



Characterization of Vocal Pathology in Military Drill Instructors

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Introduction

- Vocal abuse and misuse can cause hoarseness, vocal fold injury, and aphonia. Vocally demanding occupations like teachers¹, singers², fitness instructors³, and factory workers⁴ are at increased risks for vocally abusive behaviors and dysphonia.
- Military Training Instructors (MTIs) spend extended hours coaching young recruits in intensive weekly physical training. Vocal misuse (e.g. shouting, yelling, chronic throat clearing, and coughing) are common.⁵
- The command voice employed by MTIs typically uses physical exertion shown to increase phonatory effort and predispose instructors to a risk of increased laryngeal strain and vocal fold injuries.^{6,7} Despite high vocal demands, MTIs are provided with minimal to no training on dysphonia prevention or management.



FIGURE 1. Thirty-three-year-old male with sulcus vocalis at initial presentation to clinic.

FIGURE 2. Thirty-four-year-old male with bilateral epithelial thickening.



FIGURE 3. Twenty-eight-year-old male with left ventricular cyst and bilateral convex TVF.

Objectives

- Identify laryngeal pathology associated with MTIs, evaluate vibratory characteristics.
- Correlate pathology, auditory perceptual evaluations, and patient reported outcome measures (PROMs).

Methods

- A retrospective review** of military health system databases was completed December 2017 to October 2019 for MTIs with a diagnosis of dysphonia following approval by the San Antonio Military Medical Center Institutional Review Board.
- The study population** consisted of 12 active-duty U.S. Army DIs / Airforce MTIs (7 male, 5 female) at Fort Sam Houston and Lackland Airforce Base who completed training cycles at multiple points in their career.
- Demographic Information** was collected via review of medical records for age, gender, and pertinent medical history including diagnosis or treatment of gastroesophageal reflux disease (GERD), allergies, reported vocal hygiene, tobacco and alcohol intake.

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Table 1. Demographics and Medical History, N=12

Sex		
Female	5	41.7%
Male	7	58.3%
Median Age	34	28-43
History of Tobacco Use	0	0%
History of GERD/LPR	6	50%
History of Environmental Allergies	6	50%
Caffeine Intake	8	66.6%
Alcohol Intake	2	16.6%

- Auditory Perceptual Evaluations and PROMs** consisted of the Voice Handicap Index (VHI-10), Reflux Symptom Index (RSI), and Consensus Auditory Perceptual Evaluation of Voice (CAPE-V) were reviewed and correlated to videostroboscopy findings.
- Videostroboscopic evaluations** were analyzed using the Voice Vibratory Assessment with Laryngeal Imaging (VALI)⁸ rating scale by speech pathologists and laryngeal pathology was diagnosed by a fellowship trained laryngologist.
- Descriptive statistics** (i.e. mean, frequency, standard deviation, percentages) were calculated for characteristics of laryngeal pathology, patient reported measures, and pertinent medical history.

Results

Characteristics of Patient Population:

- Table 1** summarizes demographics and characteristics of sample population.
- Pertinent vocal hygiene history included prior history of GERD (50%), caffeine intake (66.6%), and daily water intake of less than 32 oz (8.3%).
- All patients denied prior or current tobacco use (0%). Eight (66.6%) reported occasional alcohol intake.

Laryngeal Pathology:

- Laryngeal pathology was categorized by the presence of hemorrhage (8.3%), polyp (25.5%), bilateral epithelial thickening (58.3%), unilateral epithelial thickening (33.3%), sulcus vocalis (25.0%), ventricular cyst (8.3%), and ectasia (25.0%).

Table 2.

Diagnosis	N	%	Treatment	
			Behavioral Voice Intervention	Surgery
Hemorrhage	1	8.3%	X	
Polyp	3	25.5%	X	
Bilateral Epithelial Thickening	7	58.3%	X	N=1; 14.28%
Unilateral Epithelial Thickening	4	33.3%	X	N=1; 25%
Sulcus Vocalis	3	25.0%	X	
Ventricular Cyst	1	8.3%	X	
Ectasia	3	25.0%	X	

References:

- Titze IR, Lemke J, Montequin D. Populations in the U.S. workforce who rely on voice as a primary tool of trade: A preliminary report. *J Voice*. 1997; 11:254-259.
- Estes C, Sadoughi B, Coleman R, D'Angelo D, Sulica L. (in press). Phonotraumatic injury in fitness instructors: Risk factors, diagnoses, and treatment methods. *Journal of Voice*. Doi: 10.1016/j.jvoice.2018.10.001.
- Portela AS, Granqvist S, Ternstrom S, Sodersten M. Vocal behavior in environmental noise: Comparisons between work and leisure conditions in women with work-related voice disorders and matched controls. *J Voice*. 2017; 32: 126.e23-126.e38.
- Roy N, Merrill RM, Gray SD, Smith EM. Voice disorders in the general population: Prevalence, risk factors, and occupational impact. *Laryngoscope*. 2005; 115 (11):1988-1995.

PROMs:

- VHI-10 scores ranged from 0 to 40 (mean 15.42, SD=11.27). RSI scores ranged from 4 to 25 (mean 15.33, SD=7.80).

Vibratory Characteristics:

- 100% had secondary muscle tension dysphonia/supraglottic hyperfunction, 75% had incomplete phase closure (**Figure 3**), and 66% of subjects had an hourglass or irregular glottic closure pattern (**Figure 4**).



FIGURE 4: Video montage of incomplete closure across a phase cycle in MTI with bilateral epithelial thickening.

Auditory Perceptual Measures:

- According to the CAPE-V, all 9 patients demonstrated abnormalities in roughness, breathiness, strain, pitch, and loudness with an overall average severity of 53.5 (moderately impaired).

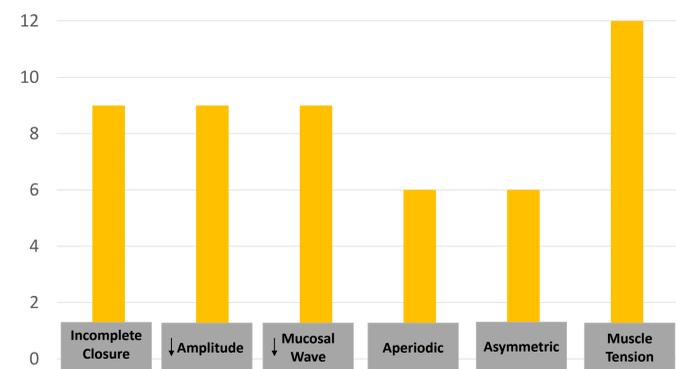


FIGURE 4: Vibratory Characteristics according to the Voice Vibratory Assessment of Laryngeal Imaging Rating Scale (VALI)

Conclusions

- Vocal fold pathology was common in DIs and MTIs.
- The most common pathology was bilateral epithelial thickening at the time of presentation to the voice clinic.
- Vibratory characteristics were altered in all patients with a high prevalence of secondary muscle tension dysphonia.
- PROMs such as the Voice Handicap Index (VHI-10) correlated with reported perceptual dysphonia and vocal fold pathology.
- Dysphonia as a result of vocal fold pathology persists throughout various stages of military training instructors' flight cycles and tends to remain despite behavioral voice intervention.
- Further work is warranted to investigate vocal fold abnormalities and corresponding physiologic alterations at the beginning of drill instructors' careers and periodically throughout.

- Spellman J, Coulter M, Roth C, Johnson C. (in press). Prevalence, characteristics and impact of dysphonia in US Marine Corps Drill Instructors. *J Voice*. Doi: 10.1016/j.jvoice.2019.02.015.
- Pomaville F, Tekerlek K, Radford A. (in press). The effectiveness of vocal hygiene education for decreasing at-risk vocal behaviors in vocal performers. *Journal of Voice*. Doi: 10.1016/j.jvoice.2019.03.004
- Estes C, Sadoughi B, Coleman R, D'Angelo D, Sulica L. (in press). Phonotraumatic injury in fitness instructors: Risk factors, diagnoses, and treatment methods. *Journal of Voice*. Doi: 10.1016/j.jvoice.2018.10.001.
- Poburka BJ, Patel RR, Bless DM. Voice-Vibratory Assessment with Laryngeal Imaging (VALI) form: reliability of rating stroboscopy and high-speed videoendoscopy. *J Voice*. 31; 4, 513e1-513e14.