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High-frequency oral oscillation with phonation and sonorous blowing into a silicone tube in older adults with presbylarynx: randomized clinical trial

Oscilação oral de alta frequência sonorizada e sopro sonorizado com tubo de silicone em idosos com presbilaringe: ensaio clínico randomizado

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ABSTRACT

Purpose: To investigate the effects of high-frequency oral oscillation with phonation (VOHFO), sonorous blowing into a silicone tube, and the combination of both techniques in older adults with presbylarynx, regarding phonation and respiration. **Methods:** Randomized clinical trial with 51 older adults diagnosed with presbylarynx by an otolaryngologist, allocated into three groups: G1 – VOHFO; G2 – silicone tube with sonorous blowing; G3 – combination of the techniques. Eight weekly sessions were conducted. Outcome variables were: maximum phonation time (MPT), vital capacity (VC), and perceptual-auditory vocal quality (GRBASI). Assessments included perceptual-auditory analysis, spirometry, and MPT measurements. Data were analyzed using ANOVA and Generalized Estimating Equations. The study is registered in the Brazilian Clinical Trials Registry (REBEC), number RBR-46hk7r. **Results:** Before the intervention, the mean MPT for the vowel /a/ was 8.1s, and after therapy, 10.1s; VC increased from 4.04L to 4.52L. These changes were statistically significant ($P < 0.001$). No changes were found in vocal quality by GRBASI, and no relevant differences were observed between isolated and combined techniques. **Conclusion:** VOHFO and sonorous blowing into a silicone tube significantly improved MPT and VC, with no perceptible effect on GRBASI. The observed aerodynamic improvement may favor vocal resistance, projection, and communicative participation in daily life, enhancing autonomy and quality of life in this population.

Keywords: Aged; Aging; Dysphonia; Rehabilitation; Voice

RESUMO

Objetivo: verificar os efeitos da oscilação oral de alta frequência sonorizada (OOAFS), do sopro sonorizado em tubo de silicone e da associação das duas técnicas em idosos com presbilaringe, quanto à fonação e respiração. **Métodos:** ensaio clínico randomizado com 51 idosos diagnosticados por otorrinolaringologista, alocados em três grupos: G1 – OOAFS; G2 – tubo de silicone com sopro sonorizado; G3 – associação das técnicas. Foram realizados oito encontros semanais. As variáveis de desfecho foram: tempo máximo de fonação (TMF), capacidade vital (CV) e qualidade vocal perceptivo-auditiva (escala GRBASI). As avaliações incluíram análise perceptivo-auditiva, espirometria e medidas de tempo máximo de fonação. Os dados foram analisados por Análise de Variância e Equações de Estimação Generalizadas. O estudo encontra-se registrado no Registro Brasileiro de Ensaios Clínicos, sob o número RBR-46hk7r. **Resultados:** antes da intervenção, o TMF médio da vogal /a/ foi de 8,1s e, após a terapia, 10,1s; a CV aumentou de 4,04L para 4,52L. As mudanças foram estatisticamente significativas (p<0,001). Não houve alterações na qualidade vocal pela escala GRBASI e não se observaram diferenças relevantes entre técnicas isoladas e combinadas. **Conclusão:** Os exercícios com OOAFS e sopro sonorizado em tubo de silicone promoveram melhora significativa em tempo máximo de fonação e capacidade vital, sem efeito perceptível na qualidade vocal perceptivo-auditiva. A melhora aerodinâmica observada pode favorecer a resistência vocal, a projeção e a participação comunicativa no cotidiano, ampliando a autonomia e a qualidade de vida dessa população.

Palavras-chave: Idoso; Envelhecimento; Disfonia; Reabilitação; Voz

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INTRODUCTION

Changes arising from the aging process result in a progressive decline in organs and mechanisms necessary for daily life. However, these changes can be minimized by adopting healthy habits, such as regular physical activity, a balanced diet, and an active lifestyle[1].

In the phonatory system, aging directly affects the vocal folds, causing the loss of elastic and collagen properties, causing them to stiffen, which can consequently lead to the occurrence of dysphonia[2,3].

In addition to laryngeal changes, aging significantly compromises the respiratory system, which is essential for vocal production. Changes such as decreased thoracic compliance, reduced respiratory muscle strength, reduced vital capacity, and increased physiological dead space reduce the efficiency of air support for phonation[4,5]. These changes directly affect the control of intensity, stability, and duration of vocal emission, interfering with maximum phonation time and phonatory resistance[6].

Regarding vocal resonance, aging can also alter the acoustic properties of the vocal tract. Modified head and neck postures, along with morphological changes in the vocal tract, generate changes in resonance, reducing vocal projection[7]. These resonant changes can accentuate the perception of weak and unclear voices in older adults, interfering with both vocal tolerance and listener intelligibility.

In the elderly, dysphonia can have a significant impact on communication and social outcomes[8]. In this context, therapeutic strategies that promote the best possible voice for this population become necessary[9]. The importance of interventions that strengthen the breathing and phonation subsystems is highlighted, favoring resonance balance in the vocal tract[10].

In Speech Therapy, the voiced oral high-frequency oscillation (VOHFO) technique, as well as other techniques of Semi-occluded Vocal Tract Exercises (SOVTE), can improve the source-filter relationship, promoting a massage effect on the larynx and the entire respiratory system[11,12].

Despite advances in the use of SOVTE in different populations, there are still important gaps in the understanding of its effects in elderly individuals with presbylarynx[13,14]. Previous studies have demonstrated immediate effects of techniques such as VOHFO and silicone tube blowing on vocal and respiratory parameters, but these focused on measures of immediate effect, without considering long-term structured interventions[15,16]. Previous findings highlight that, although SOVTE promotes source-filter adjustments and aerodynamic benefits, studies investigating its functional impacts in elderly individuals are still scarce[17-19].

Furthermore, few studies compare the isolated and combined use of these techniques, leaving open the question of whether the combination could enhance effects on breathing and phonation. This gap justifies the need for rigorously designed randomized clinical trials.

The study hypothesis was that both isolated and associated techniques promote significant improvements in aerodynamic parameters (maximum phonation time and vital capacity) and, possibly, in auditory-perceptual vocal quality, with the association expected to enhance these effects compared to isolated use.

Thus, this study aimed to verify the effects of the VOHFO technique, the silicone tube technique and the combination of the two techniques on the phonation and breathing of elderly individuals with presbylarynx.

METHODS

Ethical aspects and study design

This study was approved by the Research Ethics Committee of the Federal University of Health Sciences of Porto Alegre – CEP/UFCSPA, under opinion number 3.117.420 (CAAE 05024818.5.0000.5345), and registered in the Brazilian Registry of Clinical Trials (REBEC) under code RBR-46hk7r. This is a controlled clinical trial conducted with elderly individuals previously diagnosed with presbylarynx by an otolaryngologist. All participants signed the Free and Informed Consent Form (FICF) before the start of the study.

In order to intensify the massage effect on the vocal folds[20] and stimulate the mobility of the mucosa at the free edge[21], the following Semi-occluded Vocal Tract Exercises (SOVTE) were selected: the voiced oral high-frequency oscillation (VOHFO) technique, performed with the New Shaker device, and the sounded blowing into a silicone tube immersed in water. Originally used in respiratory physiotherapy to facilitate bronchial clearance, the New Shaker generates vibration and variation in airflow through an internal metal sphere[22].

Participants

The initial sample consisted of 65 elderly individuals. Participants were randomized using the website Random.org[23], which generated random numbers from 1 to 51, ensuring impartial distribution between groups. No allocation concealment was used, and the evaluators were not blinded to the intervention groups.

The study included individuals aged 60 years or older, with a previous otorhinolaryngological diagnosis of presbylarynx, and who had not previously undergone voice therapy. Those with a history of voice-related speech therapy, acquired neurological disorders such as Parkinson disease, stroke, and dementia, severe decompensated respiratory diseases such as advanced chronic obstructive pulmonary disease (COPD) or uncontrolled asthma, head and neck neoplasms, cognitive or motor impairments that could compromise the performance of vocal exercises, and severe hearing loss without the use of hearing aids that hindered the perception of their own voice were excluded. After applying these criteria, 14 individuals were excluded due to a history of prior speech therapy, resulting in a final sample of 51 participants, as illustrated in Figure 1.

Participants were allocated into three groups: Group 1 (G1) - group in which the VOHFO technique was applied; Group 2 (G2) - group that performed the sounded blowing technique into a silicone tube immersed in water; Group 3 (G3) - combination of the VOHFO technique and sounded blowing into a silicone tube immersed in water. The characteristics of the study participant groups are specified in Table 1.

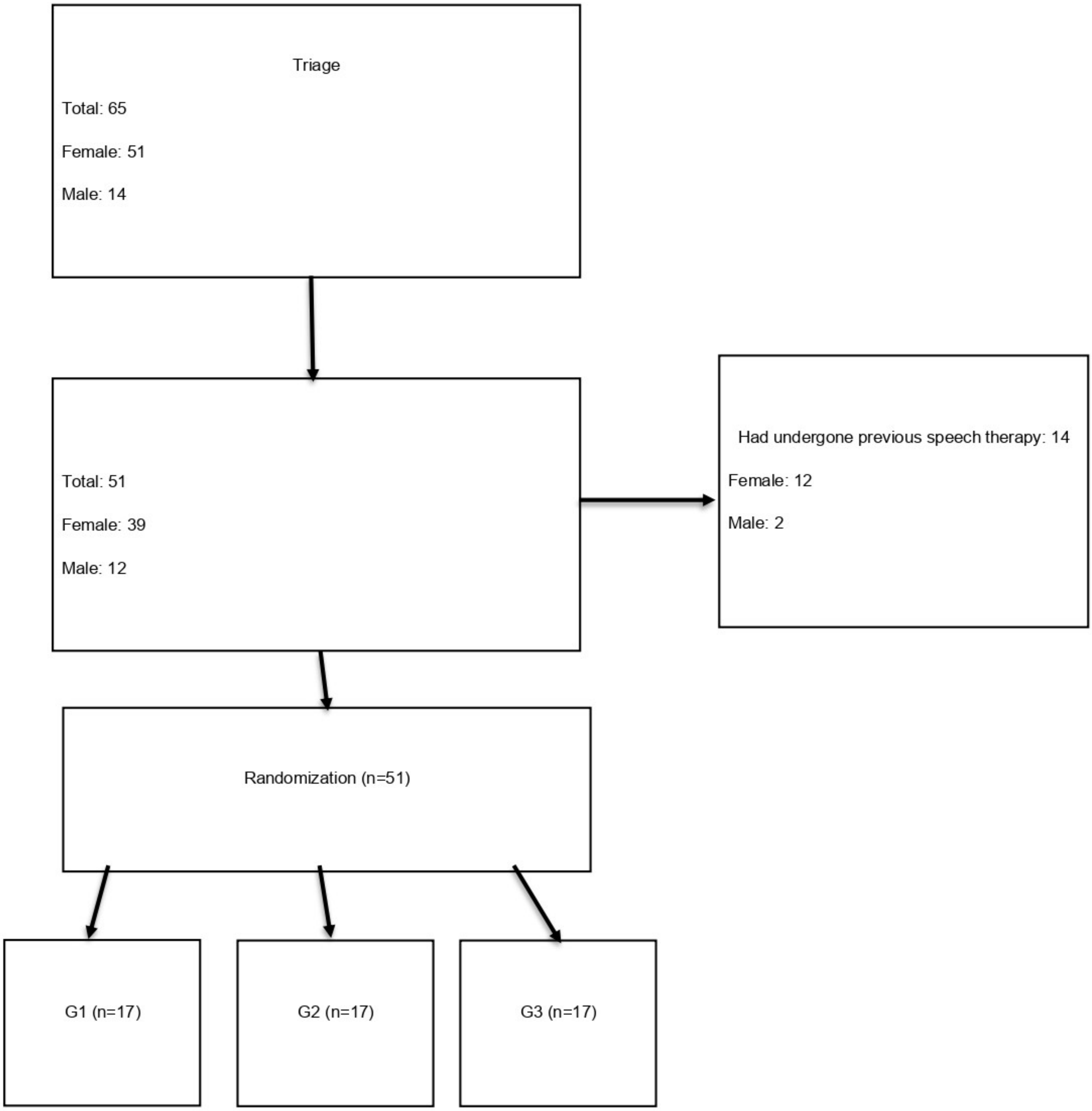

Figure 1. Sample flowchart

Table 1. Sample characterization

Variables	Group 1	Group 2	Group 3	p-value
	Mean ± SD	Mean ± SD	Mean ± SD	
Age (years)	76.5 ± 10.1	73.9 ± 7.3	74.3 ± 8.8	0.645
Gender – n(%)				0.270
Female	13 (76.5)	11 (64.7)	15 (88.2)	
Male	4 (23.5)	6 (35.3)	2 (11.8)	

Subtitle: SD = standard deviation; *n* = number of participants; % = percentage

Interventions

The interventions were conducted by a speech-language pathologist specialized in voice, with participants sitting upright with their unused hand resting on their laps. Sessions were held weekly for eight weeks, lasting 30 min, in the UFCSPA voice and speech laboratory.

- G1 (VOHFO): participants emitted the sound /u/ at their usual tone and intensity for three minutes, blowing through the New Shaker device, which was held at a 90° angle in relation to the labial philtrum, avoiding puffing of the cheeks[24].
- G2 (voiced blowing into a silicone tube immersed in water): a 510 ml plastic bottle filled two-thirds with water was used. Participants were instructed to submerge the silicone tube, 35 cm long and 9 mm in internal diameter, to a depth of 2 cm below the water surface, producing the sound /vu/ at their usual pitch and intensity for three minutes. The 2 cm depth was selected because it represents a low level of resistance, suitable for elderly individuals with presbylarynx, favoring air feedback without creating excessive overload on the vocal tract. This technical parameter sought to ensure the safe execution of the exercise and comparability with previous studies that used similar configurations[25].
- G3 (combination of both techniques): participants performed the VOHFO technique for one minute and 30 s, followed immediately by the blowing into a silicone tube technique for one minute and 30 s, totaling three minutes of vocal exercise.

All participants received the necessary devices to perform the exercises at home, with instructions to perform them twice a day, for three minutes, according to each group's protocol.

Procedures

All recordings and assessments were performed in two stages: the first before the first intervention session and the second after the last intervention session.

Voice recording

In a quiet environment, participants were asked to produce a sustained /a/ vowel and to speak sequentially by counting from 1 to 10. Recordings were performed individually in a quiet environment using a Sony LCD-PX440 digital recorder, maintaining a distance of 5 cm for the sustained vowel and the automatic speech, with participants standing.

Auditory-perceptual assessment

The GRBASI scale[26,27] was used to assess six parameters: G (grade, general degree of alteration), R (roughness), B (breathiness), A (asthenia or weakness), S (strain), and I (instability). Each item ranges from 0 to 3: 0 corresponds to absent, 1 to mild, 2 to moderate, and 3 to severe. Three speech-language pathologists, voice specialists with clinical experience, were recruited using the snowball method. They received randomly numbered audio files, without any identification of the participants regarding name, gender, age, or time of intervention. All raters were previously trained with anchor stimuli to ensure greater consistency in the auditory-perceptual analysis. For each item evaluated, the minimum agreement of two raters was considered, adopting the value assigned by the majority as the final score.

Aerodynamic measurements

The maximum phonation times (MPT) of the vowels /a/ and the sounds /s/ and /z/ were timed twice for each of the target sounds, and participants were instructed to stand with their arms at their sides. The best utterance time for each sound and the s/z ratio were selected. Reference values for healthy older adults indicate averages of 20.96 s for women and 23.23 s for men[28].

Spirometric assessment

For the spirometric assessment, the Minispir® - Medical International Research (MIR) spirometer was used to collect vital capacity (VC) data. Participants were instructed to sit with both feet flat on the floor, their spines straight, and their nostrils occluded to perform forced exhalation into the mouthpiece three times consecutively, with the highest value of the three measurements being chosen for analysis[29].

Statistical analysis

Statistical analyses were conducted according to the assumptions of normality, verified by the Shapiro-Wilk test, and homogeneity of variances, assessed by the Levene test. Quantitative variables were described by mean and standard deviation when normally distributed, or by median and interquartile range when asymmetrically distributed. Categorical variables were described by absolute and relative frequencies.

Analysis of Variance (ANOVA) was used to compare means between groups, while Pearson's chi-square test was used to determine proportions. Comparisons between the two assessment periods (pre- and post-speech-language pathology intervention) were performed using the Generalized Estimating Equations (GEE) model. They were complemented by the Bonferroni test. The linear model was applied to normally distributed variables, while the Tweedie model with logarithmic transformation was used for variables with asymmetric distribution.

The agreement between the three GRBASI scale judges was assessed using Fleiss' Kappa coefficient. It should be noted that, in this type of analysis, the parameter of interest is the k value, which expresses the degree of agreement beyond chance. Kappa values are classified as: poor (<0.00), slight (0.00–0.20), fair (0.21–0.40), moderate (0.41–0.60), substantial (0.61–0.80), and almost perfect (0.81–1.00). The significance level adopted was 5% ($P < 0.05$), and the analyses were conducted using SPSS software, version 28.0. The inter-rater agreement of the GRBASI scale is presented in Table 2.

Table 2. Inter-rater agreement of the GRBASI scale

Variables	Judge 1	Judge 2	Judge 3	Agreement (Fleiss's Kappa value)
	n (%)	n (%)	n (%)	J1 x J2 x J3
G				0.29 (*P* < 0.001)
1	50 (49.0)	53 (52.0)	55 (53.9)	
2	47 (46.1)	44 (43.1)	42 (41.2)	
3	5 (4.9)	5 (4.9)	5 (4.9)	
R				0.25 (*P* < 0.001)
0	4 (3.9)	0 (0.0)	2 (2.0)	
1	67 (65.7)	69 (67.6)	75 (73.5)	
2	28 (27.5)	32 (31.4)	24 (23.5)	
3	3 (2.9)	1 (1.0)	1 (1.0)	
B				0.14 (*P* = 0.001)
0	13 (12.7)	11 (10.8)	14 (13.7)	
1	67 (65.7)	74 (72.5)	70 (68.6)	
2	21 (20.6)	15 (14.7)	16 (15.7)	
3	1 (1.0)	2 (2.0)	2 (2.0)	
A				
0	102 (100)	102 (100)	102 (100)	-
S				0.21 (*P* < 0.001)
0	8 (7.8)	9 (8.8)	14 (13.7)	
1	71 (69.6)	69 (67.6)	63 (61.8)	
2	22 (21.6)	22 (21.6)	23 (22.5)	
3	1 (1.0)	2 (2.0)	2 (2.0)	
I				0.25 (*P* < 0.001)
0	11 (10.8)	9 (8.8)	9 (8.8)	
1	70 (68.6)	73 (71.6)	73 (71.6)	
2	20 (19.6)	19 (18.6)	20 (19.6)	
3	1 (1.0)	1 (1.0)	0 (0.0)	

Kappa (–1 to 1): the closer to 1, the stronger the agreement; Kappa>0.7: would indicate good agreement; variable "A" showed perfect agreement (100%); as it is a constant variable, no statistical test was performed

Subtitle: G = Overall grade; R = Roughness; B = Breathiness; A = Asthenia; S = Strain; I = Instability; J = judge; *P* = p value; *n* = number of participants; % = percentage

The sample size calculation was performed using G*Power software, version 3.1.9.7, based on a published study by Saters[17]. The F-test – ANOVA: Repeated measures, within-between interaction – was used. The effect size f = 0.35, the significance level $\alpha = 0.05$, the statistical power $(1-\beta) = 0.80$, the correlation between repeated measures of 0.60 and the sphericity correction $\varepsilon = 1$ were adopted. As a result, a recommended sample size of 30 participants (ten per group) was obtained. Considering losses of approximately 20%, a total of 36 participants (12 per group) was estimated to ensure a minimum power of 80% for the group×time interaction.

RESULTS

GRBASI scale

In the auditory-perceptual analysis of vocal quality using the GRBASI scale, no statistically significant differences were observed between the pre- and post-speech therapy intervention periods in any of the parameters evaluated. The medians for overall grade, roughness, breathiness, strain, and instability remained stable in the three groups, with no indication of noticeable clinical improvement after treatment. Asthenia showed constant values, making statistical calculations impossible. Detailed results are shown in Table 3.

Maximum phonation times

Maximum phonation times showed significant improvement after the intervention in all groups and for all sounds analyzed. Although initial averages remained below the normal values described in the literature[30], an increase was observed in post-therapy measurements, with values for vowels and fricatives.

In the vowel /a/ and in the fricative sounds /s/ and /z/, the three groups obtained similar increases, without relevant intergroup differences.

The s/z ratio showed a slight reduction in all groups after the intervention, with statistical significance only for Group 1 ($P = 0.024$). These results are described in Table 4.

Vital capacity

Regarding vital capacity, mean values remained within normal limits[31] at both assessment times. However, a statistically significant improvement was observed within each group after the intervention ($P < 0.001$).

There were no significant differences when comparing the isolated techniques and the combined technique, as demonstrated by the interaction value ($P = 0.113$). The complete results are presented in Table 5.

Table 3. GRBASI assessment between pre- and post-speech therapy intervention groups

Variables	Group 1 Median (P25 – P75)	Group 2 Median (P25 – P75)	Group 3 Median (P25 – P75)	p-value	Group interaction x time (p-value)
G					0.465
Pre	1 (1 – 2)	2 (1 – 2)	2 (1 – 2)	0.278	
Post	1 (1 – 2)	1 (1 – 2)	2 (1 – 2)	0.945	
P	0.238	1,000	0.653		
R					0.580
Pre	1 (1 – 1.5)	1 (1 – 1)	1 (1 – 2)	0.463	
Post	1 (1 – 2)	1 (1 –1.5)	1 (1 – 2)	0.720	
P	0.303	0.560	0.653		
B					0.901
Pre	1 (1 – 1)	1 (1 – 1)	1 (1 – 1.5)	0.605	
Post	1 (1 – 1)	1 (1 – 1)	1 (1 – 1.5)	0.525	
P	0.560	1,000	1,000		
A					*
Pre	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)	*	
Post	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)	*	
P	*	*	*		
S					0.826
Pre	1 (1 – 1)	1 (1 – 1.5)	1 (1 – 2)	0.296	
Post	1 (1 – 1)	1 (1 – 1)	1 (1 – 2)	0.238	
P	0.653	1,000	0.653		
I					0.931
Pre	1 (1 – 1)	1 (1 – 1.5)	1 (1 – 1)	1,000	
Post	1 (1 – 1)	1 (1 – 1.5)	1 (1 – 1.5)	0.964	
P	0.653	1,000	1,000		

*It was not possible to perform the statistical test because it is a constant variable
Subtitle: P25 = 25th percentile; P75 = 75th percentile; G = Overall grade; R = Roughness; B = Breathiness; A = Asthenia; S = Strain; I = Instability; *P* = p value

Table 4. Maximum phonation times

Variables	Group 1 Median (P25 – P75)	Group 2 Median (P25 – P75)	Group 3 Median (P25 – P75)	p-value	Group interaction x time (p-value)
Vowel A					0.056
Pre	8.1 (4.4 – 9.6)	8.1 (3.6 – 10.4)	4.8 (2.7 – 8.9)	0.102	
Post	10.1 (8.0 – 12.8)	9.8 (8.2 – 12.9)	8.1 (7.1 – 11.8)	0.254	
P	<0.001	<0.001	<0.001		
Sound Z					0.372
Pre	7.5 (5.8 – 9.9)	8.4 (6.3 – 10.1)	5.9 (4.4 – 7.5)	0.109	
Post	9.7 (8.2 – 11.3)	10.1 (8.8 – 12.1)	7.9 (6.7 – 10.1)	0.076	
P	<0.001	<0.001	<0.001		
S/Z					0.068
Pre	1.0 (0.8 – 1.3)	0.9 (0.8 – 1.1)	1.1 (0.8 – 1.1)	0.169	
Post	0.9 (0.8 – 0.9)	0.8 (0.8 – 1.1)	0.9 (0.8 – 1.2)	0.212	
P	0.024	0.988	0.983		

Subtitle: P25 = 25th percentile; P75 = 75th percentile pre = pre-intervention; post = post-intervention; *P* = p-value

Table 5. Vital capacity

Variables	Group 1 Mean ± SD	Group 2 Mean ± SD	Group 3 Mean ± SD	p-value
VC				
Pre	4.04 ± 0.58	4.34 ± 0.49	4.15 ± 0.55	0.254
Post	4.52 ± 0.40	4.65 ± 0.48	4.57 ± 0.45	0.647
Difference (95% CI)	0.47 (0.33 a 0.61)	0.31 (0.22 a 0.40)	0.42 (0.31 a 0.52)	0.113
P	<0.001	<0.001	<0.001	

Subtitle: SD = standard deviation; *P* = p-value; VC = vital capacity; pre = pre-intervention; post = post-intervention; CI = confidence interval

DISCUSSION

In the auditory-perceptual assessment using the GRBASI scale, no statistically significant differences were observed between the pre- and post-intervention periods. This finding may be related to the sample characteristics, in which the average age was over 70 years. The natural aging of laryngeal structures—such as mucosal atrophy, thinning of the *lamina propria*, loss of elastic and collagen fibers, and reduced laryngeal mobility—compromises vocal quality and may limit the magnitude of therapeutic effects[26]. Furthermore, the inherent subjectivity of the auditory-perceptual assessment[27] may have contributed to the variability among judges, as evidenced by the low agreement observed in some parameters.

The GRBASI scale, although widely used in clinical practice, has limitations in terms of sensitivity for detecting subtle changes, especially in elderly populations, when compared to scales such as the CAPE-V (Consensus of Auditory-Perceptual Evaluation of Voice), which demonstrates greater accuracy in identifying small vocal changes[15,16]. It is possible, therefore, that the objective changes identified in this study—such as increases in maximum phonation time (MPT) and vital capacity (VC)—were not sufficiently large to significantly impact vocal perception in the short intervention period. It is also worth noting that the statistical analysis applied to the GRBASI presented methodological limitations, as it was based on measures of central tendency and dispersion rather than more appropriate models for ordinal variables. This approach may have obscured the true distribution of responses and reduced the ability to identify relevant clinical variations.

Regarding aerodynamic parameters, MPT data were lower than the average of 11 s for the vowel /a/ reported in a study of older adults of similar age[30], but showed a uniform increase after the intervention in all groups. The participants' VC remained within the normal range for their age group[31]. Although it is known that its decrease is one of the main effects of respiratory aging, potentially compromising the sustaining of vocal emission and leading to the use of compensatory patterns, such as greater laryngeal tension[32]. Thus, even if moderate, improvements in MPT and VC may have clinical relevance, as they promote greater vocal stability, projection, and endurance. These aspects contribute to reducing phonatory effort during prolonged speech situations, increasing intelligibility, and allowing older adults to maintain conversations in noisy environments or with multiple speakers. From a functional perspective, such gains can facilitate participation in family interactions, social activities, and community settings, promoting greater integration and reducing the risk of social isolation—a condition frequently associated with aging and communicative losses. Furthermore, a more stable and resilient voice can increase the elderly's self-confidence in using speech, strengthening their autonomy and quality of life.

In the present study, the use of VOHFO in elderly individuals with presbylarynx showed aerodynamic benefits, such as an increase in maximum phonation times and vital capacity, suggesting improved pneumophonoarticulatory coordination and greater phonatory efficiency. These results reinforce the potential of the technique as a therapeutic resource for this population, which presents structural changes resulting from laryngeal aging. Nevertheless, the literature indicates that the evidence on the efficacy of VOHFO remains incipient and lacks randomized clinical trials with greater statistical power[10]. In this context, additional primary studies have also reported preliminary results, with a tendency toward improvements in vocal and aerodynamic performance, which reinforces the need for further investigations[20].

Another relevant finding was the absence of significant differences between the isolated use of the techniques and their combination, suggesting that the combination of exercises does not necessarily enhance the effects in elderly individuals with presbylarynx. This result differs from findings in different populations: in individuals with behavioral dysphonia, VOHFO showed more favorable immediate effects than LaxVox (a silicone tube immersed in water) on vocal quality and self-reported symptoms[25]; in healthy elderly women, the resonance tube technique reduced roughness and increased ease of counting, an effect not observed with VOHFO[24]. Furthermore, systematic reviews and meta-analyses confirm that semi-occluded vocal tract exercises produce consistent benefits in acoustic, perceptual, and self-assessment measures in dysphonia[11,12]. In the context of elderly individuals with presbylarynx, the fact that no differences were observed between the isolated or combined use of the techniques indicates that both can be applied independently, with the potential to generate clinical benefits. This data provides support for clinical speech-language pathology practice, as it allows the professional to select the most viable technique, according to the available resources, the patient's profile and ease of execution, favoring applicability in clinical and home care settings.

However, it is important to highlight the methodological limitations of this study. The small sample size represented a significant methodological limitation, restricting the statistical power to detect subtle differences between the groups. Although a sample size calculation was performed based on a study by Saters[17], this limitation persists and should be considered when interpreting the results. Furthermore, there was no complete blinding of the evaluators, which may have introduced biases into the auditory-perceptual analysis. There was low agreement among the evaluators on some parameters of the GRBASI scale, as evidenced by the Fleiss' Kappa values in Table 2. The observed coefficients mostly fell within the levels of slight to reasonable agreement, indicating variability in the auditory-perceptual assessment. Also noteworthy is the absence of effect size measures and confidence intervals, which would have contributed to better qualifying the clinical relevance of the findings. The eight-week intervention period can be considered relatively short, and there was no longitudinal follow-up, which makes it impossible to verify the maintenance of the gains.

The possibility of a learning effect resulting from home practice should also be considered, which may have contributed to the results independently of the supervised intervention. Finally, the generalizability of the findings is limited to older adults without severe comorbidities or a prior history of voice therapy, limiting extrapolation to more heterogeneous clinical profiles.

Another point to consider is that the analysis of respiratory and phonatory function was performed using indirect measures, such as MPT, which, although clinically useful, is less accurate than more robust instrumental methods, such as subglottic pressure and airflow. The use of complementary physiological measures could increase the sensitivity for detecting changes resulting from the intervention.

As a whole, the results suggest that the semi-occluded vocal tract exercises employed in this study may help maintain respiratory balance in elderly individuals with presbylarynx. Future studies with more robust methodological designs, longer follow-up periods, and the inclusion of additional physiological measures are needed to confirm and expand on the results obtained. Subsequent investigations should consider larger and more heterogeneous samples, including elderly individuals with different clinical profiles and previous voice therapy histories, to broaden the generalizability of the findings. Furthermore, incorporating more precise instrumental measures, such as subglottic pressure, airflow, and detailed analysis of respiratory function, could increase the sensitivity in detecting changes resulting from the interventions.

CONCLUSION

Voiced oral high-frequency oscillation (VOHFO) and sounded blowing exercises into a silicone tube immersed in water demonstrated statistically significant effects on aerodynamic measures of maximum phonation time (MPT) and vital capacity (VC) in elderly individuals with presbylarynx. However, no changes were observed in auditory-perceptual vocal quality (GRBASI), indicating that the results were not reflected in perceptual changes in phonation.

Furthermore, no differences were observed between the techniques applied in isolation and the association between them, suggesting that, for this population profile, the effects are equivalent regardless of the form of application.

From a clinical perspective, these findings reinforce that semi-occluded vocal tract exercises, such as VOHFO and voiced blowing into a silicone tube, can be safely and affordably incorporated into therapeutic programs for older adults, especially those with presbylarynx. The observed aerodynamic improvement may improve vocal endurance, projection, and communicative participation in daily life, increasing autonomy and quality of life for this population. Future studies with larger samples, different clinical profiles, and longitudinal follow-up are needed to consolidate evidence-based intervention protocols and expand the applicability of these techniques in the context of geriatric vocal rehabilitation.

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