The Effect of Surface Hydration on Teachers' Voice Quality: An Intervention Study

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Summary: Purpose. This study aimed to investigate the effects of surface hydration on teachers' voice quality.
Study Design. This is an examiner-blinded, pretest and posttest intervention study with a single group of subjects.
Method. Subjects were 27 teachers from a public-sector state school in Salvador, Bahia, Brazil. Pre- and post-intervention voice recordings were obtained. Voice samples collected underwent computerized acoustic analysis (*VoxMetria*) and perceptual analysis *via* the Consensus Auditory-Perceptual Evaluation of Voice. Intervention was conducted daily before teaching for a 4-week period, consisting of 5 minutes of nebulization with saline solution (NaCl 0.9%), after 10 minutes of dehydration breathing through the mouth.
Results. A reduction in the overall level of voice alteration was observed in the Consensus Auditory-Perceptual Evaluation of Voice, but with no statistical significance. The following were observed: an increase in the mean fundamental frequency of the vowel /a:/ ($P = 0.036$); a statistically significant reduction in the minimum intensity of connected speech ($P = 0.028$), in the median intensity of connected speech ($P = 0.014$), and in the maximum intensity of connected speech ($P = 0.007$). There was also a statistically significant reduction in the minimum ($P = 0.001$) and mean intensities of spontaneous speech ($P = 0.011$).
Conclusion. Surface hydration with saline solution led to an improvement in teachers' voice quality.
Key Words: Occupational health–Teachers–Voice disorders–Hydration of the vocal fold–Teaching.

INTRODUCTION

Teachers are part of a group of professionals who use their voice as their primary working tool.[1,2] These professionals are part of a high-risk category in terms of the development of voice problems and have the highest prevalence of dysphonia among professional voice users.[3–8]

In a study conducted on teachers and nonteachers in the United States, it was found that teachers, who have experienced multiple episodes of dysphonia, consistently attributed their voice symptoms to their occupation, as compared with nonteachers. Results also showed that teachers were significantly more predisposed to limitations in certain tasks (eg, difficulty projecting their voice, trouble speaking or singing softly, loss of singing range), thus reducing their activities or interaction, and changing professions owing to voice issues. Moreover, teachers were the professionals who were absent the most throughout the year during working days, because of dysphonia.[9]

Similar results were noted in a study conducted on teachers and nonteachers in Brazil. A significantly higher occurrence of voice symptoms was observed in teachers. Symptoms include hoarseness, vocal fatigue, difficulty in projecting the voice, discomfort when talking, monotonic voice, effort when speaking, dry throat, sore throat, coughing and vocal instability with tremor, difficulty swallowing, acid taste in the mouth, and difficulty with high-pitched singing, as well as more reports of voice alteration and the association of these symptoms with professional voice users.[10]

Dysphonia in this professional group is associated with common characteristics of this occupation, such as facing an intense and prolonged working day, conducted in noisy surroundings and under adverse vocal conditions.[6,11–15] Hoarseness, vocal fatigue when speaking, and laryngeal desiccation are the symptoms of work-related voice disorders most reported by teachers.[11,13]

A combination of environmental factors, systemic conditions, or illness may lead to laryngeal desiccation.[3,14] Vocal folds without adequate hydration may produce an onset of dysphonia and worsening of voice performance, because a reduction in fluid can create a sheet of viscous mucus that may potentially affect vocal fold vibration.[16–18]

Vocal fold hydration is maintained by fluid in several water compartments.[19] The hydration level may affect the stiffness and the viscosity of the vocal fold lamina propria.[20] Systemic hydration refers to fluid within the body and vocal fold tissue, whereas superficial or surface hydration is the fluid lining the vocal fold surface and laryngeal lumen.[19] Challenges to systemic and superficial vocal fold dehydration may compromise vocal quality and phonatory efficiency in vocally healthy subjects and in subjects with voice disorders.[21]

For this reason, professional voice users are often advised to increase hydration for the purpose of increasing vocal efficiency, reducing respiratory effort, and alleviating the symptoms and discomfort associated with laryngeal desiccation and viscous secretion. Recommendations include increasing water intake and improving environmental humidification or the inhalation of water vapor to prevent or treat excessive desiccation of the vocal folds.[16]

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There are no known studies specific to teachers that examined interventions involving only surface hydration of the larynx. The only studies found were solely on healthy women,[16,22] soprano singers,[23] and individuals with Sjogren syndrome.[24] In all of these intervention studies, the most satisfactory hydration response was observed with saline solution (NaCl 0.9%), despite its statistical insignificance. Therefore, the purpose of this study is to examine the effects of surface hydration using saline solution (NaCl 0.9%) on teachers' voice quality as a voice-protection strategy. The hypothesis is that this intervention will improve auditory-perceptual and acoustic vocal parameters in teachers.

METHOD

Design and population

This is an examiner-blinded, pretest and posttest intervention study with a single group of subjects. Twenty-seven teachers (15 women and 12 men; with average age of 44.9 years) from a public-sector education system school of Salvador, in Bahia State, Brazil, participated in this study between the months of September and November 2014.

The sample of subjects was randomly selected. All teachers employed at the school were invited to take part in the study. Teachers with or without self-reference of self-assessed dysphonia, who used their voice professionally solely within the professional context of teaching activities, were eligible for the study. The goal was to investigate the effect of surface hydration with saline solution (NaCl 0.9%) on teachers' vocal quality, regardless of the presence or absence of any vocal pathology.

Teachers with an upper respiratory infection on the days of the recordings were excluded from the study. Teachers older than 65 years of age, or currently undergoing speech therapy, or who did not take part in all the stages of the research were also excluded.

Thirty-six subjects accepted the invitation to take part in the study. However, only 27 subjects were used because of the following exclusion criteria: retirement or change of institution (two cases), health issues (two subjects), current enrollment in speech therapy (one subject), and failure to take part in all phases of the study (four subjects) (Figure 1).

This study was approved by the Research Ethics Committee of the State University of Feira de Santana (Portuguese: Universidade Estadual de Feira de Santana) as part of the Project "Teacher's Working Conditions and Health: Interventions to Construct Healthy Working Environments" under report No. 423.012 and compliant with ethical aspects in accordance with Resolution No. 466/12 of the National Council of Health (Conselho Nacional de Saúde).

Study phases

Informed consent form presentation

After the school board approved the consent form, the members of the team presented the project and invited the teachers during extracurricular activity time slots. Teachers' participation was voluntary. Those who agreed to participate received an envelope the following week containing two copies of the informed consent form and the self-reported questionnaire "Teacher's Working Conditions," which was developed by the authors for the present study.

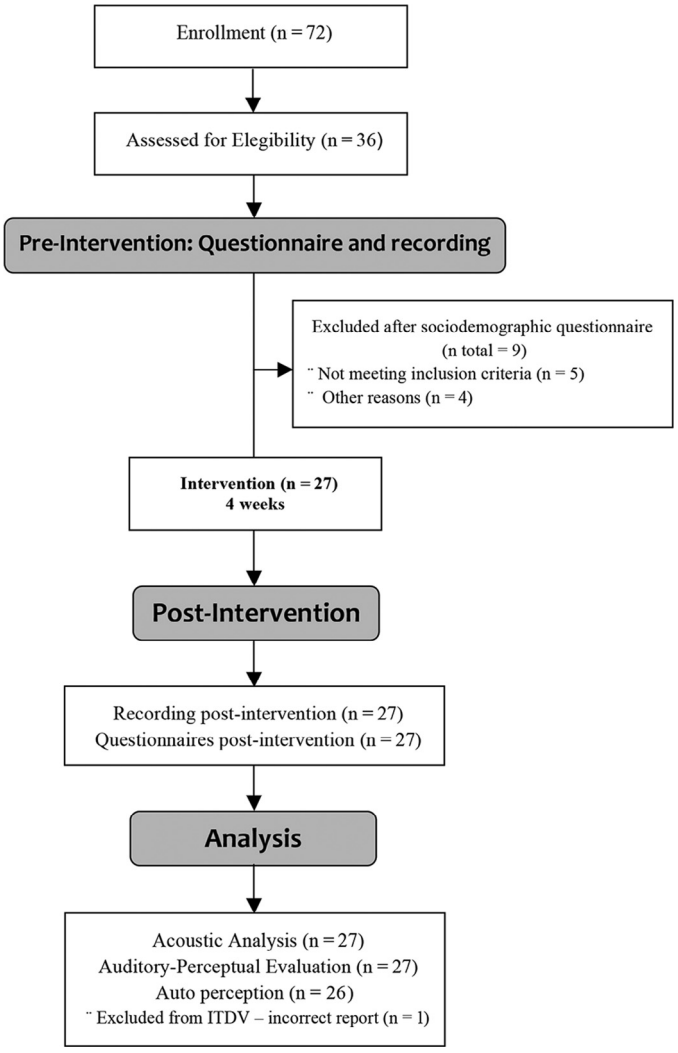

FIGURE 1. Flow diagram of the direct hydration intervention (NaCl 0.9%) in 27 teachers of a public-sector state school (Salvador, State of Bahia, 2014).

The self-reported questionnaire contained socio-demographic, functional status, working environment, work organization, habits and lifestyle questions, and a list of voice complaints. The results of the sample characterization were calculated and presented below as simple absolute frequencies.

Evaluation instruments and procedures

Voice recording. A voice recording was performed pre- and post intervention to compare the two voice samples obtained. A written form designed by the research team was used for the purpose of investigating the presence of any upper respiratory infections, in accordance with the respective exclusion and inclusion criteria.

Afterward, participants included in the study had voice samples recorded and saved on file using the CTS Informática (Pato