

COMMUNICATION SCIENCES AND DISORDERS
COLLEGE OF ALLIED HEALTH SCIENCES

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE WOMEN

FOR APPLICATION YEAR: 2021

PROJECT TITLE: Laryngeal Reflexes in those With and Without Voice Disorders

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Project Description

Vocal Hyperfunction (VH), defined as excessive or imbalanced laryngeal (voice box) muscle tension, is a common clinical problem in at least 40% of those with voice disorders. Despite the prevalence of VH, the factors that predispose someone to develop VH are not understood. It is thought that VH may be due to an "irritable larynx," or a sensory disturbance of the larynx that manifests as abnormal motor patterns; however, this has yet to be directly tested. Therefore, the overarching goal of this project is to assess how the larynx responds to different sensory stimuli in those with and without VH.

Our protocol (IRB approved #2020-0333) will evaluate chemosensory (chemical response) and mechanosensory (touch response) to the larynx. We will pass a flexible laryngoscope (camera) in through the nose, over the soft palate, and down into the throat to view the larynx. Then, we will either elicit a reflexive cough by providing a noxious chemical that results in a cough (chemosensory response) or a reflexive laryngeal closure response by providing short bursts of air to the larynx (mechanosensory response). We will record the results with the camera and use algorithmic estimation techniques to determine how sensation impacts movements.

We hypothesize that individuals with VH will show a greater magnitude of responses "indicating a hypersensitive system, and/or more variable motor responses" indicating a dysregulated laryngeal sensorimotor system. A wise scholar will be joining a research team consisting of professionals from speech-language pathology, laryngology, and biomedical engineering. The scholar will be working alongside other students and professionals to gather and analyze participant data.

Qualifications

- Preferred academic background: biomedical engineering, electrical engineering, or computer science preferred
- Preferred skills: Comfort with trouble-shooting and fixing equipment
- Preferred skills: proficient in MATLAB scripting for data processing (toolboxes: Econometrics, Audio, Statistics and Machine Learning, Image Processing)

Knowledge/Skills WISE scholar will acquire:

- Data ethics and integrity via CITI Training, IRB on-boarding, and lab on-boarding
- Experience with research participants: how to discuss research consent, how to screen and run participants
- Knowledge of voice disorders (e.g., laryngeal anatomy and physiology)
- Data processing of video images (e.g., pixel estimation algorithms)
- FDA compliance and data safety monitoring for Investigational New Drugs (IND) (Approved FDA IND Application #152398)
- Cross-discipline collaboration skills: speech-language pathology, vocal health specialists, pharmacists, and physicians (laryngology)

Suggested Readings

- Diaz-Cadiz, M., McKenna, V.S., Vojtech, J.M., Stepp, C.E. (2019). Adductory Vocal Fold Kinematic Trajectories During Conventional Versus High-Speed Videoendoscopy. *JSLHR* 62(6):1685-1706.
- Hillman R.E., Stepp C.E., Van Stan J.H., Zartu M., Mehta D.D. (2020). An Updated Theoretical Framework for Vocal Hyperfunction. *Am J Speech Lang Pathol.* 29(4):2254-2260.
- Ludlow, C.L. (2015). Laryngeal Reflexes: Physiology, Technique, and Clinical Use. *J Clin Neurophysiol* 32(4):284-93.
- Vertigan, A.E., Bone, S.L., Gibson, P.G.. (2013). Laryngeal Sensory Dysfunction in Laryngeal Hypersensitivity Syndrome: Laryngeal Sensory Dysfunction. *Respirology* 18(6):948-56.