20 to 24 years) with a 3-4 year history of professional broadcasting training, were recruited to participate in the study. Their voice (including vowels, rhymes, a poem, and a passage) was first recorded and assessed together with the vibration signals from three accelerometer sensors placed on the thyroid, chin, and nasal bridge. Thirty seven participants (16 males and 21 females, aged from 20 to 26 years) with no experience in broadcasting (novice group) were recruited as control subjects to perform the same recording task.

Results/Discussion: The broadcasters could speak in more than one mode (natural, broadcasting, or resounding mode), and the equivalent continuous sound pressure level (Leq) of the recordings of broadcasters was significantly higher than novice group. Data on other acoustic measures and skin vibration measures will also be discussed.

Gaowu Wang, PhD**,** Postdoc, Voice Research Laboratory**,** Division of Speech & Hearing Sciences**,** The University of Hong Kong**,** 5/F Prince Philip Dental Hospital**,** 34 Hospital Road, HK

Samantha Warhurst, B. Appl Sc (SLP) (Hons) , CPSP, Speech Pathologist/Postgraduate Student, University of Sydney, PO Box 170. Lidcombe NSW 1825 Australia

Edwin M.L. YIU, PhD, Professor, Voice Research Laboratory, Division of Speech & Hearing Sciences, The University of Hong Kong, 5/F Prince Philip Dental Hospital, 34 Hospital Road, HK

**Ref#: BS28**

**The Use of Ultrasound to Track Tongue Profiles as a Method of Understanding Resonance Creation in the Singing Voice**

This paper will present the utilization of ultrasound as a real-time, non-invasive method of tracking tongue profile shapes during singing. Ultrasound can permit us to investigate all levels and styles of singing with the goal of helping to determine what areas of vocal technique help or hinder the singer's resonantial goals.

The use of ultrasound offers unique advantages over traditional internal imaging techniques because: there is no radiation exposure during data collection, investigators can collect data outside the laboratory through the use of portable ultrasound machines, data is captured in the form of videos of complete phonemic sequences while the singer is actually singing, stop-motion can be employed to study phonemic details, audio signals can be simultaneously recorded for post-session acoustic analysis (using spectrography).

However, because the tongue does not work in an anatomical vacuum but interacts with the vocal structures surrounding it during ultrasound data collection, one must stabilize the head in relationship to the ultrasound transducer. This is accomplished with a HATS (Head and Transducer Stabilization) device portable enough to be transported along with the ultrasound unit. This study also featured the collaboration of the Medical University of Graz (Austria) which provided the MRI phase of the research.

We will discuss the implementation of our data collection protocol during the ultrasound phase of the project. The use of this ultrasound technique may prove to be of great benefit to researchers everywhere in their quest to greater understand the workings of the voice.

Angelika Nair, PhD, Affiliate Artist Voice Teacher, Room 207, Music Wing, Dorothy Young Center, Drew University, Madison, NJ

Garyth Nair, MA, Drew University, Professor of Music, Room 207, Music Wing, Dorothy Young Center, Drew University, Madison, NJ

**Ref#: BS-P1**

# Modulation of the Voice Related to Tremor and Vibrato

Modulation of the voice is a result of physiologic oscillation within one or more components of the vocal system including the breathing apparatus, the larynx, and the vocal tract. These oscillations may be caused by pathologic tremor associated with neurological disorders like essential tremor or by volitional production of vibrato in singers. The acoustic characteristics of voice modulation specific to each component of the vocal system and the effect of these characteristics on perception are not well-understood. The purpose of this study is to determine how the acoustic characteristics associated with laryngeal-based modulation of the voice affect the perception of the magnitude of voice modulation, and to determine if adjustments can be made to the voice source and vocal tract filter to alter the acoustic output and reduce the perception of modulation. This research will be carried out using a *kinematic model of the vocal folds coupled to a parametric model of the vocal tract area function* to simulate modulation of the voice with different voice source characteristics (i.e., vocal fold length and degree of vocal fold adduction) and different vocal tract filter characteristics (i.e., vowel shapes). It is expected that, by making adjustments to the voice source and vocal tract filter that reduce the amplitude of the upper harmonics, the characteristics of the acoustic output will be altered and the perception of magnitude of voice modulation will be reduced. [Funded by NIH R01 DC04789 and F31 DC012697]

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**Ref#: BS-P2**

# Graphical Analysis of Vocal Folds Vibration Patterns Using High-speed Imaging

The assessment of laryngeal anatomy and physiology is essential to understand the vibratory abnormalities related to vocal folds pathology. Laryngeal imaging provides useful information about healthy and pathological characteristics of the larynx. In the last years, high-speed videoendoscopy (HSV) has demonstrated the possibility to increase the understanding of vocal vibratory dynamics. Measures based on segmentation algorithms are important to document and quantify the HSV images. The goal of the current study is to describe a segmentation algorithm to calculate the glottal area and to simulate the glottal area waveform GAW from high-speed videoendoscopy. Ten subjects without vocal complain (mean age 42 years old) participated in this study. Recordings were performed by an otolaryngologist with a high-speed videoendoscopy at 4000 frames per second and 256 x 256 pixels resolution. The segmentation algorithm procedure was performed in five steps: (i) inicialization, (ii) thresholding, (iii) filtering and seed estimation, (iv) region growing and (v) closing/smoothing. For performance evaluation of the algorithm we applied manual segmentation in two HSV images and compared both results. Performance evaluation showed a relative error of 6.7% for the algorithm segmentation and of 4.2% for the manual segmentation. The proposed algorithm was able to identify the vocal fold boundaries and calculate the glottal area estimating the glottal pulse waveform from footage recorded by high speed technology. This information is useful to estimate physiological parameters of vocal folds vibration, to show the real open/closing cycle, its amplitude, regularity and symmetry. Future studies using HSV in combination with analytical methods could provide new insights of voice production

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**Ref#: M-P1**

# Voice Quality after Thryoplasty Type I

**Introduction:** Since 1993 thyroplasty type I (Isshiki) with a silicone rubber implant has been used at our department as a standard in 117 cases. The aim of this study is to investigate the postoperative voice quality.
**Material and methods:** We have evaluated the clinical documentations in 8 patients and have made the objective analysis of the voice quality applying high speed videoendoscopy, extracted the Glottal Area Waveform (GAW) and analyzed several parameters.
**Results:** Preoperatively the voice corresponded to R 1.57 B 2.29 H 2.29. The glottic closure was incomplete all along the vocal folds, the healthy vocal fold moved normally. Postoperatively the values were R 1.14 B 0.86 H 1.43, the glottic closure was 3 times complete, 4 times with dorsal insufficiency, in 1 case incomplete.
Analyzing GAW postoperatively we found the following objective parameters: Jitt (%) 2.4, Shim (%) 0.484, HNR (dB) 4.344, Closed quotient 0.141. The data showed comparably higher jitter and shimmer area values and lower HNR area values and closed quotient in comparison with the healthy group (Inwald et al., 2010).
**Discussion:** Thyroplasty type I succesfully reduces the glottic gap and improves voice quality, but it does not fully reach the parameters of a healthy voice. We suggest that further improvement in the voice quality can be reached through specific implant adjustment, improvement in the surgical technique treating the dorsal insufficiency of glottis and a long-term care for correction of the changes in vocal folds induced by age.

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**Ref#: M-P2**

# Effort Scaling and Phonation Threshold Pressure in Adductor Spasmodic Dysphonia

A variety of methods have been studied to evaluate the usefulness of botulinum toxin (Botox™) injections for reducing the symptoms of adductor spasmodic dysphonia and to determine subsequent dosing. The methods studied included acoustic measures, perceptual measures, EMG, quality of life measures, and laryngeal imaging but have proven of only minimal usefulness in assisting the patient and physician in future treatment decisions. The aim of this study was to identify a novel method to determine subsequent dosing of Botox™ injections for adductor spasmodic dsyphonia. The study compared changes in perceived phonatory effort on a 0-10 equal interval scale immediately pre-injection and one month post injection with changes in phonation threshold pressure, patient's perception of voice quality of life, and the clinicians' perceptual assessment of voice quality at both time points. Results: This pilot study focused on the data collected from ten patients with ADSD pre and post Botox™ injection to determine if measurements of change in vocal effort can assist the physician and patient in dosing amounts and dosing schedules. This pilot study was used to determine power and effect size for a larger study of the use of effort scaling to determine the effectiveness of Botox™ injections, thereby improving the dosing decision, removing confusion of what constitutes improvement from the injections, and improving communication with patients regarding the effectiveness of their injections.

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**Ref#: SLP1**

# Etiopathology of Acquired Vocal Fold Palsy and Quality of Life in These Patients

Vocal cord paresis or paralysis occurs due to lesion in the vagus nerve. Vocal cord paralysis can lead to dysphonia as well as dysphagia which lead the patient to frustration and emotional problems. A prospective study was done on Patients with vocal cord palsy who were referred to the Department of ENT for voice assessment and management The medical and surgical reports were examined. These patients were evaluated by a Speech pathologist and an Otorhinolaryngologist .Diagnosis was made based on videostroboscopic findings. We also examined voice-related quality of life (V-RQOL) outcomes in these patients. The V-RQOL measure is a validated instrument designed to evaluate voice disorders. The most frequent cause for vocal cord palsy in our study was Intubation trauma followed by surgical trauma, neurological conditions, non-surgical trauma and cardiac disorders. Tuberculosis of lungs and cancer of lungs accounted to be the rarest cause. The voice related quality of life of these patients was found to be poor. Hoarseness of voice was the most common symptom with associated dysphagia in few. The voice related quality of life of these patients was found to be poor. They were found to have problems in the social- emotional domain and physical functioning domain.

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**Ref#:SLP5**

# Objective Voice Analysis and Gender Variation

**Backgrounds:** Objective measurements in general and acoustic measurements in particular have become a substantial aspect of voice assessment during the last few decades and the mentioned measurements are related to gender characteristics of speakers. On the other hand, comparatively little is known about the characteristics of female voice as compared with male voice. Therefore, the present study aims to provide a more complete picture of the relationship between acoustic measurements and gender.
**Materials and Methods:** A group of 90 unpaid, healthy, randomly selected subjects with normal voices (45 Iranian men and 45 Iranian women), was selected for this study. All test subjects were between 20 and 50 years of age. Males and females were divided into three subgroups based on the following age ranges, with six total groups (n = 15 per group): 20-30 years, 31-40 years, and 41-50 years. Data collection was carried out, using the Dr. Speech Software version 4.0 from Tiger Electronics (subprogram: vocal assessment) at the speech therapy clinic under comfortable phonation and was used the sustained vowels /a/ and /i/, in a comfortable and habitual way, for more than 3 seconds.
**Results:** The value of (vowels /a/ and /i/) was greater for females than for males and the F0 of vowel /i/ was significantly higher than the F0 of vowel /a/ in all populations ($P < 0.05$). Conversely, the value of MPT was greater for males than for females ($P < 0.05$). There were no significant differences in average shimmer and jitter between females and males ($P > 0.05$).However, the value of HNR was greater for females than for males ($P < 0.05$).
**Conclusions:** All in all there are many reasons for differences between acoustic parameters of males and females. We would think that some of these differences definitely are based on physical sex and general differences in the vocal organs of men and women. But we also think that there are additional aspects based on social gender.
Therefore, In light of the differences that emerged for acoustic measurements between males and females, a person's gender should be taken into account when applying spectral analyses to research or clinical situations.

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**Ref#: SLP9**

**Voice Problems of Group Fitness Instructors: Diagnosis, Treatment, Perceived and Experienced Attitudes and Expectations of The Industry**

Fitness instructors frequently experience voice difficulties and are a risk for the development of vocal fold pathology. Thirty-eight individuals with a formally diagnosed voice disorder completed an online questionnaire administered via SurveyMonkey. No participants had a history of voice problems prior to starting work in the fitness industry. Laryngeal pathology included vocal cord nodules (N = 24), vocal cord cysts (N = 2), vocal cord haemorrhage (N = 1) and recurrent chronic laryngitis (N = 3). Eight individuals reported vocal strain and muscle tension dysphonia without concurrent vocal fold pathology. Treatment methods were variable, with 54.29% (N = 28) receiving voice therapy alone, 7.89% (N = 3) having voice therapy in combination with surgery, and 10.53% (N=4) having voice therapy in conjunction with medication. Four individuals were seeing a speech-language pathologist for remediation of their voice problem at the time the survey was completed. Three individuals (7.89%) received no treatment for their voice disorder. Despite 92% of participants having sought and received medical and speech pathology management for their voice problem, all respondents reported one or more of the following permanent sensory or perceptual voice changes: increased hoarseness, tired voice, weak voice, strained voice, difficulties with high or low notes, low or high speaking voice, limited singing range, loudness decay and the experience of voice/pitch breaks. During treatment, 82% of the cohort altered their teaching practices and improved vocal hygiene. Half of the cohort reported that their voice problems led to social withdrawal, decreased job satisfaction and emotional distress. Further to this, greater than 65% reported being dissatisfied with the level of industry and co-worker support during the period of voice recovery, stating that management was “unconcerned” and attributed difficulties “to illness rather than the facilities and occupation”. This study identifies a need for more proactive training and advice on voice care for instructors, as well as those in management positions within the industry.

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**Ref#: SLP11**

# Neuromuscular Electrical Stimulation of the Cricothyroid Muscle in Patients with Suspected Superior Laryngeal Nerve Weakness

We report the apparent clinical effectiveness of neuromuscular electrical stimulation in combination with voice therapy for rehabilitating dysphonia secondary to suspected superior laryngeal nerve weakness in two female patients. Both patients failed or plateaued with traditional voice therapy, but had significant improvement with the addition of neuromuscular electrical stimulation of the cricothyroid muscle and superior laryngeal nerve using a Vital Stim unit. Stimulation was provided simultaneously with voice exercises based on musical phonatory tasks. Both acoustic analysis and endoscopic evaluation revealed important improvements after treatment. In the first patient the major change was obtained within the *primo passaggio* region, whereas in the second patient, an improvement in voice quality and vocal range were the most important findings. Additionally, each patient reported a significant improvement in their voice complaints. Neuromuscular laryngeal electrical stimulation in combination with vocal exercises might be a useful tool to improve voice quality in patients with superior laryngeal nerve injury.

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**Ref#: SLP14**

# Agreement of the Voice-Related Quality of Life (V-RQOL) and the Voice Activity and Participation Profile (VAPP) scores

**Purpose:** To investigate the agreement between the V-RQOL and the VAPP scores. **Methods:** We conducted a cross-sectional study among 438 Colombian teachers with self-reported voice symptoms. The study was approved by the Medical Ethics Committee of Universidad del Rosario in Colombia. Participants filled out one self-administered questionnaire (it include the V-RQOL and the VAPP), after sign the informed consent. The Epi-info 3.5.3. (CDC/2011) software was used for data entry, and the SPSS 20 software was used for statistical analysis. Descriptive statistics were used for V-RQOL and VAPP scores. Linear regression analysis was used to examine the relationship between V-RQOL ($y$) and VAPP ($x$). Bland Altman Plot was drawn to assess the agreement between VAPP and V-RQOL scores. **Results:** Mean score on the V-RQOL was 77.03 with a standard deviation (SD) of 19.74. Mean score on the VAPP was 74.82 with a SD of 16.90. Linear regression analysis yielded the equation $y = 0.926x + 7.750$. The mean of the differences between VR-QOL and VAPP scores was -2.2098 (SD=12.11). **Conclusion:** Although there is a clear correlations between the V-RQOL and the VAPP, they seems to measure different aspects, producing different results were they are applied to assess voice related quality of life.

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**Ref#: SLP16**

# Why Vocally Unload?
# A Neuromuscular Cycle-breaker For Voice Use

"Vocal unloading" is a term that encompasses the physiotherapy treatment of the laryngeal mechanism to alleviate muscle tension and promote laryngeal mobility and thus "unload" the larynx and ease voice production. Laryngeal manual therapy as a beneficial treatment for muscle tension dysphonia (MTD) has been described in the literature and has been performed by speech pathologists (Mathieson, et al., 2009; Rubin et al., 2000; Van Lierde et al., 2011). This paper describes the rationale and benefits of manual therapy treatment and why it can be used as a neuromuscular cycle breaker for not only the pathological voice but also for the professional voice. **Methods:** Vocal unloading has a neuromuscular, biomechanical, myofascial and joint focus highlighting and targeting regions of increased muscle tone with myofascial and mobilisation techniques. Vocal unloading examines the biomechanical relationships that the larynx has with both local and distal joints and the relationship these regions have with the larynx's associated myofascial slings and how these may impact voice use. Mobilisation techniques of the laryngeal mechanism itself, including the hyoid bone and cricothryroid joint, are an integral component of treatment to optimise the biomechanical advantage of the vocal folds and potentially provide vocal fold stimulation (Blake, 2006; Sanders et al., 1998).

Vocal unloading aims to break a maladaptive compensatory neuromuscular cycle of voice use and then provide long-term neuromuscular changes within the larynx and the tissues and joints surrounding the mechanism. These changes are both physical and vocal and are completed in conjunction with speech pathology. Postural and breathing reeducation strategies are important components of any vocal unloading management plan and play a role in providing long-term neuromuscular changes (Hodges, et al., 1997); Jull et al., 2008). **Results:** Clinically, post vocal unload there is an alteration of myofascial tissue quality predominantly a decrease in muscular tone (Simons & Travell, 1998) and an ease of laryngeal mobility. Immediately post treatment patients often report a decreased level of perilaryngeal discomfort, an ease with swallow and report that it is easier to perform their speech therapy exercises. For singers, these changes are often represented by an ease in vocal siren and an improvement in vocal range and quality. The most appropriate strategies for objectively measuring these changes via questionnaires and voice analysis are currently being researched with speech pathologists and ENT specialists. **Conclusions:** Vocal unloading may be utilised to break a maladaptive compensatory neuromuscular cycle of voice use in the treatment of not only pathological voice issues but also in professional voice use. Treatment is optimised by a multi-disciplinary approach with ENT surgeons, speech pathologists and voice coaches.

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**Ref#: SLP18**

# Voice Characteristics in Children with Malnutrition


INTRODUCTION: Malnutrition refers to the condition where there is an unbalanced diet in which some nutrients are in excess, lacking or in wrong proportion. Children with malnutrition may also have altered voice characteristics.

AIM: To analyze the characteristics of voice in children with malnutrition

METHOD: This study included 60 children with malnutrition and 60 healthy children. Each group was further divided into two groups each. One group consisted of children aged between 4years – 10 years and the other group consisted of 11years to 15 years. Both groups were inclusive of male and female subjects. The health status of all subjects was assessed based on their BMI, upper arm circumference and other physical characteristics. Voice (phonation and speech) samples of each of the child were recorded in the PRAAT software. The voice characteristics of healthy children and the children with malnutrition were analyzed both perceptually using GRBAS & acoustically (PRAAT & CSL4500 softwares) and then compared. The following parameters were assessed: Fundamental frequency, Jitter, Shimmer and Harmonic Noise Ratio.

RESULTS: Minimal differences in voice parameters were observed in children with malnutrition as compared to the voice parameters of healthy children in both perceptual and objective evaluation.

CONCLUSION: This study shows that the effect of malnourishment can be seen in voice. A profile of voice parameters of children with malnutrition can also be done and this can be considered as an inclusion criteria in identifying children with malnutrition.



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**Ref#: SLP19**

# Voice Profiling of Myasthenia Gravis (MG): A Case Report

**Introduction:**

Myasthenia gravis (MG) is an autoimmune disease mediated by immunoglobulin G (IgG) anti-acetylcholine receptor antibodies and a subsequent loss of postsynaptic receptors. Dysphonias, dysphagia along with slurred and nasal speech occur because of the pathologic fatigability and weakness of striated muscles in the pharynx, esophagus, tongue and palatal muscle.

**Objective of the Study:**

To profile the voice characteristics in an elderly adult with Myasthenia Gravis.

**Materials and Methods:**

A 69 year old elderly man with the concern of change in voice since 6 months served as subject of the study. History indicated that he has been diagnosed to have Myasthenia Gravis for the last two year. Detailed voice evaluation was carried out by both subjective and objective method. Objective voice analysis was done using PRAAT software to analyze the fundamental frequency, perturbation parameters such a Jitter and shimmer variation. Subjective evaluation of voice included MPD, quality of voice, GRBAS scale and self reporting assessment.

**Results and Discussion:**

Results of the study revealed that there is a reduced pitch, intensity range, presence of voice breaks, moderate degree of hoarse voice, reduced habitual loudness with Inadequate abdominal breathing and inappropriate habitual pitch. Reduced MPD was significant. Significant variation in soft phonation index observed indicating the irregular and inadequate vocal fold adduction.

**Conclusion:**

The treatment plan should include educating the subject about vocal hygiene, physiologic vocal exercises to improve the quality and strength of the voice; and compensatory techniques to optimize vocal function.

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**Ref#: SLP26**

# Comparison of Singing Range and Aerodynamic Measures of Children Training in Western and South Indian Classical Music

Singing training begins at a very young age and this allows expansion of the voice range. Research has shown that an adult singer can cover a range of 2½ - 3 octaves. However, the voice range in children is about two and a half octaves (Aronson, 1980) and fundamental frequency roughly 265 Hz (Boone, 1977). Although some research is available on the singing voices of adults in both Western and Carnatic types of music, research on the aspects has not so much focused on children, much less on the singing range or aerodynamics.

AIM: To compare the singing ranges and the aerodynamic measures in children training in Western and Carnatic music.

METHOD: A total of twenty children, aged between 7-14 years, training in Western (10 children) and Carnatic (10 children) music were chosen for this study. All participants belonging to western music and Indian music were asked to sing from their lowest singing pitch to their highest singing pitch. Their voice samples were directly recorded into PRAAT software and aerodynamic measures were done using Aerophone-II. The parameters considered for aerodynamics measures were vital capacity, maximum and minimum SPL, SPL range, maximum flow rate, peak flow and phonetogram.

CONCLUSION: Results showed that differences exist in the singing ranges and aerodynamics between those trained in Western and those trained in carnatic music.

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**Ref#: SLP27**

# Comparative Study of Voice Characteristics of Children in India Living Above the Poverty Line and those Falling Below the Poverty Line


INTRODUCTION:
Child poverty occurs when children fail to meet the minimum acceptable standard of life, in developing countries these standards are lower. Poverty in turn leads to illiteracy, poor health and hygiene, psychological and social problems. The concept of "below poverty line" (BPL) in India is used in order to identify the poor. About 27% of households in the country hold a BPL card (1999-2000). A study in Edinburgh (Scherer and Giles, 1979) produced results showing a correlation between social status and voice settings. Research has focused more on adult population and not on children.
AIM**:** To compare the voice characteristics in children below poverty line with that of age matched peers above poverty line.
METHOD:
This study included 20 children who belong to 'below poverty line' category and 20 aged matched peers of 'above poverty line. Age ranged from 3-6 years. Voice (phonation and speech) samples of each child were directly recorded on PRAAT software and were subject to perceptual analysis by three judges using GRBAS. These samples were subject to an acoustic analysis using PRAAT. Parameters such as Fundamental Frequency, Jitter, Shimmer, Voice quality were assessed.
CONCLUSION:
Results showed minimal difference in the voice characteristics of children below poverty line both perceptually and objectively


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**Ref#: SLP30**

# The Effectiveness of Manual Circumlaryngeal Therapy in Future Elite Vocal Performers: A Pilot Study

Objective: The purpose of this study is to investigate the impact of a single session of Manual Circumlaryngeal Therapy on the vocal characteristics of future elite vocal performers (musical students).
Methods: A pretest-posttest control group design was used. Sixteen musical students were randomly divided in an experimental and control group. The experimental group received Manual Circumlaryngeal Therapy during 20 minutes whereas the control group was instructed to have complete vocal rest during 20 minutes. Immediately before and after the therapy or vocal rest an identical objective voice assessment protocol (aerodynamic measurement, acoustic analysis, voice range profile and Dysphonia Severity Index) was performed. Vocal parameters were compared before and after Manual Circumlaryngeal Therapy in the experimental group and before and after vocal rest in the control group using the Wilcoxon Signed Rank test.
Results: In the experimental group a significant difference in DSI was found between the measurement before and after Manual Circumlaryngeal Therapy. The mean DSI increased from 6.3 before to 7.5 after Manual Circumlaryngeal Therapy. No differences in DSI were found in the control group between the two measurements.
Conclusion: The results of this pilot study prudently suggest that Manual Circumlaryngeal therapy can also improve vocal capacities in healthy trained voices of future elite vocal performers.

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**Ref#: SLP31**

# Prosody and Voice: A Review and Therapeutic Implications

Purpose: Prosody is the suprasegmental variation of dynamics, frequency, and rate that carry meaning in speech. The purpose of this study is to present an overview of prosody in speech from evolutionary, developmental and cultural perspectives, and to review implications in therapy for voice disorders.

Methods: Cross-disciplinary study involving systematic literature review.

Results: Studies regarding prosody from linguistics, voice, music, and psychology were reviewed. Areas covered include evolutionary development of prosody including animal models, linguistic and emotional overlays, social and pragmatic constructs, melody and prosody, conflicts among the drivers of prosody, and the use of prosody in voice therapy. Linguistic, emotional, and pragmatic values are all manifest in prosodic variations in voice and speech. Introducing prosody in voice rehabilitation serves a number of important roles.

Conclusions: Prosody provides layers of meaning beyond the word. It represents linguistic, emotional, and social elements that cannot easily be expressed through semantics. Disturbances in the production or apprehension of prosodic meaning can severely impair communication as well as voice production.

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**Ref#:SLP32**

# Proposal for Pediatric Population Dysphonia Screening Protocol

**Objectives**. Given the importance of medical record protocols in voice clinic, we intend to verify, among children between 5 and 11 years old, with and without complaint and voice alteration, the applicability of the Screening Protocol for Pediatric Dysphonia (SPPD), with score calculation, developed by the speech pathology service at a public university. **Study Design**. Cross-sectional case-control study. **Methods**. The group with vocal disorder (VD) consisted of children from the service's waiting list (7.3 years mean age) and the group without voice disorder (NVD) consisted of subjects (8.4 years mean age) without complaints or vocal diseases. Family members responded to the mentioned protocol and the two groups of children passed through a perceptual voice assessment using CAPE-V Protocol and acoustic analysis using Praat software. In order to compare the results between the groups we used the ANOVA test and the Two Proportions Equality Test. **Results**. Difference was observed between the groups for all voice parameters assessed in CAPE-V, except loudness; and VD's mean for the overall grade was 50.63 and NVD 24.59. In all items and scores analyzed in the screening protocol, VD showed higher mean values than NVD, highlighting the total score where VD had a 61.94 mean value and NVD 26.61. **Conclusions**. The protocol's applicability was evidenced with this group, proving to be an instrument easy to understand and effective in differentiating children with and without voice complaint/disorder, which should now be applied with other and larger populations.

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**Ref#: SLP35**

# The Pediatric Voice Toolbox

This clinically-focused presentation will outline several tools used in pediatric voice therapy, including semi-occluded vocal tract tools/postures (e.g., straws, kazoos), respiratory trainers, relaxation exercises, biofeedback (low to high tech), reinforcement systems and therapy activities. The presenters will explain how these tools are incorporated to target voice therapy goals. Furthermore, differences between pediatric and adult voice therapy techniques will be explored.

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**Ref#: SLP36**

# Vibrato Difficulties in 4 Iranian Traditional Singers and the Role of Manual Therapy in Retuning Them

**Background:** Iranian vibrato is one of the most common vocal skills among Iranian traditional singers. This technique consists of periodic laryngeal vibrations and inappropriate use may lead to laryngeal discomfort and loosing this capability.
**Design:** A case series design.
**Method:** 4 professional Iranian traditional singers (3 men and 1 woman) with the complaint of poor vibrato were assessed by a speech-language pathologist, specialist in manual treatment of voice disorders. The participant's voices and larynx were assessed multidimensionaly using acoustic, audio-perceptual, manual and stroboscopic assessments before and after treatment. Therapy procedure was consisted of some joint release and muscular tension reduction techniques.
**Results:** According to palpatory examination results, the decreased thyrohyoid space was the main cause of vibrato difficulties. Moreover, the decreased space was unilateral for 3 of them. Therapy resukts helped singers to find out their appropriate laryngeal position with the least effort during vibrato and singing. Interestingly, change in thyrohyoid configuration was associated with positive change in vibrato precision and improvement of voice quality (acoustic & perceptual).
**Conclusion:** High demand vocal skills like Iranian traditional singing vibrato need some specific training to prevent muscular compensatory behaviors. In the absence of such trainings, laryngeal manual therapy could help singers to overcome to their muscular decompensations.

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**Ref#: SLP37**

# The Impact of Two Voice Therapy Facilitating Techniques on the Objective Vocal Quality in Female Future Professional Voice Users: A Pilot Study

**Objective:**The purpose of this study was to determine the impact of two voice therapy facilitating approaches namely pitch inflections and chewing on the objective vocal quality in Dutch female students who are getting trained to be speech language pathologists (SLPs). Hypothetically, one can assume that the objective vocal quality will increase after these two voice therapy facilitating techniques in comparison with the matched control group that receives no facilitating techniques.
**Methods:** This is a pretest-posttest control group design study, in which 45 female future SLPs were randomly assigned into three groups. The two experimental groups received a well-defined vocal facilitating program regarding pitch inflections and chawing, whereas the control group received no voice therapy facilitating techniques. Objective assessment techniques (aerodynamic, vocal range, acoustic measurements, and Dysphonia Severity Index) were used.
**Results :**After the vocal therapy facilitating, a significant increased DSI value and increased vocal performance were measured in the experimental groups.
**Conclusions:** Clinically, there is clear evidence that the voice therapy facilitating approaches of pitch inflection and chewing are beneficial to the objective vocal quality and the vocal performance in future SLPs. To what extent these vocal facilitating techniques had the possibility to increase the objective vocal quality in patients with a voice disorder is subject to further research.

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**Ref#: SLP41**

# Fibromyalgia, Dysphonia and the Alexander Technique: Pilot Study Findings

Patients with fibromyalgia often present to our voice clinic complaining of voice fatigue and hoarseness. In the absence of obvious vocal pathology, we suspect that voice difficulties in this patient population are due to pain guarding postural behaviors and poor vocal technique. Clinic experience suggests that a combination of behavioral voice therapy and the Alexander Technique may be an effective and efficient way to improve vocal quality in patients with fibromyalgia. The Alexander Technique is a gentle one-to-one, hands-on manual therapy combined with verbal explanation to facilitate awareness and decrease inhibition of unnecessary body tension to improve movement, postural habits and enable individuals to improve motor behavior. Our study compares perceptual voice quality (CAPE-V), and acoustic and aerodynamic measures voice measures taken immediately before and after a one-hour Alexander Technique session with an AmSAT certified instructor. We hypothesize that measures will reflect favorable short-term effects on multiple voice parameters.

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**Ref#: SLP42**

# Observation of Vocal Fold Closure During Specific Phonatory Tasks in Young Females with Normal Voice Quality

**Objective:** Since voice quality depends substantially on vocal fold closure, voice therapists try to modify vocal fold closure by specific voice techniques or adjustments in phonation mode. This study describes the observation of 6 different phonatory tasks, on vocal fold closure in healthy subjects.
**Methods:** For this study, 21 female subjects with normal voice quality were selected. The impact of different phonatory tasks was examined by fiberoptic laryngovideo-endoscopy during different modes of phonation: habitual phonation, high pitch, low pitch, glides, resonance on /m/, Coblenzer's "abspannen" and chant talk. The video-recordings were judged by three experienced professionals (two SLPs, one laryngologist) by means of a visual analogue scale.
**Results:** Statistical analysis showed that only resonance on /m/ significantly improved VFC compared with habitual phonation. All other phonation modes and techniques, except low pitched phonation, led to a significant worse closure in comparison with closure at normal pitch. The glottis closure observed by low pitched phonation was not significantly different than closure at habitual pitch. Interrater agreement was moderate to very good, depending on the mode of phonation.
**Conclusions:** The results of this study allow a better understanding of VCF during specific phonatory tasks in healthy female subjects and give an indication about the role they may play in voice therapy of these methods to influence vocal fold closure.

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**Ref#: SLP43**

**Clinical Implications: Properties and Differences of True Vocal Folds Body-Cover Conditions**

Though many studies exist describing aerodynamic and acoustic measurements of perceptual voice qualities, there are no studies that assess these measurements in terms of the physiologic conditions of the true vocal folds body-cover (TVFBC) during phonation: thick-full medial contact of mucosa; thin-medial contact of top portion of mucosa; stiff-partial contact of mucosa; and, slack (glottal fry)-loose pliant mucosa with irregular mucosal wave. We collected normative acoustic, aerodynamic, and EGG data on the conditions in TVFBC in 24 females 18-35 years-old previously trained in the four TVFBC conditions. We also evaluated the differences in the aerodynamic, acoustic, and EGG properties of the four conditions of TVFBC. This within-subjects repeated measures design study gives empirical data that confirms perceptual and physiological changes observed in the conditions. Results of one-way ANOVA revealed significant differences ($p < .05$) between the properties of the TVFBC conditions. Eleven pairwise comparisons showed significant differences ($p <. 005$) in all but one of the individual measures. Comparisons of EGG waveforms confirmed that the depth of contact during productions of the TVFBC conditions that correlated to the similar TVFBC configurations from other studies. Clinical Implications: Contrary current theories on the loudness of voice, the results indicated that loudness was not primarily dependent on airflow. Thick folds were significantly louder than all TVFBC conditions and had significantly lower airflow than stiff TVFBC, indicating that increased subglottic pressure and stable airflow will achieve a significantly louder voice. Further clinical implications, will be discussed in the presentation.

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**Ref#: SLP45**

# Voice Analysis in Special Educators: A Multi Parametric Approach

Special educators are those who train children with special needs. While teaching children with hearing impairment they may need to intensify their voice. Hence they are more prone to voice problems. There are many studies reported in literature on aerodynamic, acoustic and perceptual measurements in professional voice users including singers, teachers and actors. There is limited literature available regarding voice characteristics in special educators. The current study focuses on voice characteristics of special educators.

Seventeen preschool special educators participated in the study among which 14 were females and 4 were males in the age range of 26-46 years (Mean: 32.88; SD: 5.85) with different years of teaching experience. Forced Vital Capacity (FVC) and Mean Air Flow Rate (MAFR) values were determined using RMS Helios 701 Spirometer. Maximum Phonation Duration for /a/, /i/, /u/ and s/z ratio were obtained manually. Multidimensional Voice Program (MDVP) of CSL 4500 was also done. Dysphonia Severity Index (DSI) was determined using the lingWAVES software. Voice Handicap Index (VHI-10) (Rosen, Lee, Osborne, Zullo & Murry, 2004) and Vocal Performance Questionnaire (VPQ) (Carding, 1996) were administered to the participants individually.

Results have been discussed in terms of gender differences and effect of teaching experience on the acoustic and aerodynamic measures. There was a significant difference between males and female teachers in terms of aerodynamic measures. Also, an attempt has been made to correlate the symptoms (reported in case history, VHI and VPQ) and the measures obtained through acoustic measurements.

This study underlines the importance of documenting the acoustic, aerodynamic and perceptual measures in professionals such as special educators so that effects of their profession on their voice and the risk factors can be determined and steps can be taken to prevent these occupational hazards. Also, resources needed to cater to the needs of these professional voice users can be determined.

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**Ref#: SLP51**

**Choir Singing Therapy: Voice Outcomes from a Feasibility Study (SPICCATO) of People with Parkinson's Disease and Stroke**

Recent small-scale controlled studies have provided limited evidence that singing in a choir can improve voice/speech, respiration, quality of life, health and wellbeing in people with neurological disease. No study has examined outcomes for a mixed choir for people with different neurological conditions and an experimental design is recommended. This feasibility study aims to assess the stability, practicality and acceptability of voice measures outcomes; and to investigate relative improvements in vocal function. CeleBRation Choir members with Parkinson's Disease (PD) and Stroke have been assessed at baseline, midway and week twelve. Voice measures included Sound Pressure Level (SPL), maximum phonation time (MPT), auditory perceptual and acoustic analyses (sustained vowel, connected speech and pitch range), and self-assessment questionnaire. Stroke group presented higher Mean F0 than PD. There was a trend for Stroke to improve pitch range over time; PD kept flat. Reading was the task with higher semitones range and was consistent over time (for Mean F0). SLP measures were sensitive to change across /ah/ repetitions. Overall effect of time on QASD (Questionnaire for Acquired Speech Disorders) and difference for final vs initial VRQOL (Voice-Related Quality of Life) were significant. A RCT will be carried out to assess mixed choral singing as a potential useful rehabilitation method for individuals with voice, speech and language disorders.

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**Ref#: SLP-P1**

**Differences in Acoustic and Perceptual Vocal Parameters between Young and Elderly Women in Habitual and Loud Intensity**

This study aimed to compare elderly and young female voices in habitual and loud intensity levels and to evaluate the effect of increased loudness on the acoustic and perceptual measures. Sound pressure level (SPL), fundamental frequency (F0), jitter, shimmer, and harmonic to noise ratio (HNR) were obtained from sustained vowel /i/ at habitual and loud intensity in a group of 30 elderly and 30 young women. Perceptual assessment using RASATI scale, loudness and pitch was also performed. In the present study, loudness increase produced changes in both acoustic and perceptual measures. For habitual intensity level, acoustic and perceptual measures did not show significant differences between elderly and young speakers, maybe because these parameters might not be sensible enough to detect differences in subject's normal and habitual voices. Phonation in loud intensity, however, evidenced significant differences between young and elderly voices. Aged voices were perceived as having more roughness, breathiness, asthenia, instability, tension and less tension, pitch and loudness. Acoustic analysis also showed significant differences between young and elderly voices for jitter (a measure for roughness) and shimmer (a measure for breathiness). Jitter among the elderly was higher than among the young. Shimmer was lower among the elderly. Intensity of voice might be an important variable while comparing acoustic and perceptual measures. Therefore, it is recommended that future studies examined acoustic and perceptual parameters not only at habitual intensity, but also at the loud intensity. Moreover, jitter and shimmer may not be reliable measures to detect vocal aging at least in habitual loudness.

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**Ref#: SLP-P2**

# A Study on Perception & Phonation to SLPs' History

To accurate methods for the modeling of speech pathologists, they should be capable of speech discrimination. The individuals who have accurate pitch discrimination abilities tend to be accurate pitch matchers (Moore et al. 2005). The aim of this study was, therefore, because while pitch discrimination and pitch matching abilities appear to be related, there are varying degrees of ability across individuals (Moore et al. 2005; 2006), to know differences perception and phonation to SLPs' History. The subjects were female 45 in Chinese. The 30 subjects are as working SLP (speech language pathologists) that they have at least 12 or more 36 months. The 15 subjects are no working SLP and master's degree of dept. of speech pathology & audiology in East China Normal University. First, all subjects spoke condition of them after heard the professional singers voice samples of 5 different conditions. Second, all subjects were given "Say /e/ for more than 3seconds, in 5 different conditions." The recording was used by Dr. Speech (version 4.0, Tiger Electronics). The procedure had took turns the first and second. The results of perception to SLPs' history are represented SLPs who 36 months > 0 month > 12 months. It suggests that SLPs' history effect on perception. These results same that trained musicians and singers often excel at pitch matching and pitch discrimination tasks (Watts et al., 2005).

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**Ref#: SLP-P4**

## Talkativenes, Vocal Loudness and Voice-Related Quality of Life in Teachers

**PURPOSE:** To understand the teacher's talking demand and vocal loudness in daily and professional voice usage and also the impact on quality of life related to voice. **METHODS:** 195 teachers were asked about their daily and professional voice usage: voice self-assessment, the amount of talking demand and vocal loudness and Voice-Related Quality of Life - V-RQOL were performed. **RESULTS:** 195 teachers were assessed (age average 40.2 years). The majority has categorized their voices as good (43.07%). The mean of the teacher's talking demand was 5.28 for the daily speech and 5.90 for the professional. The mean of teacher's vocal loudness was 4.68 for the daily speech and 5.31 for the professional. For general population, the mean of daily talking demand was 4.85 and for professional talking demand was 5.20; the daily vocal loudness usage mean was 4.45 and the professional usage was 4.65. As higher the intensity of professional voice usage, higher the everyday voice intensity (62.6%, $p<0.001$); as higher the professional talking demand, higher the everyday talking demand (48.8%, $p<0.001$). Teachers that worked 2 or 3 periods per day presented high average of professional amount of speech ($p=0,025$). As worst the voice self-assessment, worst the V-RQOL total scores (bad voice = V-RQOL: 61.0; $p>0.001$), socioemotional (bad voice = V-RQOL SE: 75, $p<0.001$) and physic (bad voice= V-RQOL PH: 51.6, $p<0.001$). **CONCLUSION:** Teachers showed higher talking demand and vocal loudness than general population in daily and professional voice usage. As higher the talking demand and vocal loudness at work, higher the vocal loudness and talking demand during the daily life. Teachers that had worst voice self-assessment had a huge impact on their quality of life.

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**Ref#: SLP-P5**

**Ref#: SLP-P5**

**The Effect of Articulation on the Perceived Loudness of the Projected Voice**

Actors often receive training to develop effective strategies for using the voice on stage. Arthur Lessac developed a training approach that concentrated on three energies: structural action, tonal action, and consonant action. Together, these energies help to create a more resonant voice, which is characterized by a fuller sound that carries well over noise and distance. In Lessac-Based Resonant Voice Therapy, voice clinicians help clients achieve a resonant voice through structural posturing and awareness of tonal changes. However, LBRVT does not include the third component of Lessac's approach: consonant action. This study examines the effect that increased consonant energy has on the speaking voice—particularly regarding loudness. Audio samples were collected from eight actor participants who read a monologue using three distinct styles: normal articulation, poor articulation (elicited using a bite block), and over-articulation (elicited using a Lessac-based training intervention). Participants learned about the "consonant orchestra," practiced producing each sound in a consonant cluster word list, and practiced linking the consonants in short phrases. Twenty graduate students of speech-language pathology listened to speech samples from the different conditions, and made comparative judgments regarding articulation, loudness, and projection. Group results showed that the over-articulation condition was selected as having the greatest articulation, loudness, and projection in comparison to the other conditions, although vocal intensity (dB SPL) was not statistically different. These findings indicate that articulation treatment may be beneficial for increasing perceived vocal loudness.

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**Ref#: SLP – P6**

# Coping Strategies on Functional and Organic Dysphonia

PURPOSE: To understand coping strategies on patients with behavioral and organic dysphonia. METHODS: Number of vocal signs symptoms, VDCQ-27 - Voice Disability Coping Questionnaire – 27 and Voice-Related Quality of Life - V-RQOL were obtained on 14 patients with organic dysphonia by laryngeal papillomatosis (Group1) and 15 teachers with functional dysphonia (Group2), with similar age (G1-39,8; G2-36,1 p=0,46).
RESULTS: The average number of symptoms was 6,3 for G1 and 8,4 for G2 (p<0,001). PEED total score was 43,9% for G1 and 33,8 for G2 (p=0,07). G1 uses more problem-focused coping strategies (47,5%) than emotional-focused (37,7%) p=0,002 and G2 uses more emotional-focused coping strategies (42,1%) than problem-focused (28,9%), p=0,028. V-RQOL scores had no statistical differences between the groups (G1 53,2; G1 66,0, p=0,31)**.**
CONCLUSION: Patients with organic dysphonia cope with their voice problem using more strategies based on solving the problem than behavioral ones. Although patients with functional dysphonia present more signs and symptoms, they don't use more coping strategies. There was no difference related to the quality of life in relation to voice aspects between these two groups.

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**Ref#: SLP-P8**

# Influence of Voicing Characteristics on Sentence Production in Adductor versus Abductor Spasmodic Dysphonia

This study examined perceptual scaling judgments of overall voice quality and acoustic measures of sentence duration for phonemically loaded sentences produced by 16 speakers with adductor type (ADSD) and 10 speakers with abductor type (ABSD) idiopathic spasmodic dysphonia (recorded prior to medical intervention), in comparison with 26 age/gender matched healthy controls. Overall severity of spasmodic dysphonia (SD) was also determined. Specific sentence types were (1) vowels and vowel like consonants, (2) vowels and voiced obstruent consonants, (3) vowels and glottal fricative /h/, and (4) vowels and voiceless obstruent consonants. Sentences were produced using typical phonation and during a whispered condition.

In the typical phonation condition, results demonstrated that ADSD speakers had significantly greater difficulty with voiced consonant sentences, irrespective of consonant manner (stops vs continuants). This was manifested primarily by markedly increased sentence durations, relative to normal productions, for the voiced sentences. Using typical phonation, ABSD speakers exhibited significantly greater difficulty with voiceless consonant sentences, irrespective of consonant manner (stops vs continuants). This manifested primarily by decreased voice quality, relative to normal productions, for the voiceless sentences. SD severity was not related to these observations. In the whispered condition, severity was found to be a significant feature, in addition to type of SD or phonemic content. Speakers rated severe-to-very severe SD were significantly more dysphonic and exhibited longer sentence durations, relative to normal controls; however, mild-to-moderate severities of SD exhibited essentially normal whispered speech. Significance of these findings for understanding SD speech production and its clinical evaluation will be discussed.

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**Ref#: SLP-P9**

## Access to Pediatric Voice Care: A Telehealth Solution

Children with voice disorders (dysphonia) are at a distinct social and educational disadvantage and access to adequate services for diagnosis and treatment can be difficult. Secure Internet transmission of voice (speech) and visual data is emerging as an effective means by which to increase patient access to specialized allied health services but treatment of childhood voice disorders is not yet among them. Given the need for access to highly specialized clinical skills, the documented suitability of individual voice therapy to this model of care in adults, extending the telehealth (TH) concept to treatment of pediatric voice disorders is a novel, albeit logical step. The **purpose** of this study is to determine the feasibility of using a telehealth solution for delivering pediatric voice therapy via secure teleconferencing and Web-based systems. We will also gather preliminary efficacy data and carefully evaluate the use of telehealth by patients, families and pediatric voice care specialists. The motivating hypothesis is that an *informed, feasible and personalized* approach to pediatric voice care via telehealth is possible and will result in improved patient access to quality care and result in greater opportunity for self management and clinical monitoring. This R21 is funded by the Agency for Healthcare Research Quality (AHRQ) and is in its first of two years of funding. We will present the project design in terms of technology and service delivery as well as preliminary feasibility data from following areas: technology stability, participant and clinician satisfaction, economic analyses, and change in select parameters of voice.

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**Ref#: SLP-P10**

# Speech Therapy and Online Course

The objective of this study is to report the implementation of an online communication course whose purpose was to make information on speech techniques accessible to as many people as possible, thus helping them to better express themselves.

With the economy in Brazil being stronger, Brazilians have been having the opportunity to get better jobs and higher salaries. For that, it is increasingly essential to develop new skills and abilities. Being able to speak well in a professional context is now an advantage to those who want to get ahead.

The online communication course was organized in a website, with 10 short video lessons. The modules are organized by themes such as voice preparation and care, techniques for enunciation and techniques to speak well in public. The contents are integrated with tests, exercises and animations. The language is simple and easy to understand in order to meet the different learning styles and encourage the participant's interaction.

The methodology allows the participant to learn at his pace and put the lessons into practice in his daily life.

The advantages of the online course are: the flexibility of the teaching-learning process, a customized rhythm and use of time, the democratization of information, the use of technology to enhance learning, and a lower cost to the user.

The current online resources promoted a paradigm shift in human relations, which are no longer just presential and began to be also mediated by technology. In this case, they made it possible to structure a new concept for improving public communication and the correct use of the voice, bringing speech therapy closer to the average person, who is not a voice professional and has no speech disorders.

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**Ref#: SLP-P11**

# Effects of Intonation Patterns on Nasalance

The purpose of this study was to examine the possible effects of phonatory variations in pitch and loudness (intonation patterns) on mean nasalance. Sixty-three typical speaking subjects between the ages of 18-27 years were tested. Participants produced a mixed-vowel sentence ("He had two rock lizards") in a habitual manner, as well as using five different controlled intonation patterns. Each controlled intonation pattern emphasized a different vowel context, as well as raised intonation on the last word in the sentence to indicate a question. The Nasometer II 6400 was utilized for the recording and measurement of nasalance scores.

Results showed that intonation patterns affect nasalance values in various ways, depending on where vocal pitch and/or loudness emphasis is placed. Significant increases in nasalance during the emphasis of the high front vowel /i/ were observed, which may result from factors such as increased oral impedance, reduced radiated oral intensity, increased transpalatal acoustic energy, and subtle increases in nasal airflow. Changes in mean nasalance in a mixed vowel sentence when produced with various intonation patterns suggests a possible reason for variations in mean nasalance across normative data studies. Subjects who represent different dialectical groups may have variations in the production of a common target language (including differences in intonation patterns) that may have an effect on reported mean nasalance values.

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**Ref#: SLP-P12**

# The Aging Voice: Judgement of Vocal Pleasantness and Adjective Related to Personality

**Objective:** To analyze the correlation between the judgment of listeners on the pleasantness of the aging voice and the assigning of positive and negative adjectives to the elderly by listening to their voices. **Methods**: 56 students participated as judges and they analyzed 20 recordings of voices of women aged 60 to 82 years. The recordings contained the recitation of standardized text, recorded using an AKG C420 headset microphone connected to CSL-4400. A five-point Likert scale was used to analyze the pleasantness, with the far right being a "very nice voice" and the far left a "very unpleasant voice". A scale of beliefs and attitudes toward aging was also used, containing 18 pairs of adjectives related to the elderly, organized in the form of a bipolar 5-point Likert scale, with "in a good mood" (5 points) at one end and "grumpy" (1point) at the other. **Results:** The mean value of pleasantness in the judgment of the voices was 4,04 (4,90 to 3,21) and of the adjectives in the scale of beliefs and attitudes was 3.64 (4,62 to 2,82). The correlation between the judging of pleasantness and awarding of adjectives was analyzed through the Linear Correlation Coefficient Spearman. There was a correlation between the judgment of the pleasantness of the aging voice and the assignment of adjectives ($r = 0.894608$ and $p = 0.000001$), with the voices considered pleasant receiving positive adjectives and the voices judged unpleasant, negative adjectives. **Conclusions**: Voice quality can interfere with social relationships of elderly.

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**Ref#: SLP-P13**

# Vocal Changes in Preschool Children: Perceptions of Parents

**Objective:** This study aimed at analyzing opinions from parents of preschool students in relation to the voice of their children, as well as identify situations in which they perceived vocal changes. **Methods:** The study included 152 parents of elementary school students from 4 to 5 years. A questionnaire to be completed at home by parents or the students' guardians was used to collect data. **Results:** Regarding the opinion of parents in relation to their children's voice, the category "normal voice" was indicated by 93 (61.18%) of the respondents and the category "changed voice", by 11 (7.23%). Hoarseness, a symptom common in dysphonic children, was reported for 5 (3.29%) parents. When asked about the situations they perceived changes in the voice of their children, the situations listed as common were, in descending order: when the child is excited / happy (n = 31, f = 20.4%), when the child shouts a lot (n = 25 f = 16.5%), when the child sings (n = 23, f = 15.1%) when the child is nervous / angry (n = 22, f = 14.5%) when the child participates in outdoor activities (n = 11, f = 7.2%). Other situations (returning from school, parties, or games) were reported by parents, although less frequent. **Conclusions:** The data show that although a small percentage of parents qualify the voices of their children as "changed", a reasonable number of participants indicated situations in the daily life of the child in which they observed frequent vocal changes.

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**Ref#: SLP-P14**

## Vocal and Non-Vocal Behaviors in Kindergarten Children- Analysis of Parental Report

Kindergarten is an important phase in a child's life where there is a transition from an unstructured play and learning to a structured environment. Studies related to vocal habits in children warrant cultural and geographic location specific probing as the nature of play and related behaviors are different. This study reports the vocal and non- vocal behaviors observed by parents of boys and girls in kindergarten level. A questionnaire containing twenty closed ended questions was administered to 150 parents to tabulate several vocal & non-vocal behaviors. The results are presented below: 80% of boys developed voice problems more than girls ($p < 0.05$). This was associated to nature of play in boys. Boys tend to play more in the open environments, and in varied weather conditions. Parents believed that this nature of play might have increased the chances of upper respiratory tract infections resulting in voice problems. 96% of girls were reported to be talkative in nature. However, parents did not associate this trait of girls with voice problems. They considered that girls were generally sensitive and more expressive in their conversations. Consumption of soda or fizzy drinks and chocolate were reported in 80% of children. Parents associated this observation to frequent occurrences of sore throat and throat clearing in children. Educating the parents and the children regarding vocal hygiene and voice use will lead to better vocal health in children.

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**Ref#: SLP-P15**

## Effects of Voice Training on Acoustic and Aerodynamic Aspects of the Voices of Student Actors

Twenty student actors (10 males, 10 females; M age = 20 years) received an initial voice screening followed by assessments of acoustic and aerodynamic parameters of voice production before and after participating in either a 16 week theater course emphasizing voice training (N = 7 participants) or a theater course in which no voice training occurred (N = 13 participants). Fourteen participants (70%) passed and six (30 %) failed the voice screening, which was conducted by two speech language pathologists specializing in voice. Of those who passed the screening, five (4 males, 1 female) were in the voice training group and nine (4 males, 5 females) were in the no training control group. Given the unequal number of females in each group, analysis focused on comparisons of the pre and post acoustic and aerodynamic assessment data for the male participants in each group who passed the voice screening. Results of dependent t test analyses indicated a significant increase in maximum phonation times ($p = 0.016$) and a significant decrease in phonation quotients ($p=0.043$) from pre to post testing for participants receiving voice training. For participants not receiving voice training, there were no significant changes in maximum phonation times or phonation quotients, although a significant increase ($p = 0.002$) in mean fundamental frequency and a significant decrease ($p=0.042$) in mean shimmer were noted from pre to post testing. Results for other acoustic and aerodynamic measures were not significant for either group. Possible explanations for these results are discussed.

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**Ref#: SLP-P16**

# Intonation and Gender Perception: Applications to Transgender Speakers

Recent studies indicate that changing pitch is insufficient to change perceived gender of the voice. Resonance of the vocal tract, breathiness of voice, and intonation of speech appear to contribute as well (Hillenbrand & Clark, 2009, Van Borsel, Janssens & de Bodt, 2009). Wolfe et al. (1990) suggest that MTF speakers who pass as female use a higher percentage of upward intonation patterns and downward shifts than speakers judged to be male, but Gelfer and Schofield (2005) also studied intonation in MTF speakers and found no differences. Therefore, it remains unclear whether intonation is influential to gender perception and applicable to transgender communication treatment.

Thirty-second picture descriptions by 11 male, 12 female, 14 male-to-female and 6 female-to-male speakers were presented to 20 listeners who judged the gender and rated the femininity of the speaker's voice. There were no significant differences between the four gender groups for duration of utterance, semitone range, pitch slope, or percentage of utterances with upward, downward, or neutral pitch shifts. The only significant (yet moderate) correlations between these intonation measures and perceived femininity rating were for semitone range (Pearson r = .38) and semitone pitch slope (Pearson r = .33). However, within the MTF group, speakers who passed as female had greater semitone range and markedly more utterances with upward pitch slope. Data indicate use of a large semitone range and frequent upward pitch shifts may benefit MTF speakers who want to be perceived as female.

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**Ref#: SLP-P17**

# Screening Index for Voice Disorders in Teachers: Development and Validation

**Purpose:** to develop and validate a score that can serve as a screening index for voice disorders in teachers. **Methods:** The subjects of this study were 252 female teachers, with and without voice disorders (WVD and WOVD) from the public school system of São Paulo – Brazil. All subjects underwent medical and vocal evaluations and completed a questionnaire about experienced vocal symptoms. They were then randomly divided into samples A and B. Sample A was used to develop and Sample B to validate a Screening Index for Voice Disorder (SIVD). The development used a factorial analysis and a cut-off point to predict the risk of having a voice disorder was defined using a ROC curve. The validation was done by calculating sensitivity and specificity values for the cut-off, comparing mean scores of subjects WVD and WOVD, calculating correlation between SIVD and VHI, and the association between score and presence of voice disorder. **Results:** The SIVD is composed of 12 symptoms, and each accounts for one point on the scale. The cut-off to identify risk of voice disorder is 5 symptoms. Analyzing sample B, it was found that the SIVD has good internal consistency ($\alpha$=0.82) and sensitivity (94%), a strong correlation to the VHI, significant association between risk of having and actual presence of voice disorder, and people WVD had higher mean SIVD. **Conclusion:** The SIVD proved to be a reliable, valid tool for identification of voice disorders in teachers, especially for use in screenings, acting as an instrument of epidemiological vigilance.
**Key Words:** Faculty, Voice, Voice Quality, Voice Disorders, Epidemiology, Questionnaires.

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**Ref#: SLP-P18**

# Perceptions of Voice Character

Recent studies have shown that two thirds of investigated college-aged female population used vocal fry. Researchers suggested that vocal fry may be an emerging linguistic correlate that, on its own, may not signify the presence of an underlying pathophysiology or voice disorder. Speech pathologists have a totally different take and are more worried about how would this emerging endemic influence SLPs providing voice therapy as well as younger generation receiving voice therapy. Controversy aside, other sociolinguistic researchers are beginning to note a similar increase in the use of vocal fry among a younger female population. None of these studies has addressed if this population is aware of s increase in use of vocal fry and whether it perceives this use in a positive or negative light. This study will report on how different vocal characteristics, especially vocal fry, are perceived by 25 female college-aged speech language pathologists (SLP). It asks them to give their perceptions on the influence that media has had on the voice characteristics of their own generation, their impressions regarding prevalence of these characteristics in other college-aged female population as well as within other generations and if they feel their generation is using it more than those of the previous generations. Students will take this survey at the end of a graduate level voice course to insure they are familiar with the auditory perceptual characters of the tested voice characters.

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**Ref#: VP9**

# Caring For the Vocal Instrument with a Damaged Case

**Problem:** How does a serious vocal musician with serious physical limitations reconcile the care of their instrument? Unlike other musicians who can change out parts and cases as part of maintaining their instrument, the vocalist musician faces unique challenges of being at once both instrument and case. Unique to the vocal musician's maintenance is the fact that the condition of their case can directly affect the condition of their instrument. If a vocalist has adverse physical limitations, conditions, or impairments (i.e. disease, chronic conditions, disability), the case is broke or has damage in a way that is not reparable. What then, can the vocal musician/ professional do when problematic or chronic physical conditions adversely affect the instrument and its performance?
**Methodology:** I will focus on the nature of the problem(s) and exactly which aspect(s) of the vocal instrument is affected, i.e. actuator, vibrator, resonator, articulator. I will employ case study analysis. I will consider (a) vocalist(s) suffering from a problematic, chronic, or physical condition disability which has negative effects, imposes limitations, to some part of the subject's instrument. I will consult the subject's Primary Care Physician, any specialist physician, and a speech pathologist/therapist. I will consider what technique and training might best fit the individual to produce marked improvement.
**Conclusions:** Learning how a vocal pedagogue may focus, alter, or adapt teaching techniques to offset physical limitations of a serious vocalist.

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**Ref#: VP12**

# The Effect of Menopause on the Elite Singing Voice - Singing Through the Storm

There is a growing body of research into the effect of menopause on the speaking voice. Several studies examine the menopausal effects on the singing voice, but no studies to-date have focused on world-class singers' experiences with menopause.

This study investigated strategies that peri- and post-menopausal elite singers utilize to maintain vocal quality and range. Typical strategies include the use of vocal exercises, hormone replacement therapy and non-western treatment options. Unfortunately, any hint of vocal distress can affect a career and most performers are reluctant to publicly discuss weakness. These commonly held attitudes present an obstacle to this line of investigation.

An examination of strategies used by professional singers to cope with menopausal voice changes is warranted. The techniques used by elite singers and the concomitant literature review is of interest to the non-professional as well as the professional singer, as this issue will affect all female vocalists. Twenty world-class opera singers, elite music theatre singers and internationally known voice pedagogues were interviewed anonymously. All respondents were female and considered themselves to be peri- or post-menopausal. The interview data were analyzed using qualitative research coding software to determine what salient trends emerged that are common to singers who successfully negotiated their menopausal voice changes.

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**Ref#: VP13**

# Does Current Vocal Pedagogy Terminology Used to Describe Breathing for Singing Accurately Represent Recent Voice Research?

Since the advent of singing lessons, singing teachers have formulated language to describe for their students the process of singing. As singing lessons predate voice research, the terminology employed by singing teachers necessarily grew out of each teacher's own experience, and out of their interpretation of their own physiological responses to the singing process. When voice research began in earnest in the early part of the twentieth century, respected vocal pedagogues, such as American William Vennard, began to consciously explore the terminology commonly in use by singing teachers and to try to clarify the concepts used to underpin that terminology, using the information provided by voice researchers. By reviewing the English-language vocal pedagogy texts written in the past two and a half decades (1985-2010), this presentation will explore the terminology in current use by vocal pedagogues to describe aspects of breathing for singing. Observations will be made concerning the level of standardization of terminology within the vocal pedagogy field and, further, analysis will be offered concerning the relative effectiveness of that terminology to efficiently communicate the information provided by voice researchers about the physiological process of breathing for singing.

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**Ref#: VP14**

# A Joyful Noise - Vocal Pathology and Vocal Hygiene of Worship Leaders and Contemporary Christian Singers

Contemporary Commercial Music (CCM) is a term that encompasses many varied forms of vocalism. Christian vocal music is the sixth most popular music genre, selling over 60 million compact discs and digital tracks annually, and has outpaced other genres such as Latin, Jazz and Classical music. Contemporary Christian Singers (CCS) and Worship Leaders (WL) represent a specific subset of musicians that face unique vocal demands and risks. They typically lack professional training, must alternate rapidly between breathy and pressed phonation, and often perform in acoustically disadvantageous venues with substandard sound reinforcement systems.

To date there are no studies examining the vocal health of this growing population or their awareness of vocal hygiene principles. These singers are currently underserved by the voice community, and their unique needs are not well understood. Addressing this dearth of information, an online questionnaire was generated and distributed to participants in the Americas, Europe, Australia and Asia. The questionnaire was made available in English, Portuguese and Spanish, and more than six-hundred respondents participated. Correlations between subjects' demographic data, vocal hygiene awareness, and vocal pathology incidence were drawn in order to better understand the needs of this unique population.

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**Ref#: VP17**

**Vocal Dose Differences Among Singers in Individual Practice Rooms with Varying Acoustical Properties: A Collective Case Study**

The purpose of this study was to measure distance dose (Dd) in multiple practice room environments ($N$=3) with varying acoustical properties. Vocal majors ($N$ = 8) at a major Midwestern university School of Music wore KayPENTAX Ambulatory Phonation Monitors and were instructed to sing in three practice rooms for half an hour in each space, with a rest period of one hour between each recording session. Singing included vocalises and songs known to the participants. The participants sang the same vocalises and the same songs a cappella after an initial recorded prompt for each vocalise and song to establish key and tempo in each room. Only the room environment changed. Acoustical data (frequency amplitude, reverberation rates, and decay rates) were acquired for each singer using EASERA 1.2.2 and frequency data acquired using CSL Real-Time Pitch and Pitch Analyzer 2.0.

In addition, each participant was asked to rate aspects of singing in each environment, including perceived effort, perceived tuning, and perceived amplitude. Survey results were compared to vocal dosimeter readings to determine if singer perceptions mirrored vocal fold activity. Results were discussed in terms of future research and the pedagogical aspects of preparing individual practice spaces that encourage efficient singing as students learn and refine vocal singing technique.

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**Ref#: VP20**

**How to Prevent Vocal Problems and Maintain and Promote Long-Term Vocal Health**

The voice is our main source of communication to the world that surrounds us. We use our voices, consciously and unconsciously, for many purposes, which is why we tend to take our voices for granted until something goes wrong. (Cazden, 2011, p. 15). Vocal wellness affects us all, especially if we use our voice for daily artistic, work and income purposes. This article's main objective is to discuss and promote daily vocal health and wellness in order to prevent injuries and take focus off treatment issues. A thorough examination of numerous studies, articles, books, and in-depth personal interviews with two authorities in the field, a voice researcher and speech therapist, addressed vocal health issues and proved in favor of preventative vocal health care. Findings suggest that people who use their voices extensively or vigorously at work are at greater risk of injuring their voices, including teachers, who are most at risk. (Welch, 2000, p. 4). Singing students and singing teachers are also vulnerable to vocal problems (Thurman & Welch, 2000, p. 535). In general, people can protect their voices by understanding the basic elements of vocal education, and by establishing and developing a daily vocal regimen of healthy, conscious habits, and preventative measures. Examples will be presented during the presentation, along with implications for practice.

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**Ref#: VP21**

# Hearing Dose and Vocal Use Among University Vocal Performance Majors During a Five-Day School Period

This case study documented university vocal performance majors' ($N$ = 2), one soprano and one alto, acquired hearing dose and voice use during a five-day school week through (a) noise dose data acquired from two female students who wore Etymotic Personal Noise Dosimeters (ER200D) during waking hours for five successive days, (b) acquisition of phonation time dose (Dt) and phonation distance dose (Dd) data from the same two female students who wore KAYPentax Ambulatory Phonation Monitors (APM 3200) during waking hours for five successive days, and (c) daily participant surveys soliciting responses to hearing and voice health indicator statements. Noise dosimeter and APM data were disaggregated by voice type, classroom time, individual practice duration, voice lessons, choir rehearsals, and concerts during the five-day period.

Results were discussed in terms of university voice majors' hearing dosage, voice use behaviors, hearing and vocal health perceptions, and suggestions for future research.

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**Ref#: VP22**

**Squall and Vocal Health: A Survey of Current Practice Amongst Singers of Black Gospel Music**

Squall is a unique form of singing characterized by high phonatory intensities and thyroarytenoid-dominant production. An extreme vocal behavior, its use is generally restricted to moments of high emotional intensity. Squall is a frequent component of American black gospel singing, but it is not well understood by the voice community. Gospel singers are typically self-taught and they may be at risk for vocal pathologies when performing this emotionally powerful repertoire.

A survey was designed and administered to participants of the 2012 Gospel Music Workshop of America annual convention in Nashville, Tennessee. This is the largest gathering of gospel singers in the world. Survey questions examined: 1) How the gospel community views the use of squall; 2) The respondents' perception about the impact of squall on vocal health; 3) The respondents' level of vocal training; 4) The respondents general awareness of vocal hygiene principles. A Singing Voice Handicap Index-10 (SVHI) was also administered to all survey respondents. Correlations between the use of squall, the respondents' vocal training and hygiene awareness levels, and SVHI score were drawn in order to examine the relationship between squall and the health of the voice.

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**Ref#: VP28**

# "High Belt" Singing in Music Theater and Contemporary Female Singers: There's No Belting Like High Belting

The female belt voice continues to be a challenge to understand. Is it a resonance or registration phenomenon or both? How can formant tracking and closed/open quotients help us to understand the function of the belt voice? Are there differences among the current belters? Teachers and singers and researchers have diverse perspectives, and the research so far has not resolved the issues. To these unanswered questions we add the current extended range of the belt with the newest repertoire, originally ending at C5, now extending to F5 and beyond.

The purpose of this study is to better understand the female belt, specifically in the range C5 – C6. Our survey questions for female music theater and CCM singers and voice teachers and other professionals who work with them is helping us to understand specific parameters involved in producing the "high belt" singing range C5 – C6. The sharing of vocal terminology and aural perspectives as well as pedagogical practices is being gathered through this survey. Questions were developed from practitioners in the field in addition to the current scientific and perceptual research on music theater mix/belt singing. Findings are presented with the aim of contributing to the current understanding of the female belt voice especially in its extended range.

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**Ref#: VP32**

# Pop/Rock Singers' Attitudes toward Professional Voice Training

The marketplace for pop/rock singing is robust. The Nielsen Company reported $6.85 billion in 2010 record sales in the USA. Broadway and Equity touring productions, primarily pop/rock in style, earned $1.8 billion in ticket sales for the 2009-2010 season.

An online survey of singing voice teachers (Edwards & Meyer, 2012) indicated that many voice professionals continue to teach pop/rock singers Bel Canto technique, Italian vowels, and foreign language repertoire. The survey investigated instructor training, marketing strategies, and typical attitudes towards pop/rock singers within the voice community.

To better reach this underserved population, a closer examination of the attitudes of pop/rock singers towards the techniques indicated by the teachers in the previous study is warranted. The survey will also investigate budgetary restrictions, the value placed on professional credentials, and how pop/rock singers seek out voice professionals. Results will focus on descriptive analysis of the survey responses, a comparison to the results of the 2012 teacher survey, and the pedagogical implications for teachers who work with pop/rock clientele.

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**Ref#: VP35**

# Mariachi Singing

The goal of this study is to explore a genre of singing much like that of Western Classical singing, Mariachi singing. Preliminary investigation indicates that singers in this genre do not study with a teacher specifically for the voice. Much of their training is acquired by imitation of recordings or popular singers along with input from their instrumental teachers, yet the genre yields much of the same timbral qualities of western classical singing. As of late, there has been some cause for concern amongst Mariachi performers misusing and damaging their voices, due to a lack of training and haste in promoting the legacy of the genre.
This study will primarily focus on Mariachi groups in South Texas. Further investigations from California, Arizona and Mexico could prove quite beneficial in comparison. Currently, the teaching of the genre is well established in the public school system and in some areas, at the collegiate level as well. Teaching methods will be documented and recorded and used at a later date for comparative data. Interviews with teachers and singers will be conducted with focus on the health of the singers. Findings are sure to help us understand singing in an understudied population, and perhaps, aid a global dissemination of knowledge.

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# Acoustic and Perceptual Analysis of Brazilian Actresses' Voices

The present study aimed to compare actresses and non-actresses' voices through acoustic and perceptual analysis. Thirty actresses and thirty non-actresses participated as subjects. All participants were recorded during a read-aloud task of a 200-word text. In the LTAS analysis, the acoustical variables were the equivalent sound level (Leq), speaking fundamental frequency (SFF), alpha ratio (the level difference between 50-1000 Hz and 1–5 kHz), the level difference between the F1 and F0 regions (L1 - L0), that is, the level difference between 300–800 Hz and 50–300 Hz, and the energy level of 30 spectral points separated by 160 Hz. Voice samples from both groups were perceptually assessed by five blinded judges of speech language pathologists with more than five years of experience working with professional voice users. A total of 70 voice samples were evaluated: 30 from actresses, 30 from non-actresses and 10 repeated samples in order to assess the intra-rater concordance. Perceptual variables were pitch, vocal extension, loudness, sonority, breathiness, hyper and hypofunctional production, articulation and overall voice quality. Actresses' voices were perceived to be lower, louder, more sonorous, with more vocal extension, better articulation, and better overall quality. There were no significant differences for hypotention and breathiness. There were no differences between groups for Leq, alpha ratio, and L1-L0. Significant differences were found only for SFF. Therefore, actresses' voices were perceived with better voice quality than non-actresses. Nevertheless, this difference was not reflected objectively thought acoustic assessment.

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