Multidimensional Assessment of the Effectiveness of Group Voice Therapy

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Summary: Objective. Group voice therapy has been successfully used in patients with dysphonia, but there is little objectively documented evidence of its effects on voice quality and the self-perception of voice fatigue. The aim of this study was to investigate the effectiveness of group therapy in patients with functional dysphonia and minor anatomic vocal fold pathologies linked by appearance and history to voice use in an objective and multidimensional manner.

Study design. This is a prospective longitudinal study.

Methods. Before and after treatment, 34 adult women underwent perceptual voice assessments using the grade of dysphonia, roughness, breathiness, asthenia, and strain (GRBAS) scale, Evaluation Vocale Assistée (EVA) system aerodynamic and acoustic assessments, and maximum phonation time measurements, and made subjective evaluations using the Voice Handicap Index. The pretreatment baseline values of the participants were obtained by means of two examinations separated by an interval of 1 week. The parameters belonging to each main dimension were clustered by means of Z-transformation, and the corresponding Z-scores were analyzed.

Results. Group therapy was associated with a statistically significant improvement in the perceptual ($P = 0.008$), acoustic ($P = 0.040$), aerodynamic ($P = 0.009$ and $<0.001$), and self-evaluation parameters ($P = 0.011$).

Conclusions. Our findings provide evidence that group voice therapy can be associated with improvements in perceptual, acoustic, aerodynamic, and self-evaluated parameters in some patients with dysphonia. Controlled, randomized studies are needed in follow-up. This method of treatment may be a means of reducing the costs and waiting lists associated with rehabilitative treatment, and enhancing patients’ motivation and compliance.


INTRODUCTION

A number of studies have confirmed the effectiveness of voice therapy in the treatment of nonorganic dysphonia and benign vocal fold lesions, but the significant objective improvements that can be obtained need to be documented using a multidimensional approach. Individual voice therapy sessions are the standard of care for patients with dysphonia, but can be a considerable economic burden on national health and social welfare services, as well as on subjects paying for the sessions themselves.

However, although there is still little objective evidence concerning its effects on voice quality and the self-perception of voice fatigue, group voice therapy has been successfully used in patients with voice and speech disorders, and may also have the advantage of optimizing voice therapists’ working time and, by allowing a larger number of patients to be treated, reducing the length of waiting lists and increasing the efficient use of national health service resources. Providing group voice therapy sessions for patients who are homogeneous in terms of age, and the type and severity of their voice disorder, might stimulate mutual help and emulation in acquiring correct vocal behavior and improving voice quality. Reciprocal psychological support might also help the acquisition of motor skills and further

motivate the patients. The effectiveness of group therapy has been widely demonstrated in the field of psychiatry for the treatment of mental disorders; although psychiatric disorders are a very different condition from dysphonia, the reported positive outcomes show that patients are facilitated in understanding, following the therapist, and developing skills. Another field of application of group therapy with positive reports has been physical therapy for neurologic disorders such as Parkinson’s disease and for the treatment of disabilities consequent to stroke. The group sessions of rehabilitation provided more behavioral changes than the individual treatment sessions in patients affected by Parkinson’s disease. After stroke, the group approach allowed a more efficient time use and positive effects on the outcomes due to enhanced motivation, social interaction and reinforcement, and competition among the patients.

The aim of the present study was to assess the effectiveness of group therapy in changing vocal behavior and improving voice quality in patients diagnosed with functional dysphonia with or without minor anatomic vocal fold pathologies by appearance and history presumed due to voice use using a multidimensional protocol including perceptual, acoustic, aerodynamic, and self-evaluation parameters.

METHODS

Study design and setting

This prospective longitudinal study, which was approved by our local institutional review board and conducted in accordance with the standards of good clinical practice and the principles of the Helsinki Declaration, was carried out by the members of the voice therapy service of Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico in Milan between January and December 2015. All patients gave their written informed consent.
Study subjects
The study involved 34 adult women (mean age 40.9 ± 14.0 years, range 22–70) who were candidates for rehabilitation treatment for a voice disorder and vocal fatigue due to functional or minor organic changes in the vocal folds (vocal fold nodules or mild edema). The inclusion criteria were female gender, ≥18 years of age, dysphonia and vocal fatigue due to functional causes, with possible tissue reaction to phonotrauma confirmed by videolaryngostroboscopy, and an indication for voice therapy. Only women were included to have a homogeneous group of patients, and also because the vast majority of patients seeking voice therapy for functional or minor organic causes in our service are women.

Thirteen of the patients (38%) were school teachers, and all had a history of vocal overuse: 12 were affected by vocal fold nodules, 13 showed minor anatomic changes (vocal fold edema), and 9 had functional dysphonia only (muscle tension dysphonia or vocal folds bowing). Each patient was his or her own control, and all underwent a second multidimensional evaluation 1 week after the first to obtain pretreatment baseline values.

The exclusion criteria were laryngeal motility disorders, pathologies with an indication for phonosurgery, refusal to participate in group therapy, unfinished rehabilitation program, and previous phonosurgery or laryngeal radiotherapy.

Outcomes
At the enrollment visit (T0), a complete clinical history was taken and a record was made of each patient’s age, profession, and extraprofessional vocal habits. Rigid videolaryngostroboscopy was used to detect the physical cause of dysphonia or vocal fatigue.

Upon enrollment (T0) and 1 week later (T1), to confirm the stability of the clinical features of the voice disorder, all patients underwent multidimensional evaluations.

Multidimensional evaluation protocol
A perceptual voice assessment was conducted using the GRBAS scale, which evaluates the overall grade of dysphonia, roughness, breathiness, asthenia, and strain in a voice. The voice samples were computer-recorded using a dynamic microphone (AKG, model B 29L, Acoustics, Vienna, Austria) at a constant distance of 5 cm from the patient’s mouth (at an angle of about 60°) during the production of a sustained /a/, the repetition of single words and sentences (the Italian word “aiuole” and the sentence “Il bambino ama le aiuole della mamma”), and conversation. The patients were instructed to talk at a comfortable pitch and loudness. All of the voice samples were subsequently blindly evaluated by three independent listeners experienced in voice diseases (a voice therapist, an otolaryngologist, and a phoniatrician) and were scored as follows: 0 = normal, 1 = slight disturbance, 2 = moderate disturbance, and 3 = severe disturbance. The perceptual scores were defined as the mean scores for G, R, and B, as rated independently by the three listeners, blinded as regards the moment of the recording. In a last step, the mean G, R, and B scores were averaged to obtain a final global perceptual score.

Aerodynamic and acoustic assessments of voice recordings were made using the Evaluation Vocale Assistée (EVA) system (SQ-Lab, Aix-en-Provence, France). A rubber mask connected to a mouthpiece was placed over the patient’s mouth and made to adhere closely to the skin to avoid any air leakage. The mouthpiece contained a calibrated directional microphone at a distance of 2 cm from the patient’s oral opening and a grid pneumotachograph; the microphone and aerodynamic sensor were coaxial so that voice sound and phonatory airflow could be simultaneously recorded. The two assessments were as follows:

1. A simultaneous acoustic and aerodynamic evaluation derived from the patient’s production of a sustained /a/ at a comfortable pitch and intensity for at least 4–5 seconds. A 1-second segment of the most stable part of the signal was selected for analysis. The acoustic indices considered were percent jitter (computed as the mean absolute difference between the periods of adjacent cycles divided by the mean period; the proportion is then multiplied by 100 to get a percentage), percent shimmer (obtained similarly using peak-to-peak amplitudes), and the harmonics-to-noise ratio (HNR, in which H is the energy of the averaged wave form, and N is the mean energy of the differences between the individual periods and the averaged wave form) expressed in decibel.

2. An airway-interruption method for indirectly estimating subglottic pressure and phonation threshold pressure (PTP). A pressure sensor placed in the oral cavity measured intraglottal pressure during the emission of a sequence of “pa” from unvoiced to voiced. The patient was instructed to pronounce an uninterrupted sequence of 6–7 /pa/ with a very short interval, first whispering and then gradually gaining sound in the voice. Then the subject pronounced a sequence of /pa/ at a comfortable pitch and loudness. Oral airflow, oral pressure, and acoustic signal were recorded simultaneously to obtain an estimated PTP and an estimated subglottic pressure during spontaneous phonation. The investigator ensured that airflow had gone to zero during /p/ occlusion before proceeding with the analysis. Then pressure peaks at the /p/ occlusion were carefully measured from the obtained tracings to estimate the PTP and the subglottic pressure during spontaneous phonation.

Three consecutive measurements of the maximum phonation time (MPT) were obtained from the sustained emission of the vowel /a/ at a comfortable pitch and volume; the longest of the three times was used in the data analysis. The investigator prompted the subject to achieve the best possible result after deep inspiration.

A subjective evaluation of patient-perceived vocal status was obtained using the Voice Handicap Index (VHI). The 30 items of the index were divided into three subscales that assess the functional, physical, and emotional aspects of the disability caused by the voice impairment. The subscale scores ranged from 0 to 40, and the total score ranged from 0 to 120; a higher score indicates a greater degree of self-perceived disability.

The investigated parameters are the basic and classical issues in the field of voice function assessment and, although the different dimensions have shown poor redundancy, are not completely independent.
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