

# Speaking and Nonspeaking Voice Professionals: Who Has the Better Voice?

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**Summary: Introduction.** Voice professionals can be classified into two major subgroups: the primarily speaking and the primarily nonspeaking voice professionals. Nonspeaking voice professionals mainly include singers, whereas speaking voice professionals include the rest of the voice professionals. Although both of these groups have high vocal demands, it is currently unknown whether both groups show similar voice changes after their daily voice use. Comparison of these two subgroups of voice professionals has never been done before.

**Aim.** This study aimed to compare the speaking voice of speaking and nonspeaking voice professionals with no obvious vocal fold pathology or voice-related complaints on the day of assessment.

**Methodology.** After obtaining relevant voice-related history, voice analysis and videostroboscopy were performed in 50 speaking and 50 nonspeaking voice professionals.

**Results.** Speaking voice professionals showed significantly higher incidence of voice-related complaints as compared with nonspeaking voice professionals. Voice analysis revealed that most acoustic parameters including fundamental frequency, jitter percent, and harmonic-to-noise ratio were significantly higher in speaking voice professionals, whereas videostroboscopy did not show any significant difference between the two groups.

**Conclusion.** This is the first study of its kind to analyze the effect of daily voice use in the two subgroups of voice professionals with no obvious vocal fold pathology. We conclude that voice professionals should not be considered as a homogeneous group. The detrimental effects of excessive voice use were observed to occur more significantly in speaking voice professionals than in nonspeaking voice professionals.

**Key Words:** Professional voice user–Videostroboscopy–Voice analysis–Singers–Fundamental frequency.

## INTRODUCTION

Voice is an integral part of our social communication, individual persona, and expression of emotions. For voice professionals (VPs), additionally, it is a source of livelihood.<sup>1</sup> The different VPs include teachers, lawyers, telephone operators, television and radio broadcasters, priests, cheerleaders, aerobics instructors, counselors, singers, actors, sales people, attorneys, clergy, physicians, politicians, telephone receptionists, secretaries, day care workers, interpreters, business representatives, military personnel, travel agents, tourist guides, bank and post office employees, and insurance agents.<sup>1–4</sup> Based on mode of voice usage, VPs can be classified into two major subgroups: primarily speaking VPs (SVPs) and primarily nonspeaking VPs (NSVPs). The NSVP group mainly includes singers, whereas the speaking subgroup includes the rest of the voice professionals. Additionally, NSVPs can be of different types depending on the type of singing: classical, opera, western, jazz, country, pop, and others. Voice analysis (VA) and videostroboscopy (VSB) are two of the most common modalities used in voice assessment of VPs. VA objectively measures acoustic parameters of voice, whereas VSB permits real-time visual assessment of vocal folds and identifies structural changes in vocal folds.<sup>5–7</sup>

Although the finer mechanisms may be different, speaking and singing essentially use the same basic principle of voice production involving repeated oscillations of vocal cords. For a VP,

who has high vocal demands, both these processes can produce detrimental effects. However, it is currently unknown whether both SVPs and NSVPs face ill effects of excessive voice use to a similar extent. Literature review revealed that most studies have analyzed either SVPs<sup>3,8,9</sup> or NSVPs<sup>2,10,11</sup> separately. Additionally, most voice studies have concentrated on vocal fold pathologies, and very few have been done in VPs with no obvious vocal fold pathology. This study is the first of its kind to compare the effects of excessive voice use in VPs with no obvious pathologies in both the subgroups of VPs, using both VA and VSB.

## Aim

This study aimed to compare the speaking voice of SVPs with that of NSVPs, both of whom have no obvious vocal fold pathology and no voice-related complaints on the day of assessment.

## MATERIALS AND METHODS

This is a case-control study conducted from November 2012 to June 2014. A total of 100 VPs (50 SVPs and 50 NSVPs) were selected. Considering it was a pilot study, a sample size of 50 subjects in each group was selected. After procuring the institutional review board's approval, subjects were selected as per the following criteria:

Inclusion criteria:

- age: 18–60 years
- absence of obvious vocal fold pathologies on indirect laryngoscopic examination
- no voice-related or Otorhinolaryngology OPD (Out Patient Department) complaints on the day of assessment.

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Exclusion criteria:

- conditions that precluded performing laryngoscopy comfortably (eg, stridor, markedly decreased mouth opening, excessive gag reflex, temporomandibular joint (TMJ) abnormalities)
- conditions that precluded ability to produce voice or caused change in voice not related to vocal abuse (eg, smoker's cough, presence of tracheostomy tube, nasopharyngeal or oral mass, post-laryngeal trauma, post-laryngectomy patients)
- presence of obvious vocal cord abnormalities (eg, vocal polyps, vocal nodules, vocal cord palsy, Reinke edema, laryngopharyngeal reflux)
- medical conditions affecting voice production or quality of voice (eg, neurologic diseases; endocrine diseases; psychiatric disturbances; asthma; and speech, language, and hearing problems)
- infectious or allergic conditions affecting voice quality or its production (eg, infectious laryngitis, nasal allergy, sinusitis, pharyngitis, and tonsillitis) in the past 4 weeks.

### Patient selection procedure

Information booklets and posters were put up in our outpatient department (OPD). Some VPs (especially teachers, lawyers, and singers) visited the OPD as a part of annual health checkup camps organized by their respective employers. Other VPs who were accompanying a patient to the OPD during the study period volunteered for the study. The rest of the VPs were advised to take part in this study by their friends or colleagues who had information about this study. As we wanted to study the voice of apparently normal VPs, we excluded VPs visiting the OPD with any ENT or voice-related complaints. None of the subjects had any voice-related complaint on the day of examination.

After obtaining a written informed consent from the subjects, a detailed history regarding their profession, work experience, and formal training received for proper use of voice, if any, were noted down. History of smoking, alcohol intake, and substance abuse was also recorded. Subjects were asked about their voice-related complaints in the past 4 weeks. The four different voice complaints recorded were throat irritation, hoarseness, voice fatigue, and pain in the throat during or after voice use. If subjects had any of these complaints for most part of the day on at least 3 days a week in any of the preceding 4 weeks, it was recorded as a positive voice history. All subjects were blinded regarding the purpose of the assessment. VPs were also asked to maintain a diary for 1 month to record the duration of use of voice per day at their workplace. The recordings of the diary were collected telephonically after 1 month.

A general physical examination including head and neck examination was performed to detect any underlying illness, if any. Preliminary laryngeal examination was performed with indirect laryngoscopy mirror to rule out obvious vocal fold pathologies. To maintain uniformity and reduce interobserver bias, the same otolaryngologist collected all the relevant history and performed physical examinations including laryngeal examinations.

### Subject assessment

Both VA and VSB were performed on the same day. The tests were non-randomly orderless to avoid the bias due to order.

### Day and time of assessment

To minimize the effect of voice use on that particular day and to bring about uniformity, all VPs were instructed to report early in the morning before their day at their workplace started. Assessment was scheduled on the day following a typical voice use day. If for some reason a VP had used disproportionately less or more voice during the previous day, he or she was asked to report after a gap of 2–3 days.

### Voice analysis

#### Procedure and instrumentation

*Dr. Speech* commercial software (Tiger Electronics Inc., Seattle, WA) was used to assess voice function.

Detailed instructions were given to each patient regarding the procedure. The selected sampling frequency was 44,100 Hz. A room with a noise level less than 40 dB sound pressure level was used. A microphone (ECM-717 Electret Condenser Microphone; Sony Corporation, Japan) mounted on a stand at 10 cm from the mouth of the subject at an angle of approximately 45 degrees was placed, and the subject was asked to say a sustained vowel (/a/) for 10 seconds at a comfortable pitch and in a habitual way. A mid-5-second segment of each reading was used for analysis. Three readings were taken, and the mean of the three readings was taken as the final reading. The new wav files recorded were stored under 16-bit resolution.

The Real Analysis program of *Dr. Speech* software was used for calculation.

Parameters studied included mean fundamental frequency ( $F_0$ ), mean jitter percent (JP), mean shimmer percent (SP), mean harmonic-to-noise ratio (HNR), and the grade of breathiness.

Definitions of the parameters are as follows:<sup>12-18</sup>

- Frequency parameters:  
 $F_0$ : Number of vibrations of vocal folds per second (Hz)
- Frequency perturbation measures:  
JP: Short-term evaluation of cycle-to-cycle variation of  $F_0$  (%)  
SP: Short-term evaluation of cycle-to-cycle variation of amplitude (%)
- Noise parameters:  
HNR: Ratio between the total energy of a harmonics and the total energy of the noise components of a signal (dB)
- Voice quality estimate:  
Breathiness: Impression of the extent of air leakage through the glottis. The breathiness of the voice is graded by *Dr. Speech* software into four different grades – 0, 1, 2 and 3.

### Videostroboscopic analysis

ATMOS Endo Stroboscope L with Cam 21 with 70° laryngoscope (ATMOS Inc., Allen, PA) was used for videostroboscopic analysis.

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