Relationship between Voice Complaints and Subjective and Objective Measures of Vocal Function in Iranian Female Teachers

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Summary: Objectives. Teachers are at high risk of developing voice problems because of the excessive vocal demands necessitated by their profession. Teachers' self-assessment of vocal complaints, combined with subjective and objective measures of voice, may enable better therapeutic decision-making. This investigation compared audio-perceptual assessment and acoustic variables in teachers with and without voice complaints.

Methods. Ninety-nine teachers completed this cross-sectional study and were assigned to one of two groups: those "with voice complaint (VC)" and those "without voice complaint (W-VC)." Voice samples were collected during reading, counting, and vowel prolongation tasks. Teachers were also asked to document any voice symptoms they experienced. Voice samples were analyzed using Dr. Speech program (4th version; Tiger Ltd., USA), and labeled "normal" or "abnormal" according to the "grade" dimension "G" from GRBAS scale.

Results. Twenty-one teachers were assigned to the VC group based on self-assessment data. There were statistically significant differences between the two groups with regard to self-reported voice symptoms of hoarseness, breathiness, pitch breaks, and vocal fatigue ($P < 0.05$). Fourteen participants in the VC group and 40 from the W-VC group were determined to demonstrate "abnormal" vocal quality on perceptual assessment. Only harmonic-to-noise ratio was significantly higher for the W-VC group (ES = 0.55).

Conclusion. Teachers with and without voice complaints differed in the incidence, but not type of voice symptoms. Teachers' voice complaints did not correspond to perceptual and acoustic measures. This suggests a potential unmet need for teachers to receive further education on voice disorders.

Key Words: Teachers–Voice problem–Voice complaints–Audio-perceptual assessment–Acoustic measure.

INTRODUCTION

Teachers are professional voice users at exceptionally high risk of developing voice problems; as many as 39% of teachers report voicing problems because of the high vocal demands of their vocation.[1,2] Teachers also demonstrate higher incidence and prevalence of voice complaints compared to members of other professions whose jobs do not involve similarly high vocal demand.[3–6] Teachers with a greater number of voice complaints are at higher risk for developing a voice disorder,[2,7–10] in part due to profession-specific risk factors such as loud background noise, dryness,[11] poor posture, limited knowledge of factors that contribute to voice complaints,[12] and high day-to-day professional voice demands.[13,14]

Excessive vocal demands have the potential to cause small to large-scale changes in both vocal fold structure and function.[1,11,15] Confirming the presence of these changes is an essential step toward achieving an accurate and holistic diagnosis, therefore multiple assessment tools are often necessary. These frequently include aerodynamic, acoustic, perceptual and quality of life measures, in addition to various endoscopic means of visualizing the vocal apparatus at rest, and during various voicing tasks. Information gleaned from each of these is considered within the context of patient-specific voice complaints[4] to guide the therapeutic decision-making process. In particular, this project sought to reveal the most common vocal complaints in teachers as well as perceptual and acoustic changes associated with these complaints.

Teachers' vocal complaints and self-reported voice symptoms

Sliwinska-Kowalska et al[16] found that self-reported voice symptoms in Polish teachers were 2–3 times more than nonteachers. Seifpanahi et al[17] revealed that 54.6% of Iranian teachers demonstrated voice complaints compared to 21.1% of nonteachers. These numbers are close to those reported by other similar studies,[3,4,18,19] including hoarseness, breathiness,[3,20] and vocal fatigue. The available data show that aside from the presence of an established laryngeal pathology, dissatisfaction about voice quality prompts many teachers to take action to undergo comprehensive voice evaluation procedures.

Audio-perceptual assessment and vocal complaints

Abnormal voices are perceived and interpreted in a manner that reveals important information about voice function.[11] For a voice therapist, this is an important initial step of the comprehensive voice evaluation. Many patients with voice disorders seek treatment when they perceive something abnormal with their voice.[21] Audio-perceptual voice assessments quantify the severity of

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audible voice parameters and are used to characterize specific features of voice,[21] including pitch, loudness, and quality. Information gleaned from audio-perceptual assessments is ideally examined alongside information obtained during other, more objective assessments including acoustic analysis. Here, information pertaining to vocal frequency, intensity, and perturbation measures, obtained from the client, is compared with age- and gender-matched norms.[22] Examples of commonly used audio-perceptual assessment scales include the GRBAS scale, the Roughness, Breathiness, and Hoarseness (RBH) scale, the Consensus Auditory Perceptual Evaluation of Voice (CAPE-V), and the Grade, Roughness, and Breathiness (GRB) scale. Each of these evaluates vocal quality during conversational speech or speech produced while reading.[23] There is evidence that relates the findings of perceptual, visual (endoscopic or stroboscopic), and acoustic assessments to the presence of voice pathology.[22] However, little information exists detailing the relationship between perceptual assessment of voicing and patient-specific voice complaints. Whereas Tavares and Martins[9] showed that voice disorders were more prevalent in individuals displaying perceptual voice symptoms, Åhlander et al[8] and Gotaas and Starr[24] found no significant differences in perceptual variables relating to voice status between two groups, one with and one without vocal complaints.

Acoustic measures with vocal complaints

Acoustic analysis procedures are noninvasive and relatively simple to obtain,[25,26] and help the therapist to differentiate between normal and abnormal voices as well as quantify patient response to intervention.[26] Mixed findings exist as to the nature of acoustic measures of voice function in teachers with voice complaints. Rantala and Vilkman[27] found a positive relationship between voice complaints and increases in fundamental frequency (F_0); however, frequency perturbation (jitter) and amplitude perturbation (shimmer) were decreased in teachers with a greater number of voice complaints compared to those with few complaints. Ma and Yiu[28] and Laukkanen et al[29] found no relationship between the presence of vocal complaints and aberrant acoustic measures of vocal function.[30]

Little is known about these issues as they relate to voice complaints, particularly among Iranian teachers; however, due to concerns related to health affairs in teachers and comparisons across cultures in voice topics,[31] it seems necessary to do a survey. We sought to delineate differences between teachers with and without voice complaints, and also if there is any relation between teachers' voice complaints and other assessment results; so, the central aim of this study was to distinguish differences in: (1) reported vocal symptoms, (2) audio-perceptual assessment of voice quality, and (3) acoustic variables relating to voice function in two cohorts: teachers with and without voice complaints. We also compare these two groups based on age and years of teaching.

METHOD

Subjects

The study was approved by the ethics committee of the Iran University of Medical Sciences and all of the participants provided informed consent prior to data collection. Cluster sampling was used to select 99 female elementary school teachers from all public elementary schools in Tehran, Iran. We included only female teachers as it was shown that the prevalence of voice problems is higher in female than in male teachers[32,33] (see Table 1).

Following informed consent and baseline data collection, the teachers were assigned to one of two groups according to their responses to the following question: "Do you feel you have a voice problem?" Teachers who responded "yes" were assigned to the "with voice complaint" (VC) group. Teachers who responded "no" were assigned to the "without voice complaint" (W-VC) group.

PROCEDURES

Voice samples

Voice samples were collected from each participant using a head-mounted microphone (type: ECM-717 electret condenser microphone, Sony Corporation, Tokyo, Japan) placed at a 45 degree angle, 10 cm distance from the mouth. A sound recording program, native to the study laptop (LG company; Model: LS70, Korea), was used to record the voice signals for later analysis. After the microphone was placed, each participant was instructed to read a standard passage in Persian, count from 1 to 20, and sustain the vowel /a/ for at least 5 seconds, three times. During each task, the participant was instructed to speak in a comfortable, conversational style using typical pitch and loudness levels. The third repetition of /a/ was selected for acoustic analysis.[23] A sound level meter (Model: CEL-450, product of CASELLACELL, Casella Measurement, Buckinghamshire, UK) was used to measure the noise level of room to be Min LA: 28.00 dB and Min LC: 40.8 dB.

TABLE 1.
Inclusion and Exclusion Criteria

Inclusionary Criteria	Exclusionary Criteria
• Female	• Current or former smoker
• Aged at least 50 years (so as to avoid voice effects attributable to menopause or premenopause)	• History of heart, pulmonary, or neurologic disease
• Employed as a teacher full time (defined as an average of 36 working hours per week over 5 days)	• History of allergies
• Normal hearing	• History of head and neck surgery
• Native Persian speaker	• History of gastroesophageal reflux
	• Respiratory infection within 3 weeks of participation