Comparison Between Vocal Function Exercises and Voice Amplification

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Summary: Purpose. To compare the effectiveness of vocal function exercises (VFEs) versus voice amplification (VA) after a 6-week therapy for teachers diagnosed with behavioral dysphonia.
Methods. A total of 162 teachers with behavioral dysphonia were randomly allocated into two intervention groups and one control group (CG). Outcomes were assessed using auditory-perceptual evaluation of voice, laryngeal status assessment, self-ratings of the impact of dysphonia, and acoustic analysis.
Results. The VFE group showed effective changes across treatment outcome measures: overall severity of dysphonia relative to the CG, laryngeal evaluation, and self-perceived dysphonia. The VA group showed positive outcomes in some measures of self-rated dysphonia. The CG had poorer outcomes across self-assessment dimensions.
Conclusions. The VFE method is effective in treating the behavioral dysphonia of teachers, can change the overall severity and the self-perception of the impact of dysphonia, and the laryngeal evaluation outcomes. The use of a voice amplifier is effective as a preventive measure because it results in an improved self-perception of dysphonia, especially in the work-related dimension. One case of dysphonia aggravation can be prevented in every three patients with behavioral dysphonia engaged in VFE, and one case in every five patients using VA. The lack of a therapeutic intervention worsens teachers' behavioral dysphonia in a period of 6 weeks.
Key Words: Voice–Dysphonia–Effectiveness–Clinical trial.

INTRODUCTION

Teachers are the professional voice users most affected by voice disorders.[1–8] Dysphonia among teachers is a frequent cause of time away from work,[9–11] with a negative impact on their professional and social life.[1,6,12,13]

Because of lost workdays and expenditures with voice therapy for teachers, the societal costs in the United States are estimated at US$ 2.5 billion annually.[14] The Brazilian reality is no different, with voice-related time away from work resulting in an economic burden of more than US$90 million per year.[15,16]

Voice rehabilitation is strongly recommended in cases of dysphonia.[17] In view of this, researchers in the field of voice encourage the construction of well-designed clinical trials focusing on voice issues. Scientific evidence gathered from such studies supports clinical decision making[17–25]; treatment programs with proven efficacy can contribute to change the current scenario of teachers' voice problems.

As is the case worldwide, the number of studies addressing teachers' voice is substantial in Brazil; nevertheless, there is no record of any randomized clinical trial (RCT) evaluating therapeutic interventions for teachers.[7]

In view of this reality, we set out to compare the effectiveness of vocal function exercises (VFEs)[26] with that of a therapeutic intervention using a personal voice amplification (VA) system[27,28] over a period of 6 weeks for teachers with behavioral dysphonia. We were unable to find RCTs comparing VFE with VA use.

The use of a voice amplifier is a practical alternative for dysphonic teachers, as it protects them from voice strain during the long classroom hours[27,28] and promotes better voice ergonomics in the work setting. However, we raise the question of whether using this resource is sufficient to bring positive modifications to teacher dysphonia, thus justifying the growing public expenditures on new personal amplification systems without a body of scientific evidence of benefits to the vocal health of teaching professionals.

By contrast, the VFE method, a holistic approach, is the most extensively tested intervention with teachers.[29–33] The aims of the method are to rebalance the three subsystems of voice production (ie, respiration, phonation, and resonance) and to improve vocal strength and power.[26] After voice therapy with VFE, participants perceive overall voice improvement and greater ease and clarity of speaking[29,31] as well as fewer voice complaints and significant changes in voice quality.[31,32] The conclusions of VFE studies are relevant, yet effectiveness trials developed in countries or populations with quite diverse characteristics are not always applicable across cultures.

The aim of the present RCT was to compare the outcomes of the VFE method in Brazil and to understand the impact of a personal VA system for teachers with behavioral dysphonia across the various dimensions of dysphonia evaluation.

METHODS

Type of study

The present study was a single-blind, randomized, controlled, clinical trial developed at the Escola Paulista de Medicina, Federal University of São Paulo (UNIFESP) and conducted at the Speech-Language Pathology Clinic of the Hospital das Clínicas, Federal University of Minas Gerais (UFMG). This study was approved by the Ethics Committees under protocols CEP 0284/10 and ETIC 0521.0.203.000-09, Register: www.clinicaltrials.gov (NCT01196611).

Accepted for publication December 30, 2014.
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Journal of Voice, Vol. 29, No. 6, pp. 718-726
0892-1997/$36.00

http://dx.doi.org/10.1016/j.jvoice.2014.12.012

Inclusion criteria

The inclusion criteria are as follows: female teachers; age between 18 and 50 years; childhood education to high-school teachers; workload of at least 20 h/wk; presence of behavioral dysphonias; and candidates for vocal rehabilitation.

Exclusion criteria

The exclusion criteria are as follows: physical education, music, or day-care teachers; teachers on leave of absence or not teaching class during the study period; history of a diagnosis of neurologic and/or psychiatric disorders; smokers; patients with upper airway infection at the moment of data collection; unavailability to attend the sessions regularly; and previous treatment for voice problems.

Randomization

Simple computer-generated randomization into three groups with the same number of participants.

Auditory-perceptual evaluation of voice

Samples were collected of all participants and consisted of the emission of the vowel /a/ and the Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V)[34] sentences adapted to the Portuguese language.[35] The voices were recorded directly into the computer, with the participants in a standing position. A Shure Model 16 cardioid condenser microphone (Shure Inc.) with a flat frequency response curve of 50–15 000 Hz, pattern cardioid (unidirectional), Impedance low (600 Ω balanced; output Level (at 1 kHz), open Circuit Voltage: –68.0 dB (0.40 mV) was used. It was placed 10 cm away from the speaker's mouth at an angle of 90__in an acoustically treated room.

Laryngeal examination

Otolaryngologic evaluation was performed by videolaryngoscopy using a rigid laryngoscope Storz 70° (Karl Storz).

Self-assessment of the impact of dysphonia

The protocol for the self-ratings was the VAPP–voice activity and participation profile: assessing the impact of voice disorders on daily activities[36] validated to Portuguese.[37] This protocol was comprised 28 questions encompassing five dimensions: self-rated severity of the voice problem, effect on the job, daily communication, social communication, and on expression of emotions.[37,38] Two additional scores can be calculated: activity limitation score and participation restriction score. These scales address the relationship between the limitation caused by the voice problem and the individual's willingness to participate in daily life activities.

Acoustic evaluation of voice

The speech sample for acoustic analysis included the emission of the sustained /ae/ vowel at the usual frequency and intensity. The recorded emissions were edited: The first and the final second of recording (rise and decay) were omitted. The middle segment, with a mean duration of 3 seconds, was analyzed. The *Computerized Speech Lab* (CSL) MDVP Advanced, Model 4500CSL; Kay PENTAX (PENTAX Medical Company) was used in the analysis. Reference values of normality for female voices of the CSL software were shimmer (shim = 1.997), percent jitter (jitt = 0.633), and noise-to-harmonics ratio (NHR = 0.112). For the fundamental frequency (F_0), the reference value was that established for Brazilian women, which is $F_0 = 204$ Hz[39].

Clinical trial criteria

Participants should complete 6 weeks of treatment; the control group (CG) should undergo the preintervention evaluations and wait 6 weeks before initiating treatment. Participants in the VFE group (VFEG) should attend 100% of the sessions and have at least 70% of home practice; the VA group (VAG) should use the VA throughout the duration of classes or at least 70% of that time. The CG participants should not undergo any type of voice rehabilitation program during the 6-week period. All the patients should be reevaluated. Participants who failed to comply with the trial criteria were excluded from the sample.

Intention-to-treat analysis

Over the course of clinical trials, inevitably some participants drop out of treatment. Because our sample was large and dropout rates were low, we favored an intention-to-treat analysis. Thus, we used the preintervention and postintervention data of the 134 participants who completed the 6 weeks of therapy and the replicated preintervention data of the 28 participants who failed to complete the treatment. The reasons for dropout are described throughout this article and in the study flow diagram (Figure 1).

Procedure of interventions and dropouts in the groups

Control group. The CG participants underwent the same preintervention evaluations as the experimental groups and waited 6 weeks before initiating treatment. Five participants of the 54 women in the CG did not return for reevaluation and were unwilling to give explanations. Five others undertook vocal rehabilitation at another service during the waiting period.

Voice amplification group. The participants used the voice amplification throughout their teaching hours during 6 weeks. They recorded the number of hours per day of VA use on a tally sheet. The device they used was a Voice Amplification TSI SUPERVOZ II portable speech-assistance VA system for indoor use (TSI–TECNISYSTEM INDUSTRIAL DO BRASIL). Specifications are maximum output power: 10 W (IHF), 6.5W(RMS); output impedance: 4 U; operating voltage: 7.4 V; battery: 7.4 V/1000 mAh; power adaptor: DC 10.6 V; recharging time: approximately 4 hours; playing time: 8 hours (depending on volume and temperature); product dimensions: 9 3 11.5 3 4 cm; net weight: 280 g; headphone sensitivity:_47 dB, and frequency response: 80 Hz–12 KHz.

The volunteer therapists were speech-language pathology undergraduates trained to administer the VFE method and offer guidance regarding VA use. They taught and trained the teachers in the use of the microphone. During the training session, the