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Immediate vocal effects produced by the Shaker® device in women with and without vocal complaints

Efeitos vocais imediatos produzidos pelo dispositivo Shaker® em mulheres com e sem queixa vocal

Keywords

Voice
Voice Quality
Speech Acoustics
Voice Training
Speech Therapy

ABSTRACT

Purpose: To evaluate the acoustic and self-perception modifications obtained after the first, third, fifth and seventh minutes of voice oral high-frequency oscillation practice accomplished with the Shaker® device. **Methodology:** Twenty-seven women aged between 18 and 41 years with and without vocal complaint participated in the study. The sustained vowel / ε / was recorded at maximum phonation time before (pre-exercise) and after the first, third, fifth and seventh minutes of voice oral high-frequency oscillation practice accomplished with Shaker®. The acoustic analysis of the following parameters was performed: noise, fundamental frequency, glottal to noise excitation, Jitter, Shimmer and number of harmonics. **Results:** There were no significant differences in the comparison of the acoustic parameters between the participants with and without vocal symptoms. It was observed an improvement in the self-perception of vocal discomfort in the groups of women with and without vocal symptoms, comparing the moment before the practice with the first and third minutes of practice. There was a reduction in Jitter values when comparing the time before practice with the moments after one and seven minutes and when comparing the moments after five and seven minutes of exercise in the group of women with vocal symptoms. **Conclusion:** The Shaker® technique showed positive results both in individuals with symptoms and in individuals without vocal symptoms.

Keywords

Voz
Qualidade Vocal
Acústica da Fala
Treinamento da Voz
Fonoterapia

RESUMO

Objetivo: Avaliar as modificações acústicas e de autopercepção obtidas após o primeiro, terceiro, quinto e sétimo minuto de prática da técnica de oscilação oral de alta frequência sonorizada, realizada com o dispositivo Shaker®. **Método:** Participaram do estudo 27 mulheres com idade entre 18 e 41 anos com e sem queixa vocal. A vogal sustentada /ε/ foi registrada em tempo máximo de fonação antes (pré-exercício) e após o primeiro, terceiro, quinto e o sétimo minuto de execução da técnica de oscilação oral de alta frequência sonorizada com o dispositivo Shaker®. Foi realizada a análise acústica dos seguintes parâmetros: ruído, frequência fundamental, glottal to noise excitation, Jitter, Shimmer e número de harmônicos. **Resultados:** Não houve diferenças significativas na comparação dos parâmetros acústicos entre as participantes com e sem sintomas vocais. Observou-se melhora na autopercepção do desconforto vocal nos grupos das mulheres com e sem sintomas vocais, comparando-se o momento antes da prática com o primeiro e terceiro minutos de prática. Houve redução dos valores de Jitter, ao comparar o momento antes da prática com os momentos após um e sete minutos e ao comparar os momentos após cinco e sete minutos de exercício, no grupo de mulheres com sintomas vocais. **Conclusão:** A técnica com o Shaker® mostrou resultados positivos, tanto em indivíduos com sintomas quanto em indivíduos sem sintomas vocais.

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INTRODUCTION

Semi-occluded vocal tract (SOVT) exercises consist of the emission of a breath associated with prolonged sounds, such as, for example, the vowel "u"[1]. SOVT exercises have been indicated in clinical speech-language therapy practice to improve vocal efficiency[2,3]. Besides being indicated in cases of dysphonia[4], SOVT exercises have also been used in normophonic individuals[2,5] to improve vocal quality and in sung voice training, as vocal warm-up[6,7]. Techniques such as lip vibration, tongue vibration, bilabial fricatives, nasal sounds, lip constriction, prolonged "B" exercise, glottal firmness, finger Kazoo, and straw phonation are considered SOVT exercises[2,8,9].

During the performance of SOVT exercises, the partial occlusion of the mouth creates a resistance to the passage of air and promotes a retroflex resonance, which favors the separation of the vocal folds during vibration, reducing tension and collision impacts of the vocal folds[2,4,8], besides promoting vibration of the laryngeal cartilages, helping to release tension in the pharynx and reduce phonatory effort[10]. The increase in intraoral pressure promotes changes in the glottic configuration and vocal tract, besides providing changes in the fundamental frequency (F0), greater comfort in phonation[2,] and a voice rich in harmonics[4]. Such strategies favor primary muscle adjustment, the adequate position of the vocal folds, and stretching corresponding to the voice frequency and glottal resistance [11].

The Shaker® is a high-frequency oral oscillation device used by physiotherapists in the bronchial hygiene of patients[12]. This device, when blown by the patient, produces airway vibrations from the displacement of the steel ball, located in the front part of the device[12]. This vibration occurs at high frequency at the moment of air exhalation, which promotes mobilization of bronchial and pulmonary secretions to regions of the upper airways[12].

The Shaker® has been used systematically by physiotherapists in the rehabilitation of patients with pulmonary diseases and submitted to thoracic and abdominal surgeries, due to its ease of acquisition, easy handling, and also the benefits generated in bronchial hygiene and upper airways[12,13].

The use of this device associated with vocal emission has shown favorable results on vocal quality, both under the auditory perception of speech-language therapists and singers, who report easier emission after its practice. This occurs because the blowing sound in the device seems to work as a SOVT exercise, with the steel ball providing resistance to blowing[12,14], resulting in effects similar to other exercises such as those of phonation in straws[15].

A study[15] analyzed the immediate effects of high-frequency sound-driven oscillation exercise performed with the New Shaker® device, a variation of the Shaker® model, and compared it with the effects produced by LaxVox®, in normophonic individuals. The authors found similar effects of the techniques on vocal and laryngeal symptoms, but the New Shaker® favored the reduction of throat pain and irritation, decreased the sensation of reduced loudness, and provided an increase in maximum phonation time in male individuals[15]. Another study[16] analyzed the effects produced by the New Shaker® in normophonic individuals without vocal complaints and dysphonic individuals with vocal complaints. The authors found an improvement in the source-to-filter ratio and decreased severity of vocal and laryngeal symptoms in both groups, with women improving more in terms of laryngeal symptoms, while men improved more in terms of vocal symptoms[16]. The high frequency sounded oral oscillation technique performed with the New Shaker® device was also used in research with elderly women, being compared to the sounded blowing technique with a resonance tube. Only the sound blowing technique with a resonance tube resulted in improved vocal quality, however, both techniques showed similar results in the self-perception of vocal and laryngeal symptoms of the participants[17].

Despite the positive results verified in these studies[15-17], there is a lack of scientific studies involving the use of the Shaker® in speech-language therapy practice and it is still not known how long it takes to perform the technique in which the effects are already noticed.

Therefore, the objective of the present study was to evaluate the acoustic and self-perception changes obtained after the first, third, fifth, and seventh minutes of practice of the high-frequency sound oscillation technique, performed with the Shaker® device associated with vocal emission.

As a hypothesis of the study, we have that the use of Shaker® associated with vocal emission is capable of generating positive vocal acoustic effects, existing a minimum time of execution of the technique so that such effects start to be noticed.

METHODS

This is a cross-sectional, experimental, analytical study, with convenience sampling, approved by the Research Ethics Committee of the Centro Universitário Metodista Izabela Hendrix, under the number 2.926.636. Twenty-seven women with and without vocal symptoms participated in the study. Inclusion criteria were: age between 18 and 45 years old, absence of cardiovascular disease, a neurological or hearing disease that could interfere in the phonation process, absence of cleft lip and/or palate, facial or rib fractures, absence of acute asthma, or chronic obstructive pulmonary disease, bronchospasm, severe renal alterations, and untreated pneumothorax, and not being a smoker. The use of the Shaker® generates intense intra-oral and pulmonary pressure and may worsen the above diseases, thus justifying the need for the absence of these pathologies. Not completing all the stages of the study was an exclusion criterion. All individuals were informed about the study procedures and signed, after reading, the Informed Consent Form (ICF).

Brazilian Portuguese Voice Symptom Scale (VoiSS) was used to identify possible vocal complaints and characterize the sample. The VoiSS is an objective scale, of simple calculation and interpretation, composed of 30 questions, each with five response options: never, rarely, sometimes, almost always, and always. The questions are graded on a scale of 0 (never) to 4 (always) points, and individuals who reach a score equal to or greater than 16 are considered to have vocal symptoms [18].

Each participant filled out a Visual Analog Scale (VAS) and was instructed to mark their perception regarding the level of vocal discomfort. The VAS was composed of a graduated line scale, in which the extreme left represented the absence of vocal discomfort and the other extreme, the maximum possible vocal discomfort. From these two references, each participant was instructed to point at any spot on the line their perception of vocal quality at that moment.

Initially, the participant's voice was recorded. The recordings were made in a quiet room and recorded on a Dell® Optiplex 3020 computer, Intel Core i3, 4160 U, 3.60 GHz, 4 GB, and 64-bit operating system. For voice recording, we used a Shure® professional unidirectional BLX wireless headset microphone (consisting of BLX4 receiver, BLX1 bodypack transmitter, and PGA31 headset microphone), attached to a computer, positioned laterally to the participant's mouth at a distance of approximately five centimeters. The participants were asked to stand up and utter the extended vowel /ɛ/ in maximum phonation time.

Then the participants performed the high-frequency sound oscillation technique blowing the mouthpiece of the Shaker®, Classic model, while uttering the vowel /u/, with usual pitch and loudness, in maximum phonation time, for one minute, making breathing pauses when necessary. The time was recorded by one of the researchers and all the individuals were instructed on the correct execution of the vocal technique. As the study was carried out in a single session, in order not to overburden the participants, we chose to train the technique for a maximum of 5 seconds, so that they would feel confident and have feedback from the researcher. If there were any questions, they were answered.

After practicing the exercise for one minute, a new recording of the sustained vowel /ɛ/ was made and vocal self-perception was obtained through VAS. Each participant was then asked to perform the technique for another two minutes (totaling three minutes of practice), followed by another two minutes of exercise (total of five minutes), and finally, for another two minutes (total of seven minutes), ending with five recordings of vocal samples from each participant and self-perceptions through the VAS.

During the exercise, the peripheral oxygen saturation (SpO_2) and heart rate (HR) of each participant were monitored through a More Fitness® pulse oximeter, model MF-415. The monitoring was done to prevent the participants from feeling discomfort concerning breathing since the exercise requires the intense action of breathing.

Data collection was performed with four participants per day, totaling seven days of collection. During each day of data collection, four Shaker® devices were used, one for each individual. After use, the instruments were cleaned by immersing them in a one-liter solution of Glutaraldehyde (Glutacin 2% 28 days Cinord®) for ten hours, the time required for sterilization of the device, according to the manufacturer›s information.

The acoustic analysis of the voices was performed using the VoxMetria software. The acoustic parameters analyzed were: fundamental frequency (F0), noise, glottal to noise excitation (GNE), Jitter, Shimmer, number of harmonics, and maximum phonation time (MPT). These parameters were evaluated in the five moments mentioned above.

A comparative analysis of each acoustic parameter was performed between the periods pre-exercise (M0), with one minute of phonation (M1), three minutes (M3), five minutes (M5), and seven minutes (M7), respectively.

The descriptive analysis of continuous variables (VAS, MTF, noise, F0, GNE, Jitter, Shimmer, number of harmonics, and age) was performed using measures of central tendency (mean, median) and variability (standard deviation, minimum and maximum). To evaluate the distribution of continuous variables we applied the Kolmogorov-Smirnov test. We used Friedman's test to compare each parameter (VAS, MPT, noise, F0, GNE, Jitter, Shimmer, and number of harmonics) at different times, both for individuals with and without vocal complaints. In the cases in which there was a difference between the moments, we applied the Wilcoxon Test to verify in which moment there was a difference. We used the Mann Whitney test to compare each parameter (VAS, MPT, noise, F0, GNE, Jitter, Shimmer, and number of harmonics) between individuals with and without vocal complaints at each moment and at the VoiSS. All data were analyzed considering a significance level of 5%. The statistical analysis of the data was performed using the IBM SPSS (Statistical Package for the Social Sciences), version 19.0.

RESULTS

Among the 27 participants in the study, 10 (37%) had no vocal symptoms and 17 (63%) had symptoms. Data analysis indicated that the groups were not different regarding age (p=0.668), with a mean of 25.6 years old (SD = 5.4) for the group with symptoms and 25.9 years old (SD = 8.0) for the group without vocal symptoms.

The mean VoiSS scores for the groups with and without vocal symptoms were 26.9 (SD = 9.9) and 8.6 (SD = 4.5), respectively.

There was no statistically significant difference in comparing the results of the vocal parameters between the groups with and without vocal symptoms (Table 1).

The comparison of the results of the acoustic parameters at different moments in the group without vocal symptoms showed a difference for the variable self-perception of vocal discomfort, obtained through the VAS (Table 2). This difference was significant when comparing M0 with M1 and M0 with M3 (Figure 1).

The comparison of results at different times in the group with vocal symptoms indicated a difference with statistical significance for the variable self-perception of vocal discomfort and Jitter (Table 3). Regarding vocal discomfort, this difference was significant when comparing M0 with M1 and M0 with M3 (Figure 2). As for the Jitter variable, this difference was significant when comparing M0 with M1, M0 with M7, and M5 with M7 (Figure 3).

Table 1. Comparison of voice analysis parameters of individuals with and without vocal symptoms

Time	Variable	WITHOUT VOCAL SYMPTOM (n=10)					WITH VOCAL SYMPTOM (n=17)					p-value*
		Mean	Median	SD	Minimum	Maximum	Mean	Median	SD	Minimum	Maximum	
M0	VAS	2.10	1.00	2.13	0.00	5.00	2.94	3.00	1.64	0.00	6.00	0.23
	MPT	13.77	13.48	4.26	8.53	19.09	13.72	11.48	8.13	6.16	41.17	0.45
	Noise	1.14	1.05	0.67	0.52	2.78	1.11	0.99	0.58	0.45	2.26	0.84
	F0	212.17	216.71	20.33	168.13	234.38	220.36	217.06	16.96	181.91	251.14	0.74
	GNE	0.78	0.81	0.16	0.38	0.93	0.79	0.82	0.14	0.51	0.95	0.82
	Jitter	0.40	0.15	0.46	0.10	1.48	0.29	0.18	0.24	0.07	0.80	0.78
	Shimmer	3.32	2.94	1.30	1.75	6.01	2.61	1.92	1.57	1.17	7.28	0.10
	Nº of harmonics	16.60	19.00	7.14	6.00	25.00	19.06	22.00	5.39	7.00	24.00	0.38
M1	VAS	1.10	0.50	1.29	0.00	3.00	1.65	2.00	1.27	0.00	4.00	0.28
	MPT	15.87	15.21	7.25	6.58	29.80	14.98	12.94	8.22	6.74	43.21	0.65
	Noise	214.89	210.49	20.76	181.21	238.92	230.28	227.11	24.37	194.86	303.37	0.85
	F0	0.96	0.65	0.70	0.32	2.32	0.98	0.93	0.46	0.39	1.82	0.60
	GNE	0.83	0.91	0.17	0.50	0.98	0.82	0.83	0.11	0.62	0.96	0.51
	Jitter	0.19	0.13	0.18	0.05	0.56	0.18	0.14	0.13	0.06	0.50	0.60
	Shimmer	2.35	2.39	0.77	1.51	3.41	2.23	1.83	1.26	0.59	5.33	0.47
	Nº of harmonics	19.60	23.00	7.03	6.00	26.00	18.88	21.00	5.13	5.00	24.00	0.35
M3	VAS	0.50	0.00	0.85	0.00	2.00	1.76	1.00	2.05	0.00	7.00	0.06
	MPT	16.68	15.69	7.20	7.93	28.84	14.92	13.07	7.55	8.68	40.86	0.38
	Noise	213.15	211.37	21.73	185.88	250.40	230.67	229.01	25.59	192.77	312.38	0.77
	F0	0.88	0.63	0.56	0.40	2.01	1.02	0.79	0.64	0.38	2.57	0.82
	GNE	0.84	0.91	0.14	0.57	0.96	0.81	0.87	0.15	0.44	0.97	0.74
	Jitter	0.23	0.11	0.34	0.06	1.19	0.20	0.12	0.25	0.07	1.11	0.58
	Shimmer	2.64	2.36	1.23	0.99	4.62	2.08	1.95	0.99	0.64	4.45	0.26
	Nº of harmonics	19.80	22.00	6.14	7.00	26.00	20.41	21.00	4.18	11.00	25.00	0.84
M5	VAS	0.60	0.00	1.07	0.00	3.00	1.82	1.00	2.13	0.00	7.00	0.08
	MPT	16.21	14.66	7.16	6.99	28.02	14.97	13.28	7.98	7.66	42.69	0.65
	Noise	218.64	223.17	21.98	186.25	249.91	232.46	231.29	23.68	186.31	292.47	0.79
	F0	1.04	0.91	0.66	0.37	2.26	1.06	0.84	0.63	0.43	2.26	0.69
	GNE	0.81	0.84	0.16	0.51	0.97	0.80	0.86	0.15	0.51	0.95	0.72
	Jitter	0.18	0.13	0.13	0.06	0.47	0.21	0.12	0.27	0.07	1.19	0.90
	Shimmer	2.82	2.61	1.02	1.87	5.19	2.54	2.09	1.49	0.70	5.71	0.21
	Nº of harmonics	19.10	20.00	5.78	7.00	26.00	19.94	21.00	4.52	8.00	25.00	0.78
M7	VAS	0.70	0.00	1.34	0.00	4.00	1.94	1.00	2.77	0.00	9.00	0.17
	MPT	15.52	15.16	6.09	8.65	27.45	15.17	12.88	9.55	7.01	48.16	0.62
	Noise	213.59	217.07	20.07	186.93	238.30	231.78	235.47	22.28	199.32	269.95	0.74
	F0	1.05	0.67	0.73	0.42	2.44	1.04	0.97	0.50	0.36	1.94	0.82
	GNE	0.80	0.90	0.18	0.47	0.96	0.80	0.82	0.12	0.59	0.97	0.74
	Jitter	0.24	0.11	0.42	0.07	1.43	0.13	0.10	0.07	0.07	0.30	0.92
	Shimmer	2.64	2.14	1.25	1.27	4.91	2.22	1.85	1.24	0.73	4.75	0.42
	Nº of harmonics	19.50	21.50	6.45	5.00	27.00	19.00	20.00	4.83	8.00	27.00	0.56

*Mann-Whitney Test

Caption: n: number of participants; SD: standard deviation; VAS: Visual Analog Scale; MPT: maximum phonation time; F0: fundamental frequency; GNE: Glottal Noise Excitation; Nº: number.

Table 2. Comparison of voice analysis parameters at different times in individuals without vocal symptoms (n=10)

	Moment	Mean	Median	SD	Minimum	Maximum	p-value*
VAS	M0	2.10	1.00	2.13	0.00	5.00	0.012**
	M1	1.10	0.50	1.29	0.00	3.00	
	M3	0.50	0.00	0.85	0.00	2.00	
	M5	0.60	0.00	1.07	0.00	3.00	
	M7	0.70	0.00	1.34	0.00	4.00	

*Friedman Test; **p<0.05

Caption: SD: standard deviation; VAS: Visual Analog Scale; MPT: maximum phonation time; F0: fundamental frequency; GNE: Glottal Noise Excitation; Nº: number

Table 2. Continued...

	Moment	Mean	Median	SD	Minimum	Maximum	p-value*
MPT	M0	13.77	13.48	4.26	8.53	19.09	0.053
	M1	15.87	15.21	7.25	6.58	29.80	
	M3	16.68	15.69	7.20	7.93	28.84	
	M5	16.21	14.66	7.16	6.99	28.02	
	M7	15.52	15.16	6.09	8.65	27.45	
F0	M0	212.17	216.71	20.33	168.13	234.38	0.794
	M1	214.89	210.49	20.76	181.21	238.92	
	M3	213.15	211.37	21.73	185.88	250.40	
	M5	218.64	223.17	21.98	186.25	249.91	
	M7	213.59	217.07	20.07	186.93	238.30	
Noise	M0	1.14	1.05	0.67	0.52	2.78	0.533
	M1	0.96	0.65	0.70	0.32	2.32	
	M3	0.88	0.63	0.56	0.40	2.01	
	M5	1.04	0.91	0.66	0.37	2.26	
	M7	1.05	0.67	0.73	0.42	2.44	
GNE	M0	0.78	0.81	0.16	0.38	0.93	0.435
	M1	0.83	0.91	0.17	0.50	0.98	
	M3	0.84	0.91	0.14	0.57	0.96	
	M5	0.81	0.84	0.16	0.51	0.97	
	M7	0.80	0.90	0.18	0.47	0.96	
Jitter	M0	0.40	0.15	0.46	0.10	1.48	0.201
	M1	0.19	0.13	0.18	0.05	0.56	
	M3	0.23	0.11	0.34	0.06	1.19	
	M5	0.18	0.13	0.13	0.06	0.47	
	M7	0.24	0.11	0.42	0.07	1.43	
Shimmer	M0	3.32	2.94	1.30	1.75	6.01	0.107
	M1	2.35	2.39	0.77	1.51	3.41	
	M3	2.64	2.36	1.23	0.99	4.62	
	M5	2.82	2.61	1.02	1.87	5.19	
	M7	2.64	2.14	1.25	1.27	4.91	
Nº of harmonics	M0	16.60	19.00	7.14	6.00	25.00	0.813
	M1	19.60	23.00	7.03	6.00	26.00	
	M3	19.80	22.00	6.14	7.00	26.00	
	M5	19.10	20.00	5.78	7.00	26.00	
	M7	19.50	21.50	6.45	5.00	27.00	

*Friedman Test; **p<0.05
Caption: SD: standard deviation; VAS: Visual Analog Scale; MPT: maximum phonation time; F0: fundamental frequency; GNE: Glottal Noise Excitation; Nº: number

Table 3. Comparison of voice analysis parameters at different moments in time in individuals with vocal symptoms (n=17)

	Moment	Mean	Median	SD	Minimum	Maximum	p-value*
VAS	M0	2.94	3.00	1.64	0.00	6.00	0.001**
	M1	1.65	2.00	1.27	0.00	4.00	
	M3	1.76	1.00	2.05	0.00	7.00	
	M5	1.82	1.00	2.13	0.00	7.00	
	M7	1.94	1.00	2.77	0.00	9.00	
MPT	M0	13.72	11.48	8.13	6.16	41.17	0.235
	M1	14.98	12.94	8.22	6.74	43.21	
	M3	14.92	13.07	7.55	8.68	40.86	
	M5	14.97	13.28	7.98	7.66	42.69	
	M7	15.17	12.88	9.55	7.01	48.16	

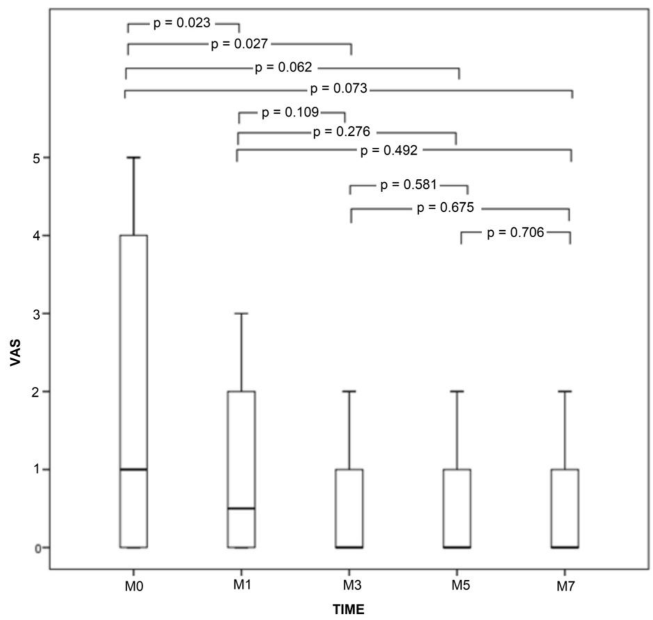
*Friedman Test; **p<0.05
Caption: SD: standard deviation; VAS: Visual Analog Scale; MPT: maximum phonation time; F0: fundamental frequency; GNE: Glottal Noise Excitation; Nº: number

Table 2. Continued...

	Moment	Mean	Median	SD	Minimum	Maximum	p-value*
F0	M0	220.36	217.06	16.96	181.91	251.14	0.083
	M1	230.28	227.11	24.37	194.86	303.37	
	M3	230.67	229.01	25.59	192.77	312.38	
	M5	232.46	231.29	23.68	186.31	292.47	
	M7	231.78	235.47	22.28	199.32	269.95	
Noise	M0	1.11	0.99	0.58	0.45	2.26	0.633
	M1	0.98	0.93	0.46	0.39	1.82	
	M3	1.02	0.79	0.64	0.38	2.57	
	M5	1.06	0.84	0.63	0.43	2.26	
	M7	1.04	0.97	0.50	0.36	1.94	
GNE	M0	0.79	0.82	0.14	0.51	0.95	0.672
	M1	0.82	0.83	0.11	0.62	0.96	
	M3	0.81	0.87	0.15	0.44	0.97	
	M5	0.80	0.86	0.15	0.51	0.95	
	M7	0.80	0.82	0.12	0.59	0.97	
Jitter	M0	0.29	0.18	0.24	0.07	0.80	0.002**
	M1	0.18	0.14	0.13	0.06	0.50	
	M3	0.20	0.12	0.25	0.07	1.11	
	M5	0.21	0.12	0.27	0.07	1.19	
	M7	0.13	0.10	0.07	0.07	0.30	
Shimmer	M0	2.61	1.92	1.57	1.17	7.28	0.066
	M1	2.23	1.83	1.26	0.59	5.33	
	M3	2.08	1.95	0.99	0.64	4.45	
	M5	2.54	2.09	1.49	0.70	5.71	
	M7	2.22	1.85	1.24	0.73	4.75	
Nº of harmonics	M0	19.06	22.00	5.39	7.00	24.00	0.707
	M1	18.88	21.00	5.13	5.00	24.00	
	M3	20.41	21.00	4.18	11.00	25.00	
	M5	19.94	21.00	4.52	8.00	25.00	
	M7	19.00	20.00	4.83	8.00	27.00	

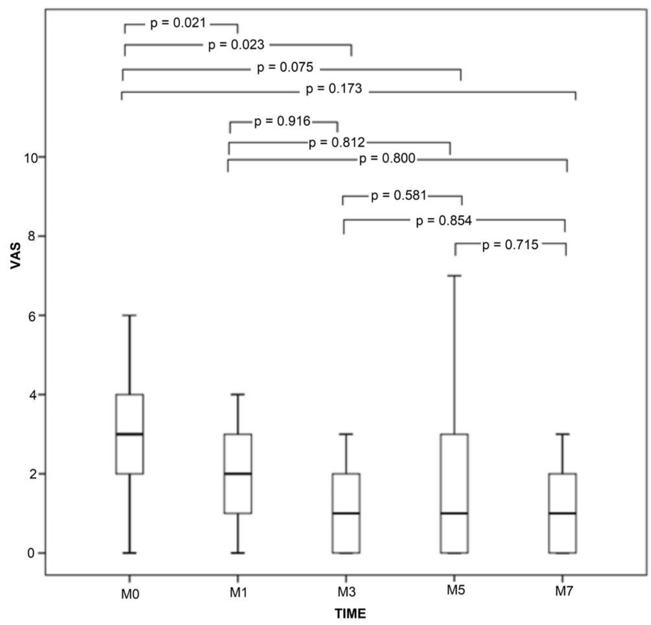
*Friedman Test; **p<0.05

Caption: SD: standard deviation; VAS: Visual Analog Scale; MPT: maximum phonation time; F0: fundamental frequency; GNE: Glottal Noise Excitation; Nº: number



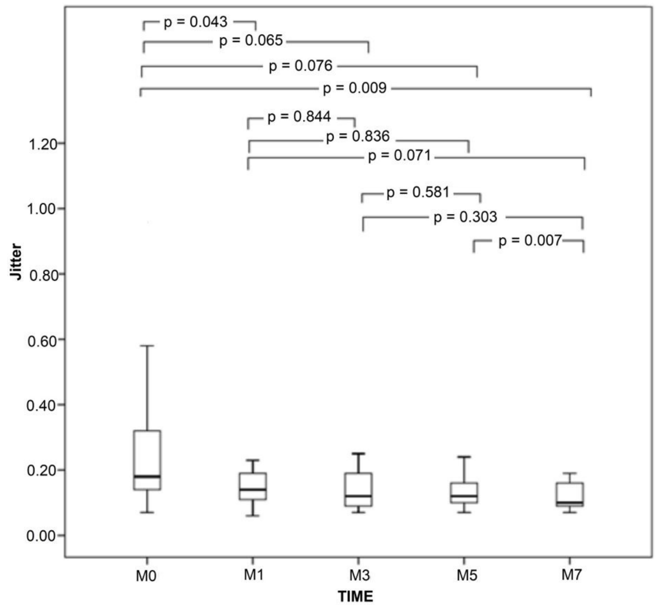
Caption: p=probability of significance (Wilcoxon Test)

Figure 1. Comparison of vocal discomfort at different moments in individuals without vocal symptoms (n=10)



Caption: p=probability of significance (Wilcoxon Test)

Figure 2. Comparison of vocal discomfort at different moments in individuals with vocal symptoms (n=17)



Caption: p=probability of significance (Wilcoxon Test)
Figure 3. Comparison of JITTER at different moments in individuals with vocal symptoms (n=17)

DISCUSSION

In the present study, there was a higher prevalence of people with vocal symptoms than without symptoms, considering the score obtained in the VoiSS. In the study which validated the Brazilian Portuguese Voice Symptom Scale (VoiSS) [18], individuals from the general population had a total mean score of 7.11 points, while the mean score of the participants in this study was 20.1 points, which can be justified by the fact that the sample of convenience included voice professionals, speech-language therapy students and patients from a school clinic. The age of the individuals did not influence these symptoms, since there was no age difference between the groups with and without vocal symptoms.

As for the parameters analyzed, no significant differences were found between individuals with and without vocal complaints at any time of the study. This fact may be related to the limited number of participants in the sample, as well as may suggest that the immediate effects of the technique of oral oscillation of high-frequency sound, performed with the Shaker® occur similarly, regardless of the presence or absence of vocal symptoms. The study[16] which investigated the effects of this technique, using the New Shaker®, in dysphonic individuals and individuals without vocal alterations, verified a reduction in the severity of vocal symptoms in both groups, which is consistent with the present study. However, the authors found that the improvement was greater in the group of dysphonic individuals, justified by the fact that they had greater severity of vocal symptoms [16].

The results of the present study show an improvement in the self-perception of phonatory discomfort in women with and without vocal complaints after performing the high-frequency sound oscillation technique using the Shaker®. No significant differences were found in the acoustic analysis parameters, when comparing the groups, at the different times of performing the technique.

According to the literature[19], it can be inferred that the self-perception of vocal discomfort was positive after the minutes of exercise execution for individuals due to the high pressure that the Shaker® causes in the region of the upper airways, which may have favored the glottic coaptation, increasing projection and vocal comfort. This finding also suggests that three minutes is the ideal time for performing the technique, especially in the group without symptoms, which had the least vocal discomfort at this time, and since there were no major changes in self-perception from the fourth moment on. Studies by other authors[5,20,21] have pointed out similar findings regarding the execution time of different SOVT exercises. The other studies that used the Shaker® [15-17] did not compare different execution times of the technique but found positive effects for three minutes.

A study[20] investigated the ideal time to perform the blowing and high-pitched sound exercise, also considered as a SOVT exercise, in dysphonic women with vocal nodules, and obtained a better response in the perceptual-auditory and acoustic evaluations with three minutes of performance of the exercise, although the self-perception of phonatory discomfort only changed (feeling worse) after the seventh minute of performing the technique. Another study[5] analyzed the tongue vibration SOVT exercise and found positive effects, such as increased fundamental frequency, vocal intensity, and noise reduction in the third minute of performing the technique. The SOVT exercise performed with the high-resistance straw was also compared regarding the time of execution in women with behavioral dysphonia, and positive vocal responses were verified after the third minute of the exercise, with improved phonatory effort, increased maximum phonation time, and reduced fundamental frequency variability, and with continued exercise, these parameters worsened[22].

Although no significant change was found in the MPT in individuals without vocal symptoms, this variable increased until the third moment of the technique, and it is important to stress that the p-value was close to the cutoff point. Piragibe et al.[17] found no change in MPT after the high-frequency sound oral oscillation technique using the New Shaker® in elderly women. Antonetti et al.[15] found an increase in MPT only for males after the mentioned technique. Thus, one can imagine that the change in MPT with the technique is influenced by individual characteristics, such as gender, requiring further investigations in future researches.

Regarding the individuals with vocal symptoms, the parameter self-perception of vocal discomfort showed positive changes, comparing the first with the second and third moments, indicating that in this population, performing the exercise for one minute may be beneficial in vocal terms, since the best result was in the second moment (one minute of performing the technique).

Comparing the pre- and post-exercise moments of the group of individuals with vocal complaints, one can observe an improvement in the Jitter values (which consists of F0 disturbances)[23] in the first minute, as well as after the seventh minute of performing the technique. Studies in the literature have analyzed the Jitter parameter in different vocal techniques, such as the sonorant tongue vibration, which resulted in a decrease in Jitter, indicating a possible improvement in the phonatory system balance in women with mild dysphonia or normal vocal quality[24]. However, studies carried out with blowing and high-pitched sound[20], high resistance straw[22], and the New Shaker[15-17] found no change in the Jitter along the practice execution times. It is important to note that, although all are considered SOVT exercises, the different techniques have specificities that can result in distinct vocal effects. Moreover, although some researches use the same technique, they present different methodological designs, which makes it impossible to compare the studies.

The study carried out had important limitations regarding its sample and, therefore, it allows us to consider the found results only for the population in question. The absence of a laryngological exam of the participants and the perceptual-auditory evaluation in the data analysis also constitute limitations. Another limitation identified was the execution of five emission recordings in maximum phonation time, which may have overloaded the individual. Despite these limitations, the study contributes to the literature in the area, since few articles were identified related to the use of this resource in voice therapy, and none of them compared the effect of different execution times of the technique. Research with larger samples is necessary to analyze the real effect of Shaker® associated with vocal emission in individuals with and without vocal complaints. Other suggestions for future research include collecting data on different days or provide more resting time between the moments of execution of the technique, to avoid a possible overload for the individual and also, include the perceptual-auditory analysis, performed by experienced professionals in the methodology of data analysis.

CONCLUSION

The results of the present study indicate a better self-perception of the individuals associated with vocal discomfort over time after performing the SOVT exercises with the use of the Shaker®.

We observed a decrease in jitter values after the first and seventh minutes of the exercise in the group of women with vocal complaints, which suggests better regularity of vibration of the vocal folds.

It is suggested that future studies with larger samples should be done to analyze the real effect of Shaker® on the vocal quality of women with and without vocal complaints.

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Authors contributions

ACOS and NEPS were responsible for writing the project, collecting, tabulating, and analyzing data, and writing the article. LLCRN was responsible for the research idea, project writing, critical review of the article, and writing the article. BOS assisted with article writing, data collection, and analysis. RMMMF participated in data collection, critical review of the article, and article writing.