VOLUME 20, ISSUE 1

The Voice

The Voice

VOICE OF THE EDITOR

Mary Sandage, PhD

Exercise Science: Considerations for the Performing Voice

By Mary Sandage, PhD

Training of the performing voice is not unlike training an athlete to achieve optimal performance. Individuals who rely on the voice for stage or song use skeletal muscles that share many of the same properties as the muscles used by athletes. We have much to learn from the well-established discipline of exercise science to improve our knowledge of muscle physiology in health and disease as well as muscle adaptations to exercise and extended rest for the vocal performer. What we think we know to be true about vocal fatigue as an inevitable part of regular performance may, in fact, be better managed if we apply principles of fatigue resistance from the realm of whole body exercise performance, as described so well by Dr. LeBorgne.

In this issue of The Voice, we have invited an exciting group of voice researchers, all of whom are vocal performers, to describe how aspects of exercise science can inform vocal training and prevention of voice disorders in the performer. From basic research that describes the interaction between respiration and phonation to application of strength and conditioning principles, our authors have turned the lens of vocal training to the exercise science considerations that can be applied for optimal vocal performance.

VOICE OF THE EDITOR
MARY SANDAGE, PHD

Assistant Professor
Dept. of Communication Disorders
Auburn University

NEW

Voice of the Editor

In This Issue:

THINKING LIKE A VOCAL ATHLETE: MINIMIZE VOCAL FATIGUE

By Wendy D. LeBorgne, PhD CCC-SLP

Depending on a given persons level of physical fitness, running as fast and hard as possible for two hours will result in varying levels of physical fatigue and possible injury. For physically fit individuals, their bodies have been conditioned with time and training to pace, conserve energy, and appropriate muscles have been strengthened for maximal efficiency. Fatigue will be minimal and recovery will be rapid. For those persons who do not train or condition effectively for such intense physical demands, their bodies are inefficient in the task, lack appropriate muscle strength, likely compensate with other muscles, and by the end of the run may be exhausted or injured. Their bodies are fatigued and the recovery time may be lengthened in comparison to the physically fit group.

Vocal athletes, whether avocational or professional, are expected to consistently perform at their physiologic vocal extremes with apparent ease and artistry. Similar to physical athletes, the vocal athlete must be mindful of the physiologic demands that singing places on the respiratory, phonatory, resonance, and psyche systems. Vocal fatigue among vocal athletes is often a complaint when presenting to the voice pathologist or otolaryngologist. Physically, the laryngeal examination may result in essentially normal findings, yet the singer continues to report vocal fatigue. In the absence of abnormal laryngeal findings, vocal athletes should be encouraged to examine their vocal fatigue as a similar parallel to physical athletes. Depending on the intensity and vocal fitness level of the individual, the voice will be able to withstand a given amount of use without fatigue. Once the singer crosses that threshold (singing/speaking too much, too loudly, or out of range), the vocal mechanism will begin to fatigue and the body will begin to try and compensate. Symptoms of vocal fatigue may include: hoarseness, change in laryngeal sensation (tightness, neck muscles aching), increased vocal effort to produce sound, loss of dynamic control (generally soft becomes more difficult), vocal onsets become dis-coordinated, and the singer may begin to experience physical compensation (jaw tightness, tongue tightness). Over time, continuing to sing on a vocally fatigued mechanism may result in physical and vocal changes (and possible injury) that will alter the way that a singer performs.

Vocal fatigue may be defined as a decreased ability to produce normal voice (quality, dynamic control, frequency range, and possibly neuromuscular laryngeal firing). There have been several groups of vocal athletes who have been identified as reporting high incidences of vocal fatigue as a common complaint. Some of the professions consistently reporting vocal

(Continued on page 3)

"Over time, continuing to sing on a vocally fatigued mechanism may result in physical and vocal changes (and possible injury) that will alter the way that a singer performs."

THINKING LIKE A VOCAL ATHLETE: MINIMIZE VOCAL FATIGUE—CONTINUED

(Continued from page 2)

fatigue range from educators to singers including the pediatric to geriatric populations. Self-assessment and self-rating tools have been developed to help vocal athletes begin to quantify their degree of fatigue and perceived effort level. In examining common themes of reported vocal fatigue among vocal athletes, one can begin to develop vocal training programs to include stamina, strength, agility, flexibility, and power exercises based on individual performance demands of the artist and subsequently reduce vocal fatigue.

As each genre requires different vocal and physical demands of their artists, reasons for reported vocal fatigue should be individually investigated. Pushing the voice too hard, too quickly without proper training may be one of the quickest routes to injury. Vocal Athletes are therefore encouraged to practice and train in a cost-efficient manner. For example, when training for a marathon, training protocols take place over a period of several months with gradual increase in pace and duration of exercise. There are also built in periods of rest. Think about what performers often do; wait until the last minute to learn new music, rehearse for several hours at a time "full out," and the most intensive week vocally is often tech week (resulting in physically, mentally, and vocally exhausted performers for the show). Unlike physical athletes, vocal athletes often do not build in periods of rest and they rarely "taper" their vocal use coming into the week of a big performance. Consider training smarter and train like a vocal athlete in order to minimize vocal fatigue and potential injury. Vary the intensity of your daily vocal workouts. Pace your training schedule as well as the intensity of voice use within your individual practice sessions. For example (for an eight week rehearsal process): Weeks 1-3 are vocal building weeks and week four is a recovery week. Then, weeks 5-7 are increased vocal building, with week eight as a recovery week. Within your weekly practice sessions, balance your vocally intensive practice days with an easy vocal day the following day. Take a day of vocal rest each week for adequate recovery.

Vocal fatigue in vocal athletes remains an ongoing concern as the performance demands and expectations of artists continues to increase in order to meet the ever-changing music industry market. It is often left to the artist themselves to self-monitor and manage their vocal fatigue. Symptoms of vocal fatigue that go untreated for long periods may result in physical vocal injury and/or change in neuromotor planning.

WENDY LEBORGNE, PHD, CCC-SLP

Voice Pathologist
& Singing Voice Specialist
Clinical Director

Dr. Wendy LeBorgne (voice pathologist & singing voice specialist) is the director of two private practice voice centers (BBIVAR, Dayton, OH and ProVoice Center, Cincinnati, OH). She holds an adjunct professor position at Cincinnati College-Conservatory of Music as a Voice Consultant. Dr. LeBorgne completed a B.F.A. in Musical Theater from Shenandoah Conservatory and both her masters and doctoral degrees from the University of Cincinnati in Communication Sciences and Disorders. Original peer-reviewed research has been published in multiple international journals and she is a contributing author on multiple books and recently co-authored **The Vocal Athlete** text and workbook. Her patients currently perform on radio, TV, film, cruise ships, Broadway, national tours, and opera stages around the world. She is a sought after speaker and master-class clinician on vocal athletes and musical theatre performing.

From the Lungs to the Larynx to the Lips

RESPIRATORY-PHONATORY INTERACTION:
CURRENT UNDERSTANDING AND POTENTIAL DIRECTIONS

By Aaron Ziegler, PhD, Leah B. Helou, PhD, Amanda Gillespie, PhD

Researchers have spent decades building an understanding of what happens from the lungs to the larynx to the lips. Studies have examined this relationship in ventilation alone, during communication, in both sexes, across the lifespan, in varying body positions, in various levels of metabolic demand, in diseases and conditions of disorder, during states of calm, and during emotional states. Much of this research has assumed that the lungs are healthy, that they act as a constant driving force for phonation, and that they have a unidirectional effect on the vocal folds. In actuality, the respiratory and laryngeal systems appear coupled, acting together as a coordinated structure to meet metabolic needs and communication demands. Recent data even suggest the larynx is key in both the complementary and competing goals of the respiratory system. Accordingly, the lungs might not be a simple bellows system and the larynx might not simply be entrained and meant to react only to the lungs' needs.

Amazing Airways. Most people at rest produce speech easily with only mild disturbances to respiratory homeostasis. In contrast, during high respiratory drive (HRD), characterized by increased ventilation, metabolic needs appear to override communicative demands. Despite research showing voice sounds breathy and speech is choppy in HRD, millions of professionals in the occupational setting demonstrate an amazing ability to speak (or sing) during physical activity. Their voice is often described as loud, strained, and facilitated by high vocal fold impact, thus elevating the risk for voice problems.

A conceptual starting point in understanding the intersection of motor control and hard-wired physiology of respiratory and phonatory functions is the opposing and, possibly competing, laryngeal configurations required for breathing and voice. The vocal folds play a role in the determination of respiratory resistance, airflow volume, and rate of breathing, tightly matching ventilation to metabolic need. Accordingly, the vocal folds abduct widely during breathing in HRD. Phonation, on the other hand, requires close approximation of the vocal folds during expiration. Thus, phonatory closure in HRD blunts ventilation and disturbs homeostasis.

To date, research has examined voice under unmanipulated phonatory conditions only, leaving undetermined whether communication with specified vocal targets would reveal a new balance between respiratory and phonatory functions. To address this question, Dr. Ziegler and colleagues examined the larynx in HRD conditions during comfortable and loud voice production. The data revealed that when physical activity levels increased and participants did not have a fixed loudness goal, the respiratory and

(Continued on page 5)

AARON ZIEGLER, PHD

Instructor of Otolaryngology, Department of Otolaryngology/ Head & Neck Surgery, Oregon Health & Science University

LEAH B. HELOU, PHD

Department of Otolaryngology, University of Pittsburgh, Pittsburgh, PA

Systems Neuroscience Institute, Pittsburgh, PA.

AMANDA GILLESPIE, PHD, SLP-CCC

Department of Otolaryngology, University of Pittsburgh, Pittsburgh, PA

RESPIRATORY-PHONATORY INTERACTION:, CONTINUED

(Continued from page 4)

phonatory systems attended to the body's metabolic needs, and voice output was breathy. Apparently, in the absence of phonatory goals the lungs seem to *"win"*.

Conversely, when participants had to be loud, airflow increased but at rates that were always less than in the unconstrained loudness condition. Thus, less air escaped through the glottis during loud voice compared to comfortable. These results suggest that speakers employ a task-specific control of laryngeal movements and make neuromuscular adjustments to accomplish a loud, clear voice, favoring phonation over short-term metabolic needs. Sometimes voice "wins". In sum, goals matter and laryngeal movements during voice production are functional. The coupled systems demonstrate adaptability, and vocal output appears to depend on whether goals are *complementing* or *competing*. Future research should evaluate the impact of other communication goals as well as voice training and fitness levels on phonatory function in HRD.

Disease and Dysphonia. Most literature on the interactions between the larynx and lower airways makes the assumption of healthy lungs. But healthy lungs are not always a given. In fact, chronic respiratory diseases, such as asthma or COPD, affect millions of Americans, and people with lung disease report significantly greater rates of dysphonia than those without lung disease. When the lower airways are affected by disease, a competition may exist between the respiratory needs for phonation and for ventilation.

"We know the larynx and lower airways are often coupled, complementing each other to meet a ventilatory or phonatory goal."

One area where such a competition may occur lies in the body's need to rid or retain carbon dioxide (CO_2). A large body of literature has identified that when there is too much or too little CO_2 in the blood (hypercapnia/hypocapnia) laryngeal resistance changes to release or retain CO_2 to keep the respiratory system in balance. These laryngeal changes have been observed during breathing, but it is less clear what happens when the larynx has to help the lungs in need while also needing to establish consistent resistance for *phonation*. To answer this question, Dr. Gillespie and colleagues conducted a study of phonatory laryngeal resistance during hyper- and hypocapnia. Results showed that participants were able to maintain normal laryngeal resistance for voicing, despite large increases and decreases in CO_2.

These findings are perplexing. We know the larynx and lower airways are often coupled, complementing each other to meet a ventilatory or phonatory goal. But as in HRD conditions, it seems that, at least in the short term, we can override the ventilatory and metabolic needs of the system to meet a communication goal. The fact that voice "wins" in these experimental studies doesn't help explain why and how so many voice problems develop. It could be that voice and communication can win *but only up until a point*. And that point varies for everyone. Perhaps each individual has his/her own phonatory-respiratory dysfunction tipping point. Future research questions need to better examine these areas of variability.

Stresspiration. Not everyone suffers respiratory disease or needs to perform vocally in high respiratory drive, but everyone experiences emotions. The autonomic nervous system is responsible for involuntary physiologic changes (e.g., those

(Continued on page 6)

RESPIRATORY-PHONATORY INTERACTION, CONTINUED

(Continued from page 5)

impacting heart rate, breathing, etc) in response to the ever-changing environment, and may be one pathway by which stress affects the larynx. Perhaps the larynx is impacted by stress vis-à-vis its valving role in respiration, or perhaps it is uniquely affected by stress in ways unrelated to breathing.

Little research has directly examined the *laryngeal* response to stress, however, the *respiratory* stress response is well-characterized. During stress, individuals respond with fairly predictable changes in breathing: respiratory rate increases and breaths become more shallow. The rapid, shallow breathing that occurs during stress is largely driven by the sympathetic nervous system, or the *"fight-or-flight"* system. Conversely, the calming functions of the parasympathetic nervous system facilitate slow, relaxed, abdominal breathing. In accordance with the ventilatory needs for fighting or fleeing, the glottis may dilate during stress, facilitating air intake. Or it may close in a classic *"protective adductory reflex,"* or in preparation for yelling. Alternatively, perhaps the stress response is to freeze and hide, and the associated *"breath holding"* is a way to "*hold one's tongue*" in fear of speaking out.

These questions are relevant because much of the voice diagnostic and therapeutic approach to so-called *"functional"* voice disorders is predicated on the belief that the larynx is responsive to stress. To examine this claim, our group measured the activity of the intrinsic laryngeal muscles during acute psychological stress. As predicted, antagonistic muscle groups showed increased electromyographic activity during acute stress. It remains unclear whether the abductory or adductory activity prevailed in terms of what would be observed endoscopically, and if the laryngeal muscles were uniquely responding to the stressor or if their actions were complementing respiratory response. As of yet, glottal aperture during autonomically-induced bronchoconstriction remains generally unknown. Thus, it remains unclear how the lungs and larynx are entrained to each other's needs during times of stress, and when and how their actions diverge as a function of changing needs or goals. However, it is evident that the larynx is indeed a stress responder, which has implications for our clinical and investigative observations of laryngeal activity and the vocal product.

A combined theme of the research presented in this article is that goals matter, and that the larynx can function independently, at least to a point. The structures that contribute to voice are part of one coupled system, and great benefit would come from thinking creatively about how to study that system in functionally and ecologically valid ways. How can we balance the need for experimental control without sacrificing the broader context of these relationships? This one coupled system has parts that work toward goals that are sometimes complementary and sometimes in dramatic competition. Given a phonatory goal, we can override metabolic demands, at least for the short term. Given mechanical or chemical changes in the lungs, phonatory goals can win, to a point. We would be remiss to not consider the profound influence of the autonomic nervous system, which affects our research participants and patients alike.

Dr. Aaron Ziegler is a postdoctoral fellow at the Northwest Clinic for Voice and Swallowing within the Department of Otolaryngology/ Head & Neck Surgery at Oregon Health & Science University in Portland, Oregon. His research investigates respiratory-phonatory interactions, the association between vocal dose and phonatory function, and models of voice therapy.

Dr. Helou earned her PhD from the University of Pittsburgh. She is now enjoying a postdoctoral fellowship in Neuroscience at the Center for the Neural Basis of Cognition and the Systems Neuroscience Institute. Her research interests pertain to cognitive and non-volitional control of vocalization. Dr. Helou also has clinical duties at the UPMC Voice Center and is an adjunct faculty member at Duquesne University.

Amanda I. Gillespie, PhD, CCC-SLP is an Assistant Professor of Otolaryngology and Adjunct Professer of Communication Science and Disorders at the University of Pittsburgh. She received her undergraduate degree from New York University, and her master's and PhD from the University of Pittsburgh. Her research interests include investigating new treatments for voice disorders, and the interesection of respiration and phonation.

2015 SYMPOSIUM AWARDS

YOUNG INVESTIGATORS SATALOFF AWARD

It is a great pleasure to announce that **Stephanie Misono, MD**, was selected as the 7th Annual Sataloff Young Investigator Award recipient for her paper *New Perspective on Psychosocial Distress in Patients with Dysphonia: The Moderating Role of Perceived Control*. On behalf of Elsevier, the Sataloff Award Committee, Committee Chair Dr. Norman Hogikyan, Advisory Board Chair Dr. Michael Johns and The Voice Foundation, congratulations!

HAMDAN INTERNATIONAL PRESENTATION AWARD

This Award is endowed by Dr. Abdul-Latif Hamdan and is specifically for those presenters who are coming from outside of North America. The committee recommended **Anna Rumbach,PhD, BSc, MSpPathSt, GCHEd** for the 2015 award. She is a Lecturer in Speech Pathology , School of Health and Rehabilitation Sciences at The University of Queensland, Australia.
Prevention of Laryngeal Contractures After Ingestion and Inhalation Injuries: Can Voice Therapy Help?
Anna Rumbach, Nicola Clayton

BEST STUDENT AWARD

Matthew Schloneger, PhD, was the winner of the first annual Best Student Presentation Award sponsored by **Dr. Abdul-Latif Hamdan.** The award judging, done live at the symposium, included both poster and oral presentations and the winning presentation was:
Assessments of Voice Use and Voice Quality Among College/University Singing Students Ages 18-24 through Ambulatory Monitoring with an Unfiltered Accelerometer Signal
Matthew Schloneger, Eric Hunter

POSTER AWARDS SPONSORED BY PENTAX MEDICAL

First Place
Acoustical Bases for the Perception of Vibrato as a Model of Vocal Tremor
Rosemary A. Lester, Brad H. Story
Second Place
Effects of a Cognitively Demanding Task on Spectral-Cepstral Acoustic Features of Voice in Healthy Young Adults
Megan K. MacPherson, Carolyn M. Michener, Cara E. Stepp
Third Place
An iOS-based Cepstral Peak Prominence App: Usability and Feasibility for Patient Practice of Voice Therapy Technique
Eva Van Leer, Xuefu Zhou

BEST PAPER WINNERS: 2014

Basic Science:
Vocal Fold Fibroblast Response to Growth Factor Treatment is Age Dependent: Results from an In Vitro Study,
Journal of Voice, Vol. 28, Issue 4, p420–423
Matthias Graupp, Karl Kiesler, Gerhard Friedrich, Herwig Ainödhofer, Hans-Jürgen Gruber, Petra Kieslinger, Amulya Saxena, Shigeru Hirano, and others

Clinical Medicine:
Efficacy of Anti-Reflux Surgery on Refractory Laryngopharyngeal Reflux Disease in Professional Voice Users: a pilot study,
Journal of Voice, Vol. 28, Issue 4, p492-500
Brittany Weber, Joel E. Portnoy, Andres Castellanos, Mary J. Hawkshaw, Deborah Lurie, Philip O. Katz, Robert T. Sataloff

Speech Language Pathology:
Exploring the Relationship Between Spectral and Cepstral Measures of Voice and the Voice Handicap Index (VHI),
Journal of Voice, Vol. 28, Issue 4, p430–439

Voice Training

An All-Encompassing Discipline

SCIENTIFIC PERSPECTIVE ON THE VOCAL ATHLETE

By veera khare asher, DMA, CSCS

VOICE TRAINING IS A SPORT

Once an individual is considered a vocal athlete, from an exercise science perspective, training the vocal process cannot focus on performance of the vocal mechanism alone. Voicing and its related mechanisms including volition, respiration, phonation, resonation and articulation, demands attention of the entire body and the interactions between nerves, muscles, and skeleton. Creating physical full body exercise programs for effectively training interactions of the neuromusculoskeletal system targeting voice performance, must therefore consider both the proprioceptive and biomechanical systems.

Proprioceptive Neuromuscular Facilitation (PNF) is an example of a technique that addresses both the proprioceptive and biomechanical systems, and with evidence-based medicine (EBM), has become widely accepted by athletes and clinicians. In sport science, PNF techniques are used primarily as a stretching technique, however the fundamental principles of PNF can also be applied to improve functional movements, muscle strength and stamina.

Voice training can benefit from adopting the fundamental principles and applications from PNF and exercise science; however, in order to create physical full body exercise programs specific to voice performance, it is imperative that voice experts become versed in the basics of neuromuscular training as defined by strength and conditioning science.

Identifying a consistent primary muscle contraction sequence throughout the body (i.e. firing order and type of muscle contraction) for the vocal process, that also makes use of neural mechanisms with proprioceptive characteristics, is critical for creating physical training programs. Ideally, the voice targeted neuromuscular recruitment pattern defined, will support enhancement of athletic performance of the entire body with a focus on the spine, while also considering quality of the voice and prevention of overuse injury. Already existing physical exercises can be adopted, but need to be modified if they do not have a voice performance or laryngeal stabilization component as a target goal for training.

Proprioceptive mechanisms are also dependent on spinal health for neuromuscular training. Target goals for voice training via physical exercises would therefore need to consider the neurophysiology of proprioception and CNS (central nervous system) proprioceptor sites (i.e. spinal cord, brain stem and cerebral cortex), in tandem with the biomechanical system (balance, coordination

(Continued on page 9)

VEERA KHARE ASHER, DMA, CSCS

(Continued from page 8)

and agility) for optimization of athletic performance for the entire neuromusculoskeletal system.

THE BREATH-CORE-VOICE CONNECTION

Voice performance is dependent on breath flow, and a level of control of subglottal pressure. The coordination of subglottal pressure is created in a complex coordination of the laryngeal and abdominal musculature during a controlled forced expiratory breath, necessitating laryngeal stabilization simultaneously with core stabilization. Voice pedagogues, such as Richard Miller, suggest exercises to train prephonatory tuning (prevoicing), which supports the concept that athletic improvement of voice performance can be achieved in part without phonation.

Prephonatory tuning, and its similarities to the process of the glottal Valsalva Maneuver in sport performance is where voice and sport professionals might meet on similar ground. In July 2014, the *Journal of Strength and Conditioning Research* published the results of a study that supported grunting as a form of phonation to enhance core power without oxygen cost. Since athletes do not have a way to measure or monitor phonation or voicing during a physical exercise or in performance training, then interdisciplinary research between sport science and voice science would be beneficial.

WHY STRENGTH AND CONDITIONING SCIENCE?

The area of strength and conditioning science is a component of exercise science that uses scientific principles for the purpose of developing and evolving practical applications, including physical exercise programs, in athletic training. The science of strength and conditioning addresses the changes of neuromuscular training at the cellular level. Neuromuscular training adaptions include: chronic motor unit adaptations, chronic neural adaptations, skeletal muscle adaptations, fiber type adaptations, fiber type transitions, biochemical muscle cell changes, anaerobic endocrine adaptations, and anaerobic improvements.

Knowledge of neuromuscular training adaptations is also imperative for how training and load variables are determined when considering muscular endurance, hypertrophy (muscle mass), strength and power. Load, repetitions, sets, and rest periods are based on the sport and SAID (specific adaptations to imposed demands) for the athlete. As specificity of training for voice performance becomes more clearly defined by its neuromuscular recruitment patterns, then physical exercise programs training the entire body for vocal power and stamina can be asserted. The choice of exercises, intensity and duration is further dependent on program design and periodization of long term training.

"...but the art of voice performance, with its texts, music, and storytelling is still an entity of its own that may never be demystified."

IN CONCLUSION

When discussing voice training as an all-encompassing discipline, it is important to clarify the difference between training goals using exercise science for improving athletic

(Continued from page 9)

performance for vocal strength, stamina and prevention of overuse injury, from training goals using proven methods for improving communication skills for speech and for artistic interpretation for performing artists. Sport science may be able to define some mechanisms of the body for improved vocal power and stamina and prevention of overuse injury, but the art of voice performance, with its texts, music, and storytelling is still an entity of its own that may never be demystified.

Although the world of sports is so vast, and a leader in athletic training, the physical full body exercise programs targeting improvement in voice performance, once defined, measured and tested, from both a voice science and exercise science perspective, may contribute back to the sports world and improve aspects of performance in their athletes as well.

References:

Asher V. The elite singer of the 21st century: innovation and new tools for training. *Grammy.org*, 2013. http://www.grammy.org/news/the-elite-singer-of-the-21st-century-innovation-and-new-tools-for-training

Asher V. The olympic singer: integrating pilates training into the voice studio." DMA diss., University of Nevada Las Vegas, 2009

Baechle TR and Earle RW eds. *Essentials of Strength Training and Conditioning*. 3rd ed. Champagne, IL: Human Kinetics, 2014.

Hibbs AE, Thompson KG, French D, Wrigley A, Spears I. Optimizing performance by improving core stability and core strength." *Sports Medicine*. 2008; 38(12):*995-1008*.

Sandage MJ, Pascoe DD. Translating exercise science into voice care. *Perspectives on Voice and Voice Disorders*. 2010;20(3): 84-89.

Thomas LB, Harrison AL, Stemple JC. Aging thyroarytenoid and limb skeletal muscles: lessons in contrast. *Journal of Voice*. 2008;22(4): 430-450.

Dr. Veera Khare Asher, soprano, earned her Opera degrees at the University of British Columbia and the Hartt School of Music in Connecticut. She completed her DMA in Voice Performance at the University of Nevada, Las Vegas under Dr. Carol Kimball. Dr. Asher's doctoral research highlighted her expertise as a voice performer and voice pedagogue, as well as knowledge from voice science, sport science and her years of post-secondary study in biochemistry at UBC. She has since been invited to present on her sports strength and conditioning techniques for NATS National, NATS-Los Angeles, The Voice Foundation, PAS6 , Grammy MusiCares; PAMA , NCVS-ICVPB, VASTA Conferences, and most recently for the NSCA (National Strength and Conditioning Association) in October 2014. As a professional member of organizations working within the disciplines of sports science/medicine (ACSM & NSCA) and Arts Medicine (PAMA), she was invited to introduce the Athletes and the Arts Initiative as a Grammy MusiCares Provider. Dr. Asher is a certified strength and conditioning specialist and professional member of the National Strength and Conditioning Association (NSCA). She is presently doing preliminary investigation on her Performance Body Sequencing™ and Precision Form techniques with Cory Schierberl at the United States Sports Academy Human Performance Lab.

SYMPOSIUM!

TVF JOINT MEETING WITH INTERNATIONAL ASSOCIATION OF PHONOSURGERY

SESSIONS IN 2015

Vocal Ease: Power without Pain, Strength without Strain: Learning to Feel the Vibratory Sensations of a Sustained, Richer, and Fuller Speaking Voice Using the Lessac System

WORKSHOP: DIANE GAARY AND ROBIN CARR

Workshops, Workshops

Stand Up Straight and Breathe!

WORKSHOP: JEANINE F. WAGNER & MARIA CLAUDIA FRANCA

Thanks to the attendees for the photos!

Breath and Support in Estill Vioice Training: Let It Go!

WORKSHOP: MARY MCDONALD KLIMEK

Conversation Training Therapy

WORKSHOP: JACKIE GARTNER-SCHMIDT (& AMANDA GILLESPIE) WITH ATTENDEE MARTHA RANDALL

Soul Ingredients: Developing the Rhythm, Phrasing, and Vocal Runs in Soul Singing

WORKSHOP: TRENEICE ROBINSON-MARTIN

Functional Voice Training for Pop/Rock Singers

WORKSHOP: MATTHEW EDWARDS

MASTER CLASS: DR. ROBERT SATALOFF AND MASTER CLASS TEACHER DOLORA ZAJICK

MASTER CLASS: STAR MEZZO-SOPRANO DOLORA ZAJICK TEACHES A CONTRALTO.

EVEN AFTER A FULL DAY OF SESSIONS, OVER 150 PEOPLE CROWDED THE ROOM FOR THE MASTER CLASS WITH VERA HONOREE **DOLORA ZAJICK,** ACCOMPANIED BY **RICHARD RAUB** .

MASTER CLASS: STAR MEZZO-SOPRANO **DOLORA ZAJICK** MAKES SOME CHANGES AND WE HEAR EVEN MORE GLORIOUS TONES FROM SOPRANO **CHRISTINA CHENES**.

POSTERS 50! POSTERS

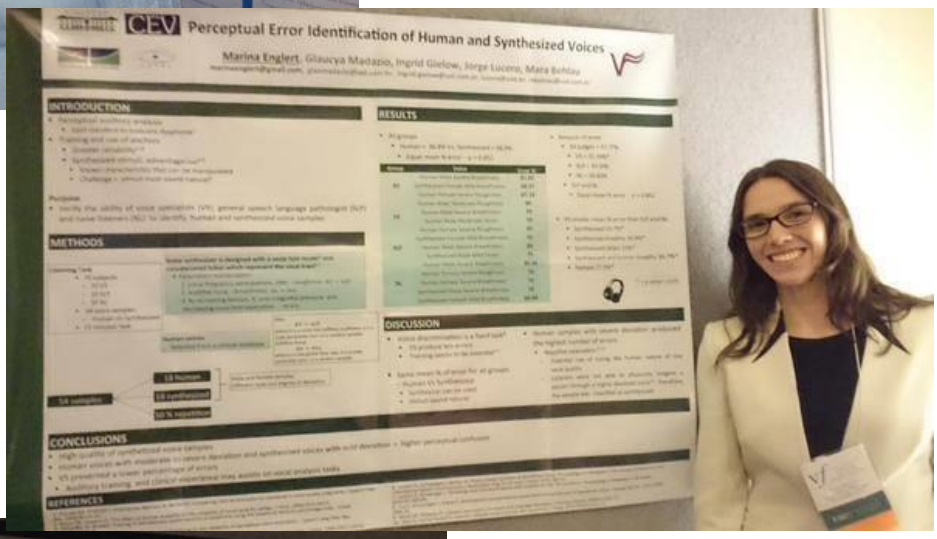
Control of the Glottal Configuration in Ex-Vivo Human Models

-AUDE LAGIER

MORE POSTERS

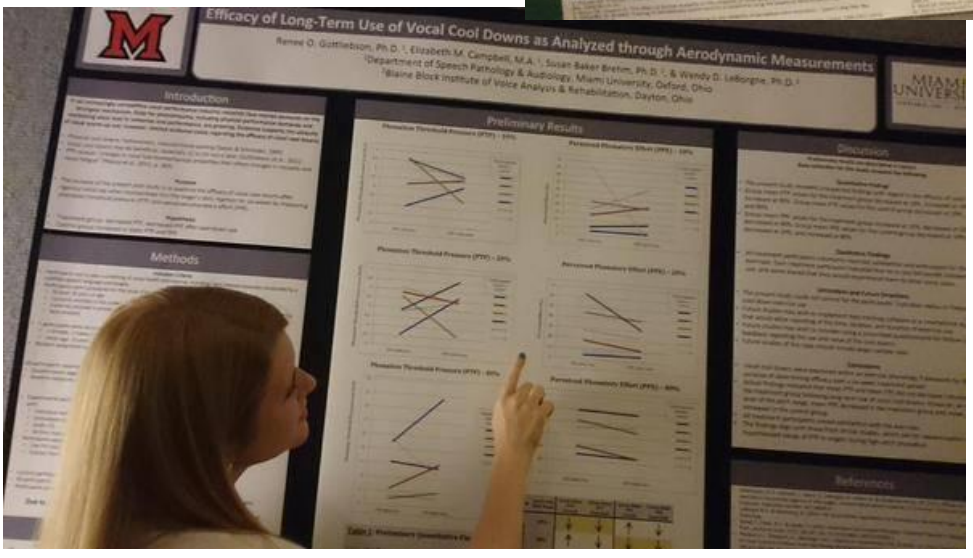
A Survey of Voice Usage among Religious Ministers

-EBONEE SMITH AND
MARIA CLAUDIA FRANCA



Perceptual Error Identification of Human and Synthesized Voices

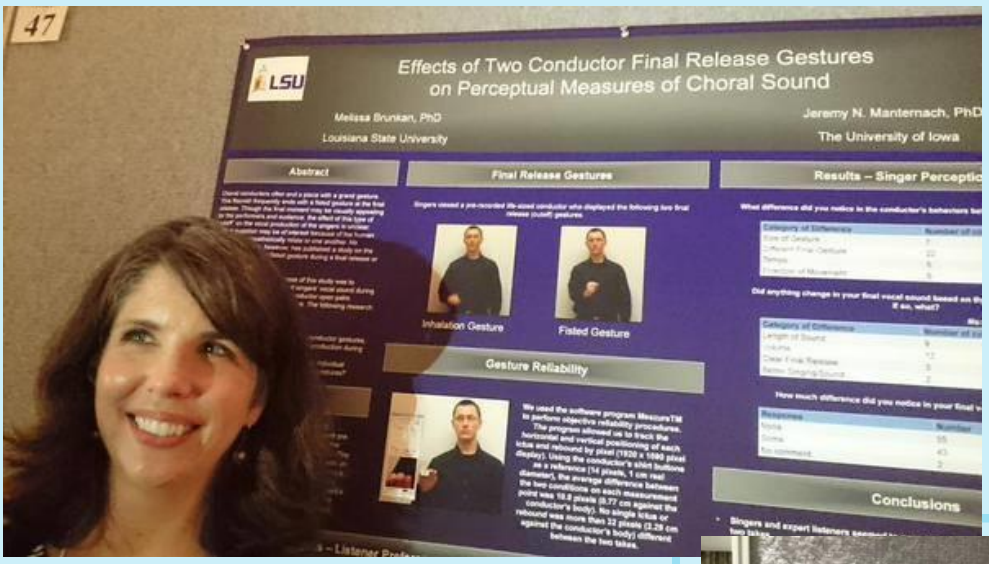
-MARINA ENGLERT



The Efficacy of Long-Term Use of Vocal Cool Downs as Analyzed through Aerodynamic Measurements

-RENEE O. GOTTLIEBSON

More, More, More



Effects of Two Conductor Final Release Gestures on Perceptual Measures of Choral Sound

-MELISSA BRUNKAN AND JEREMY MANTERNACH

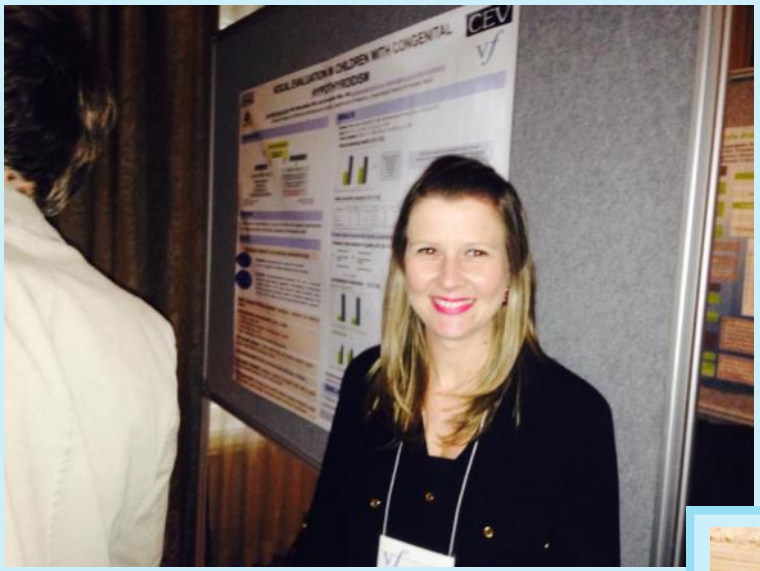
Benign Vocal Cord Lesions in Azerbaijan Mugham Singers and Their Treatment

-RAMIL HASHIMLI
WITH MARA BEHLAU

The Effects of Varied Conductor Background Colors on the LTAS, Intonation, and Perceptions of Three SATB Choirs

-ALAN J. MARTIN

What, More?

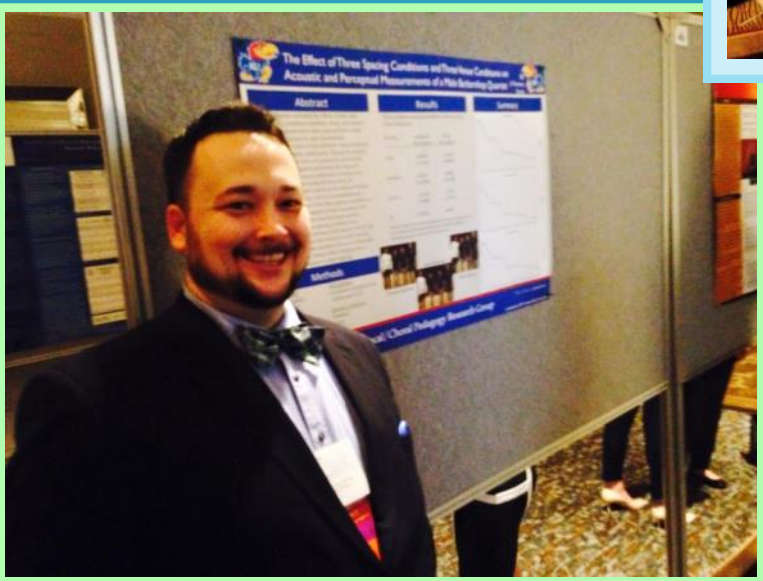


Vocal Evaluation of Children with Congenital Hypothyroidism

-ANA PAULA DASSIE-LEITE

Male Singing During Pubertal Voice Change: A National Survey of Male Enrollments and Selected Program Components in Middle School/Junior High School Choral Programs

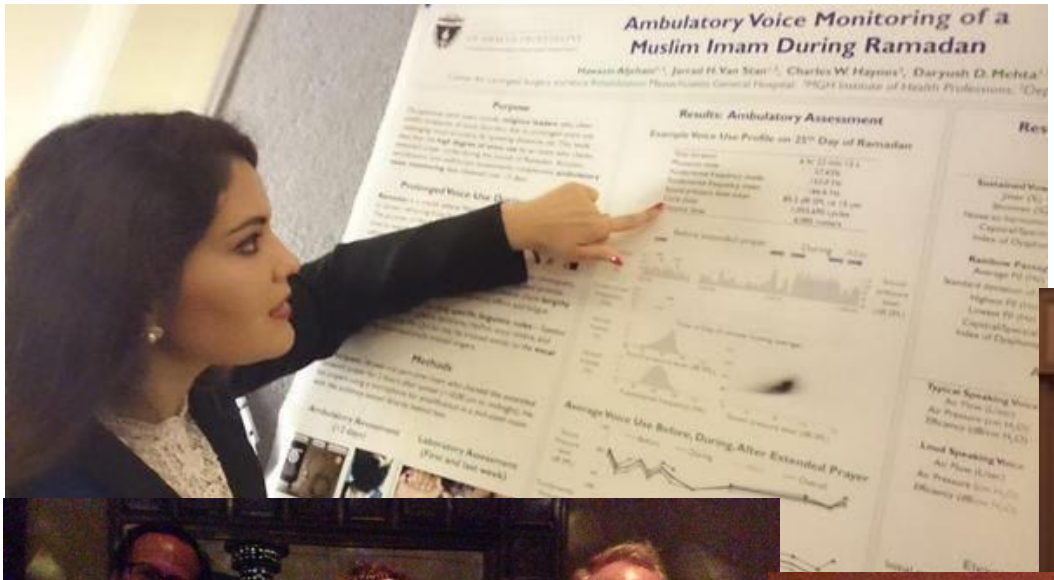
-NATHAN DAME



The Effect of Three Spacing Conditions and Three Venue Conditions on Acoustic and Perceptual Measurements of a Male Barbershop Quartet Member

-S. SCOTT THOMAS

Another



Ambulatory Voice Monitoring of a Muslim Imam During Ramadan

-HAWAZIN ALJEHANI

Presentation Outreach Meeting

Front: MAGGIE ANDERSON, LUCILLE RUBIN, DONNA SNOW, BRIAN P. GILL **Back:** MARIA RUSSO, NANCY P. SOLOMON, DEANNA MCBROOM, CAITROINA MUNIER, JAN POTTER REED, JEANIE LOVETRI, BROCK MEADATH, DIANE GAARY, ESTELLA LA

SAVE THE DATES:

45TH ANNUAL SYMPOSIUM: CARE OF THE PROFESSIONAL VOICE

JUNE 1-5, 2016 PHILADELPHIA PENNSYLVANIA

Having a blast with the Brazilian Colleagues!

Caring for the Whole Singer: Medical, Therapeutic, Research and Pedicological Perspectives

-JOHAN SUNDBERG, INGO TITZE, MARA BEHLAU, MELIN TAN AND DAVID MEYER

IAP Board Meeting

- ROBERT SATALOFF, MICHAEL BENNINGER—PRES., MARC REMACLE, GUILLERMO CAMPOS, JEAN ABITBOL, HARVEY TUCKER, NICK MARAGOS, IRIS RODRIGUEZ

SLP Session

Panel Discussion

- EDWIN YIU, CHAIR

THE VOICE FOUNDATION

Advancing understanding of the **voice** through interdisciplinary **scientific research & education**

THE VOICE FOUNDATION BOARD OF DIRECTORS

THE VOICE FOUNDATION

219 N. Broad St. 10FL
Philadelphia, PA 19107
(215) 735-7999
(215) 762-5572

voicefoundation.org
office@voicefoundation.org
journal@voicefoundation.org
abstracts@voicefoundation.org
symposium@voicefoundation.org

OUR THANKS TO PENTAX MEDICAL
SPONSOR OF THE 2015 POSTER SESSION