Journal of Education and New Approaches 2023, 6(2), 394-407

JENA

Journal of Education and New Approaches

JENA

Measurement of the Turkish Authority Music Voice Training Process at the Initial Stage with Acoustic Parameters*

Nuran AYAZ[**1] & Sema SEVİNÇ[2]

Recieved: ***28.11.2023*** *Accepted:* ***25.12.2023*** *Published:* ***30.12.2023***
DOI: 10.52974/jena.1397041

Absract:
Objective sound analysis methods In this study, prepared in the screening model for due diligence, Selcuk University Dilek Sabancı State Conservatory Department of Traditional Turkish Music Department of Turkish Art Music I. The Control and Experimental groups created with the participation of 18 classroom students consisted of 9 students each. All the voice training exercises, studies and works written by the researcher to the experimental group were applied, while the control group was briefly pre-prepared only for the opening of the voice and the teaching of the work was carried out. This study was applied to the control and experimental group simultaneously for 14 weeks. This study aims to determine the positive change in the development of sound in the initial stage of Turkish Makam Music Sound Education, the content of the courses and the sound education applied by the educators. This study covers a sample created with the idea that it will contribute to the development of Turkish music style and attitude and will help academic studies to be conducted in order to perform exercises, etudes and makam works consisting of voice training techniques used in Western Music education and Turkish music Makams. In this study, prepared in the screening model for due diligence; Selçuk University Dilek Sabancı State Conservatory Department of Traditional Turkish Music Department of Turkish Art Music Anasanat I. The Control and Experimental groups created with the participation of 18 students of the class consisted of 9 students. All the voice training exercises, studies and works written by the researcher to the experimental group were applied, and the control group was briefly pre-prepared for the opening of only the voice and the teaching of the work was carried out. This study was applied to the control and experimental groups at the same time for 14 weeks. This study aims to determine the positive change in the development of sound at the initial stage of the audio training provided by the Turkish Authorities, the content of the courses and the audio training applied by the educators.

Keywords: *Sound, acoustic analysis, frequency.*

Atıf:
Ayaz, N., & Sevinç, S. (2023). Measurement of the turkish authority music voice training process at the initial stage with acoustic parameters. *International Journal of Education and New Approaches*, *6*(2), 394-407. https://doi.org/10.52974/jena.1397041

[1]Selcuk University, Türkiye. Orcid ID: 0000-0002-4252-5580
[2]Necmettin Erbakan University, Türkiye. Orcid ID: 0000-0002-2531-8635
*This paper was produced on the basis of the PhD thesis prepared by Author 1.
*Corresponding Author: nrnayaz@hotmail.com

INTRODUCTION

Acoustic analysis is a method that is performed based on objective parameters and can be easily repeated when desired. Computer-aided programs are used in audio laboratories to evaluate the acoustic parameters of sound. Computerized Speech Laboratory, MDVP and Dr. Speech is the most widely used voice analysis programs. The Multi-Dimensional Voice Program (MDVP) is a gold standard software program for quantitative acoustic evaluation of sound quality that can document up to 30 parameters in a single sound sample. MDVP, which has found a wide use in testing normal and diseased sounds, is unique in terms of its ability in studies on the classification of pathological sounds. The results are graphically and numerically compared with these normative values. With the multidimensional analyses obtained with MDVP, it can evaluate the pathologies of patients more broadly and, most importantly, monitor changes over time. MDVP is designed to be fast and easy to use. He can log out directly. (Altın, 2006)

Purpose of the Study

This study; Turkish Makam Music has acquired the purpose of collective change of sound development at the initial stage of voice education, which provides Voice Education, the contents of the courses and the voice education applied by educators.

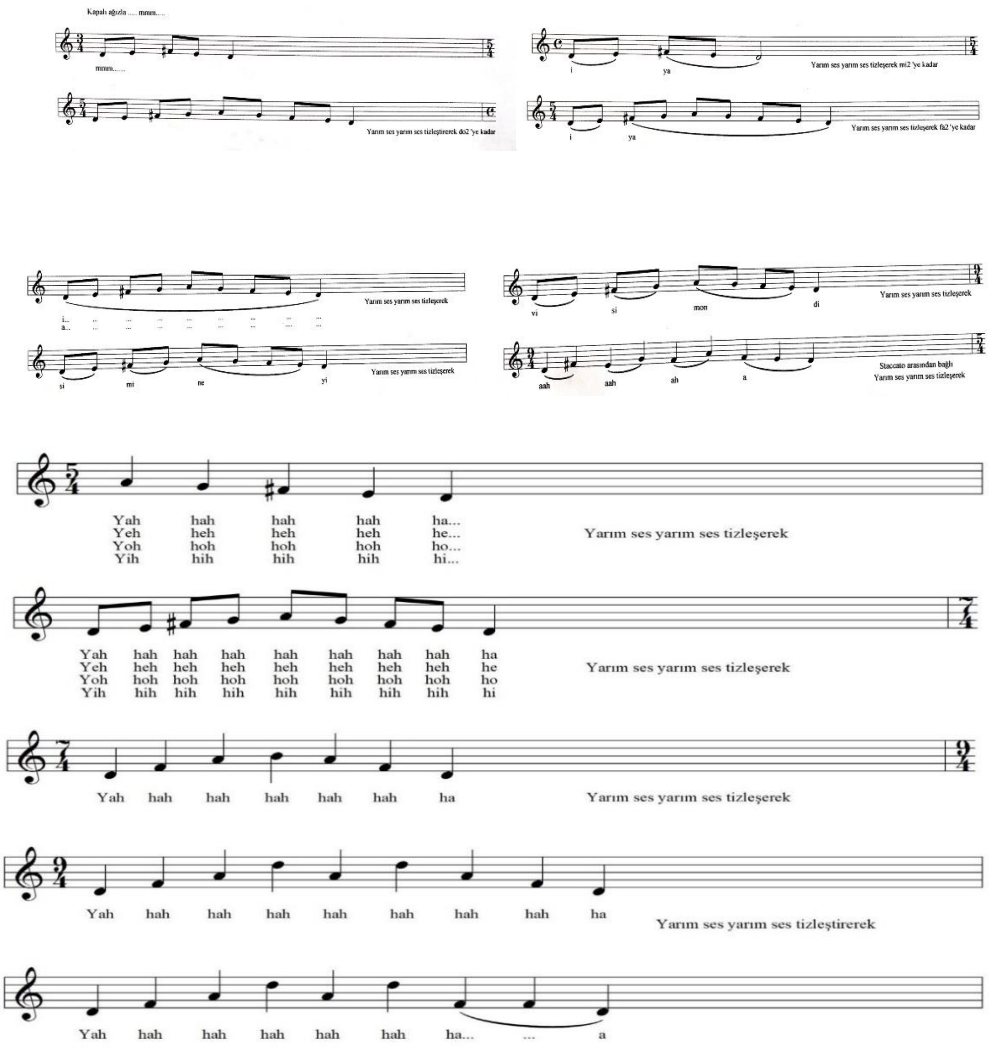
METHOD

In this study, prepared in the screening model for due diligence; Selcuk University Dilek Sabancı State Conservatory Department of Traditional Turkish Music Department of Turkish Art Music I. In the research, which was created with the participation of 18 students, the Control and Experimental groups consisted of 9 students each. All the voice training exercises, studies and works written by the researcher to the experimental group were applied, while the control group was briefly pre-prepared only for the opening of the voice and the teaching of the work was carried out. This study was applied to the control and experimental group simultaneously for 14 weeks.

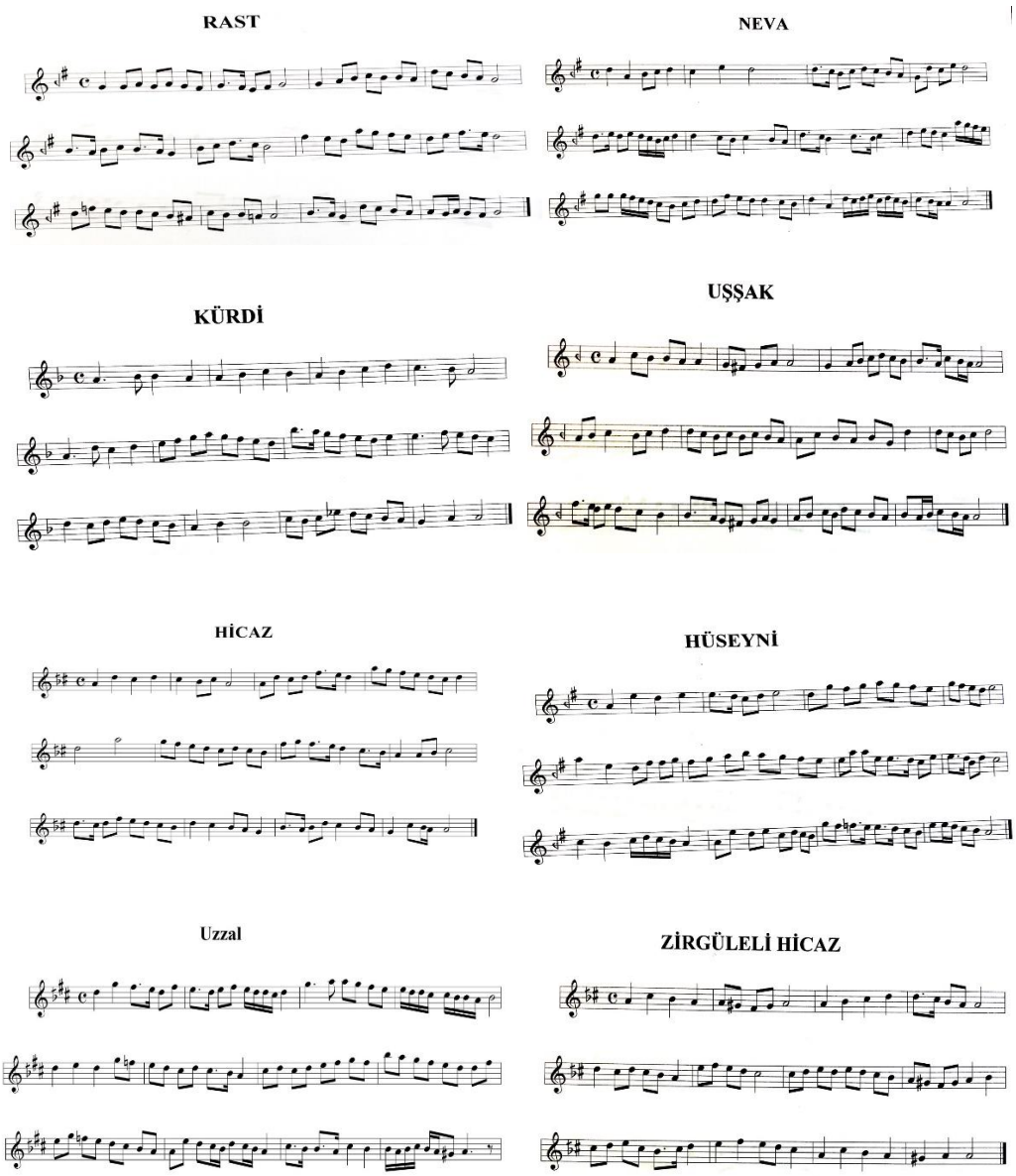
FINDINGS, COMMENTS AND DISCUSSION

Voice Training

The basic elements of voice education and various singing techniques contribute to individuals to produce a bright, clear and agitated voice comfortably with the correct phonation. Thanks to the voice exercises created by taking into account individual differences in order to acquire basic elements and various singing techniques, individuals can use their voices correctly, beautifully and effectively. In voice education, systematic and regular work is necessary for the conscious development of hearing (ear) and sound. During the training process, a person asks himself, "how should this tone resonate?" the ability to ask and answer questions is an important stage of development. In other words, depending on the timbre, the accuracy of the brightness of each vocal should be adjustable by the ear (Özsan, 2010).



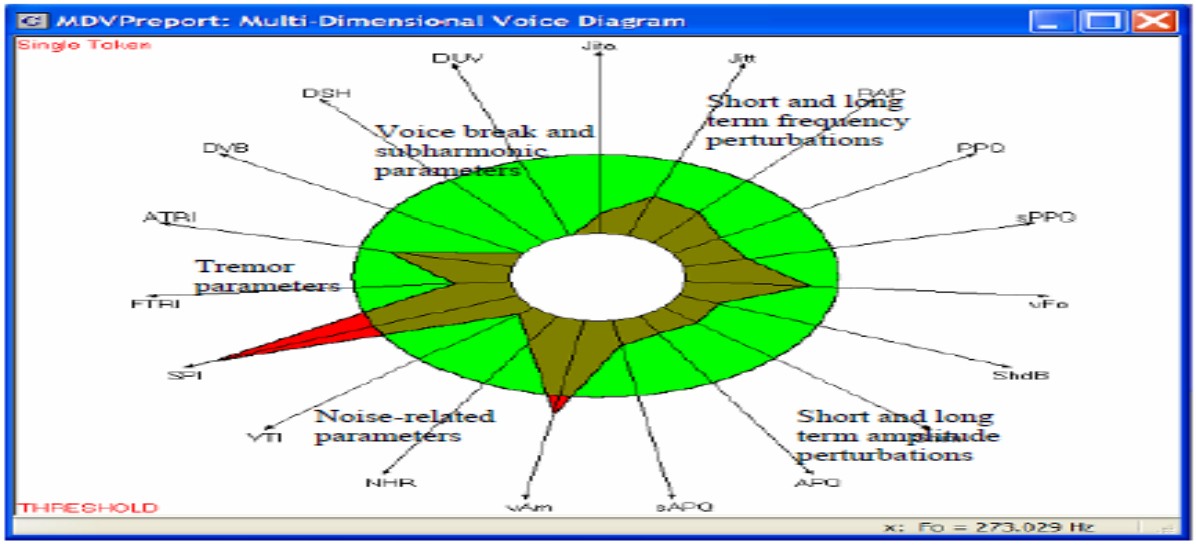
Common Sound Heating Exercises



Experimental Group Physical Exercises

Acoustic Analysis

Acoustic analysis is a method that is performed based on objective parameters and can be easily repeated when desired. Computer-aided programs are used in audio laboratories to evaluate the acoustic parameters of sound. Computerized Speech Laboratory, MDVP and Dr. Speech is the most widely used voice analysis programs. The Multi-Dimensional Voice Program (MDVP) is a gold standard software program for quantitative acoustic evaluation of sound quality that can document up to 30 parameters in a single sound sample. MDVP, which has found a wide use in testing normal and diseased sounds, is unique in terms of its ability in studies on the classification of pathological sounds.



Graph 1. The Multi-Dimensional Voice Program

All values are shown on a circular graph, and values between normal values are indicated in a green circle and dark green, and values outside the normal are indicated Decently in red. Sound analysis systems measure the frequency, intensity, irregularities in the frequency and intensity of an audio signal, the amount of harmonics and noise it contains in the form of different parameters (Kılıç M.A, Okur E: 2001). In the acoustic analysis of sound, five main parameters are measured, namely basic frequency (Fo), jitter, shimmer, harmony noise ratio (HNR), normalized noise energy (NNE).

Measurable Parameters:

1. Basic frequency (F0): The frequency of a simple sound formed at the larynx level is called the basic frequency and is indicated by its unit (hertz) Hz. It shows the number of vibrations of the vocal cords in 1 sec. The time elapsed between two vibrations is called a period, and its unit is milliseconds (Kılıç & Okur, 2001). The fundamental frequency is a physical expression, and its perceptual counterpart is pitch. As the fundamental frequency increases, the pitch becomes thinner, as it decreases, it thickens. A change in the fundamental frequency also means a change in the speed of the glottic cycle, that is, a change in the mechanical properties of the vocal cords. When the length of the vocal cords increases, the area exposed to subglottic pressure expands and the opening phase of the glottic cycle shortens. Since the elastic structures that are stretched will come to the middle line faster, the closing phase also shortens and F0 increases. With the help of the cricothyroid November muscle, F0 can be increased. The F0 value is in the range of 100-150 Hz for men and 200-300 Hz for women (Fox & Bredenoord, 2008).

2-Parameters related to Jitter: The vibration parameters of the vocal cords are determined in perturbation measurements. The ideal thing is that the fundamental frequency does not change at all during flat phonation. But in practice, phonatory organs cannot provide this, and small differences appear between successive periods. Dec. These unintentional changes in the fundamental frequency are called “frequency perturbation” or “jitter”. Jitter refers to the variation in each period. It can be expressed in milliseconds (ms) or as a percentage of the glottic cycle (%). The average of the absolute value of the difference of each period in the analyzed sound sample with the period after it is called “absolute jitter”. “Jitter (%)” is also obtained by dividing the absolute jitter by the average period (Fox & Bredenoord: 2008).

Perturbation, also called jitter, means the variability of the frequency of each vibratory cycle relative to the next. There is also a certain amount of frequency variability in people without voice disorders. The jitter is calculated as follows. The frequency of each vibratory cycle is subtracted from the frequency of the subsequent cycle or the previous cycle. The same mathematical operation is performed on all cycle frequencies in the time interval to be evaluated. The arithmetic average of the 40 values found is taken and divided by the average period. The resulting result is multiplied by 100 and jitter is found.

Absolute jitter: It is the average of the absolute value of the difference between each period in the analyzed sound sample and the period after it. It is not a reliable parameter because it varies according to the fundamental frequency.

3-Sound intensity: The sound intensity is the perceptual equivalent of the magnitude of the pressure of the sound waves. Its unit is dB spl. As in an audiogram, a phonetogram is obtained by measuring the lowest and highest intensities that a person can extract for each frequency, writing the intensity of the sound in dB on the y axis and the frequency of the sound in Hz on the x axis (Kara, 2010).

4-Shimmer perturbations: It expresses the amplitude variation in each glottic cycle as % or dB. It is normally below 3%. As its value increases, the sound quality deteriorates. As shown in the basic frequency perturbation, very short-term amplitude changes in audio signals are measured here. The amplitude perturbation, called a "shimmer", is expressed in dB or %. Shimmer (dB): Shimmer is calculated in dB by comparing the peak amplitude of each period with the peak amplitude of the next period. The shimmer shows the relative change between the amplitudes of the sound wave at short intervals (Kara, 2010). The average of the absolute value of the difference in intensity between each period and the period after it is divided by the average period intensity and “Shimmer (%)” is obtained (Fox, Bredenoord:2008). Dec. Jitter and shimmer enable the detection of vocal variability and difference in normal and pathological voice in a non-invasive way (Vieira et al., 2002).

5-Spectral parameters: The trace created using sound spectrography is called a “spectrogram” and is a graphical representation of the energy generated by the sound source. Sound spectrography, which decomposes acoustic waves into their most basic components, was developed in the 1940s. This development came about as a result of Graham Bell's desire to make speech visible for his wife, who has hearing difficulties. Sound spectrography shows the “frequency”, “duration” and “intensity” properties of sound. In this way, information about the phonation, articulation and resonance qualities of the human voice is obtained. (Dursun et al., 2003).

Regular and periodic vertical lines are noticeable in the spectrogram of a male voice without vocal pathology when singing the ‘a’ vowel, which shows synchronized vocal cord movements. (Dursun et al., 2003). Spectrographic analysis of the sound; spectrogram of a normal sound; shows well-developed harmonics in the form of evenly settled horizontal lines (Dursun et al., *2003).*

6-Harmonic-Noise ratio (HNR): HNR is the ratio of harmonic energy to noise energy. If the frequency of a complex sound is not an exact multiple of F0, it is considered noise. The noise component is caused by the formation of turbulent airflow or irregular glottic vibration due to the failure of the glottis to close completely during the vibratory cycle. The ratio of the sound

energy, whose frequency is formed by F0 and its harmonics, to the sound energy at noise frequencies is called HNR. It is thought that this measurement is an objective method for evaluating the degree of severity of dysphonia (Kara, 2010).

Computer-aided programs are used in today's sound laboratories to evaluate the acoustic parameters of sound. CSL (Computer Speech Laboratory), developed by Kay Elemetrics company, MDVP, PRAAT and Dr. developed by Tiger Electronics. Speech is a widely used voice analysis programs. CSL is a program that includes the waveform, spectrogram, LPC analysis and formant values of audio signals, energy time graph. MDVP is a program that evaluates the frequency, perturbation, noise and tremor parameters of audio signals.

Statistical Analysis:
SPSS 15.0 production mode (Statistical Package for Social Sciences) program was used for statistical analysis. In the evaluation of intra-group parameters, the Wilcoxon Sign Dec Rank test and the Chi-Square test were used for statistical analysis, the Mann Whitney U test was used for the evaluation of differences between groups, and the Pearsan test was used for correlation.

Study Group
This study was composed of Undergraduate I students from Selcuk University Dilek Sabancı State Conservatory Department of Traditional Turkish Music, Department of Turkish Art Music. Half of the students are studying the reed as a main instrument, and half are studying voice performance. this study, which started with 18 students, was completed with 16 people by deactivating two students whose pre-education registrations were received but did not attend school. In this study, a Control and Experimental Group were formed and the students were placed in mixed groups without distinguishing between those who received voice training and those who did not.

Acquisition and Analysis of Data
The information about the study was given in detail to the students participating in the study by the person conducting the research. Permits have been obtained for research from Selcuk University Dilek Sabancı State Conservatory and Selcuk University Faculty of Medicine.

The data were obtained as a result of applied and acoustic evaluations, and the recordings were taken at the sound laboratory of the Otolaryngology service of the Faculty of Medicine of Selcuk University.

The acoustic properties of the voice were measured using the CSL (Computerized Speech Laboratory) 4500 computer environment using Kay Elemetrics MDVP (Multi-Dimensional Voice Program), Main Program and Shure Sm 48 model microphone. All measurements were made in a quiet room, with the distance between the mouth and the microphone being about 15 cm, while the subjects made a “aaa” and “pah” sound in a comfortable timbre and height Deceleration. Among the acoustic properties, F0 (Fundamental Frequency), F1, F2, F3, F4, F5 formant frequencies, jitter (%), shimmer (%), 8 NHR (Harmonic Noise Ratio) parameters were measured (Doğanyiğit, 2015).

After all the audio recordings were taken, all the sounds were listened to again and the tracks were recorded as a separate audio file, and the audio recordings taken for pre- and post-training were selected from them. For each student, voice analysis was performed individually on the

voice recordings using the CSL (Computerized Speech Laboratory), MDVP program developed by Kay Elemetrics company, and the voice recording results obtained from these analysis results before and after the training were used for statistical analysis.

Analysis Results

In this study, Kolmogorov-Smirnov test was applied from normality tests with SPSS 21 package program and wilcoxon test and Mann-Whitney U test were used from nanoparametric tests for abnormal variables, two sample t-tests independent of parametric tests and two dependent sample t-tests were used for normal variables

Table 1. Normality test

	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Maximum SPL	0,125	32	0,200*
Mean SPL	0,131	32	0,179
Mean SPL	0,076	32	0,200*
Expiratory Volume	0,063	32	0,200*
Mean SPL	0,107	32	0,200*
SPL Range	0,080	32	0,200*
Mean Pitch	0,176	32	0,013
Pitch Range	0,256	32	0,000
Target Airflow	0,162	32	0,032
Average Fundamental Frequency	0,217	32	0,001
Mean Fundamental Frequency	0,217	32	0,001
AbsoluteJitter	0,118	32	0,200*
Jitter Percent	0,528	32	0,000
Shimmer in dB	0,148	32	0,072
Shimmer Percent	0,258	32	0,000
Noise to Harmonic Ratio	0,183	32	0,008
Soft Phonation Indeks	0,185	32	0,007

The Kolmogorov-Smirnov test result is Maximum SPL, Mean SPL, Mean SPL, Expiratory Volume, Mean SPL, SPL Range, Absolute Jitter and Shimmer in DB's sig. Since their values are greater than 0.05, they are suitable for the normal distribution and parametric tests were used. Mean PITCH, Pitch Range, Target Airflow, Average Fundamental Frequency, Mean Fundamental Frequency, Jitter Percentage, Shimmer Percentage, Noise to Harmonic Ratio and Soft Phonation Index's sig. Since their values are less than 0.05, they are not suitable for normal distribution and nonparametric tests were used.

Table 2. Comparison of the Pre-test and Post-test of the experimental group

Experimental group		N	Average	Standard Error	t-test	Sig. (p)
Maximum SPL	PRE TEST	8	85,45	1,56	-4,451	0,003
	LAST TEST	8	97,54	2,92		
Mean SPL	PRE TEST	8	83,36	1,60	-4,787	0,002
	LAST TEST	8	93,28	2,46		
Mean SPL	PRE TEST	8	85,30	1,82	-4,608	0,002
	LAST TEST	8	94,15	2,47		
Expiratory Volume	PRE TEST	8	1,03	0,08	-,924	0,386
	LAST TEST	8	1,15	0,10		
Mean SPL	PRE TEST	8	64,03	1,36	-3,060	0,018
	LAST TEST	8	70,54	1,66		
SPL Range	PRETEST	8	47,72	1,94	-3,917	0,006
	LAST TEST	8	56,59	2,06		
AbsoluteJitter	PRE TEST	8	38,25	10,52	1,695	0,134
	LAST TEST	8	23,25	4,66		
Shimmer in dB	PRE TEST	8	0,15	0,02	-,352	0,735
	LAST TEST	8	0,15	0,02		

The average score obtained by the Maximum SPL, Mean SPL, Mean SPL, Mean SPL and SPL Range tests of the experimental group of 8 people included in the study (Sig. Since their values are less than 0.05 Dec), there is a significant difference between the pre-test and the post-test. There is no significant difference between the Expiratory Volume, AbsoluteJitter and Shimmer's dB test score averages between the pre-test and post-Dec.

Table 3. Comparison of Pre-test and Post-test of the control group

Experimental group		N	Average	Standard Error	t-test	Sig. (p)
Maximum SPL	PRE TEST	8	82,91	1,16	-7,942	0,000
	LAST TEST	8	93,35	1,79		
Mean SPL	PRE TEST	8	80,94	1,20	-7,244	0,000
	LAST TEST	8	90,58	2,08		
Mean SPL	PRE TEST	8	79,47	0,82	-3,338	0,012
	LAST TEST	8	87,07	2,84		
Expiratory Volume	PRE TEST	8	0,92	0,09	-1,320	0,229
	PRE TEST	8	1,16	0,15		
Mean SPL	LAST TEST	8	64,52	1,13	-2,006	0,085
	PRE TEST	8	70,25	2,90		
SPL Range	PRE TEST	8	43,64	1,71	-3,092	0,018
	LAST TEST	8	53,38	2,61		
AbsoluteJitter	PRE TEST	8	39,75	6,27	-0,561	0,593
	LAST TEST	8	43,50	6,75		
Shimmer in dB	PRE TEST	8	0,18	0,02	0,892	0,402
	LAST TEST	8	0,16	0,02		

The Mean SPL, Mean SPL and SPL Range test scores of the control group of 8 people included in the study were averaged (Sig. Since their values are less than 0.05 Dec), there is a significant difference between the pre-test and the post-test. There is no significant difference between the Expiratory Volume, Mean SPL, AbsoluteJitter and Shimmer mean scores obtained from Dec tests between the pre-test and post-test.

Table 4. Comparison of the Pre-test and Post-test of the experimental group

Experimental group		N	Average	Standard Error	Wilcoxon test	Sig.(p)
Mean PİTCH	PRE TEST	8	173,50	54,45	-1,120	0,263
	LAST TEST	8	181,47	44,95		
Pitch Range	PRE TEST	8	41,92	49,77	-1,820	0,069
	PRE TEST	8	85,48	71,24		
Target Airflow	LAST TEST	8	0,27	0,10	-2,521	0,012
	PRE TEST	8	0,45	0,13		
Average Fundamental Frequency	PRE TEST	8	181,63	61,70	-2,524	0,012
	LAST TEST	8	270,50	93,87		
Mean Fundamental Frequency	PRE TEST	8	181,63	61,45	-2,524	0,012
	LAST TEST	8	270,50	93,87		
Jitter Percent	PRE TEST	8	179,99	507,90	-,560	0,575
	LAST TEST	8	0,45	0,17		
Shimmer Percent	PRE TEST	8	2,38	0,51	-2,530	0,011
	PRE TEST	8	1,37	0,51		
Noise to Harmonic Ratio	LAST TEST	8	0,10	0,03	-2,380	0,017
	PRE TEST	8	0,15	0,05		
Soft Phonation Indeks	PRE TEST	8	25,88	10,45	-2,524	0,012
	LAST TEST	8	15,62	9,60		

The mean scores obtained from the Target Airflow, Average Fundamental Frequency, Mean Fundamental Frequency, Shimmer Percentage, Noise to Harmonic Ratio and Soft Phonation Index tests of the experimental group of 8 people included in the study (Sig. Since their values are less than 0.05 Dec), there is a significant difference between the pre-test and the post-test. There is no significant difference between the Mean PITCH, Pitch Range and Jitter Percentage test scores between the pre-test and Dec.

Table 5. Comparison of Pre-test and Post-test of the control group

Experimental group		N	Average	Standard Error	Wilcoxon testi	Sig.(p)
Mean PİTCH	PRE TEST	8	155,03	48,46	-1,680	0,093
	PRE TEST	8	168,46	37,66		
Pitch Range	LAST TEST	8	70,37	70,47	-1,260	0,208
	PRE TEST	8	69,78	68,59		
Target Airflow	PRE TEST	8	0,33	0,16	-1,014	0,310
	SON TEST	8	0,41	0,27		
Average Fundamental Frequency	PRE TEST	8	148,87	60,02	-2,521	0,012
	LAST TEST	8	183,00	59,18		
Mean Fundamental Frequency	PRE TEST	8	148,87	60,02	-2,521	0,012
	LAST TEST	8	183,00	59,18		
Jitter Percent	PRE TEST	8	131,28	370,00	-0,840	0,401
	LAST TEST	8	129,96	365,69		
Shimmer Percent	PRE TEST	8	2,00	0,75	-0,816	0,414
	LAST TEST	8	1,75	0,70		
Noise to Harmonic Ratio	PRE TEST	8	0,12	0,01	-1,332	0,183
	LAST TEST	8	0,11	0,03		
Soft Phonation Indeks	PRE TEST	8	16,12	4,67	-0,351	0,726
	PRE TEST	8	15,75	6,81		

The average score obtained from the Average Fundamental Frequency, Mean Fundamental Frequency tests of the control group of 8 people included in the study (Sig. Since their values

are less than 0.05 Dec), there is a significant difference between the pre-test and the post-test. Mean PITCH, Pitch Range, Target Airflow, Jitter Percentage, Shimmer Percentage, Noise to Harmonic Ratio and Soft Phonation Index scores obtained from the Mean PITCH, Pitch Range, Noise to Harmonic Ratio and Soft Phonation Index tests, there is no significant difference between the pre-test and Dec.

Table 6. Comparison of the pre-test with the experimental group and the control group

Experimental group		N	Average	Standard Error	t-test	Sig.(p)
Maximum SPL	Trial	8	85,45	1,560	1,307	0,212
	Control	8	82,91	1,163		
Mean SPL	Trial	8	83,36	1,604	1,207	0,248
	Control	8	80,94	1,203		
Mean SPL	Trial	8	85,30	1,824	2,911	0,011
	Control	8	79,47	0,829		
Expiratory Volume	Trial	8	1,03	0,083	0,836	0,417
	Control	8	0,93	0,098		
Mean SPL	Trial	8	64,03	1,365	-0,277	0,786
	Control	8	64,52	1,138		
SPL Range	Trial	8	47,72	1,949	1,571	0,139
	Control	8	43,64	1,717		
AbsoluteJitter	Trial	8	38,25	10,522	-0,122	0,904
	Control	8	39,75	6,279		
Shimmer in dB	Trial	8	0,15	0,023	-1,189	0,254
	Control	8	0,19	0,020		

The Mean SPL test score averages of 8 people included in the study were taken from the Mean SPL test of the pre-test (Sig. Since their values are less than 0.05, there is a significant difference between the experimental group and the control group. Dec. There is no significant difference between the Maximum SPL, Mean SPL, Expiratory Volume, Mean SPL, SPL Range, AbsoluteJitter, Shimmer and Dec scores obtained from dB tests between the experimental group and the control group.

Table 7. Comparison of the final test with the experimental group and the control group

Experimental group		N	Average	Standard Error	t-test	Sig.(p)
Maximum SPL	Trial	8	82,91	1,163	-4,887	0,000
	Control	8	93,35	1,793		
Mean SPL	Trial	8	80,94	1,203	-4,004	0,001
	Control	8	90,59	2,087		
Mean SPL	Trial	8	79,47	0,829	-2,567	0,022
	Control	8	87,07	2,844		
Expiratory Volume	Trial	8	0,93	0,098	-1,278	0,222
	Control	8	1,16	0,159		
Mean SPL	Trial	8	64,52	1,138	-1,838	0,087
	Control	8	70,25	2,901		
SPL Range	Trial	8	43,64	1,717	-3,112	0,008
	Control	8	53,38	2,616		
AbsoluteJitter	Trial	8	39,75	6,279	-0,407	0,690
	Control	8	43,50	6,753		
Shimmer in dB	Trial	8	0,19	0,020	0,766	0,456
	Control	8	0,16	0,023		

The average scores of 8 people taken into the study from the Maximum SPL, Mean SPL, Mean SPL and SPL Range tests of the last test (Sig. Since their values are less than 0.05, there is a

significant difference between the experimental group and the control group. Dec. There is no significant difference between the Expiratory Volume, Mean SPL, AbsoluteJitter, Shimmer and Dec scores obtained from dB tests between the experimental group and the control group.

Table 8. Comparison of the pre-test with the experimental group and the control group

Pre-Test		N	Average Rank	Mann-Whitney U	Sig.(p)
Mean PİTCH	Trial	8	9,75	22,000	0,294
	Control	8	7,25		
Pitch Range	Trial	8	7,75	26,000	0,529
	Control	8	9,25		
Target Airflow	Trial	8	7,50	24,000	0,400
	Control	8	9,50		
Average Fundamental Frequency	Trial	8	10,19	18,500	0,156
	Control	8	6,81		
Mean Fundamental Frequency	Trial	8	10,19	18,500	0,155
	Control	8	6,81		
AbsoluteJitter	Trial	8	7,56	24,500	0,431
	Control	8	9,44		
Shimmer in dB	Trial	8	7,50	24,000	0,401
	Control	8	9,50		

There is no significant difference between the Mean PITCH, Pitch Range, Target Airflow, Average Fundamental Frequency, Mean Fundamental Frequency, AbsoluteJitter, Shimmer in dB scores of the 8 people included in the study from the Decal tests and the control group.

Table 9. Comparison of the final test between the experimental group and the control group

Last Test		N	Average Rank	Mann-Whitney U	Sig.(p)
Mean PİTCH	Trial	8	9,25	26,000	0,529
	Control	8	7,75		
Pitch Range	Trial	8	8,88	29,000	0,753
	Control	8	8,13		
Target Airflow	Trial	8	10,50	16,000	0,093
	Control	8	6,50		
Average Fundamental Frequency	Trial	8	11,38	9,000	0,016
	Control	8	5,63		
Mean Fundamental Frequency	Trial	8	11,38	9,000	0,016
	Control	8	5,63		
AbsoluteJitter	Trial	8	5,81	10,500	0,024
	Control	8	11,19		
Shimmer in dB	Trial	8	7,69	25,500	0,493
	Control	8	9,31		

The Mean Fundamental Frequency, Mean Fundamental Frequency and AbsoluteJitter tests of the last test of 8 people included in the study were the average score (Sig. Since their values are less than 0.05, there is a significant difference between the experimental group and the control group. Dec. There is no significant difference between the Mean PITCH, Pitch Range, Target Airflow, Shimmer and Dec scores obtained from dB tests between the experimental group and the control group.

CONCLUSION AND IMPLICATIONS

When the students in the study group are evaluated according to the in-course performance scale, there is a significant difference between the Experimental and Control Groups before and

after the training. It was aimed that the students of the experiment group analyzed and understood the work from beginning to end and read it, and this goal was achieved. According to the acoustic evaluation results, when the data obtained from MDVP (Multi-Dimensional Voice Program) were evaluated, the average scores of the experimental group from the Maximum SPL, Mean SPL, Mean SPL, Mean SPL and SPL Range tests (Sig. Since their values are less than 0.05) revealed a significant difference between the pre-test and the post-test. Dec. There is no significant difference between the Expiratory Volume, AbsoluteJitter and Shimmer's dB test score averages between the pretest and Decontest. Since this difference shows a positive change in the chart given in the Octobers, a significant difference appears positively in both statistical data and student evaluation data. In the control group, the Mean SPL, Maximum SPL, Mean SPL and SPL Range tests were used for the average score (Sig. Since their values are less than 0.05 Dec), there is a significant difference between the pre-test and the post-test. There is no significant difference between the Expiratory Volume, Mean SPL, Absolute Jitter and Shimmer average scores obtained from dB tests between the pre-test and Dec. According to the averages of these results, the students also showed improvement, but since this development is not as detailed and continuous as the experimental group training, the parametric results and student evaluation results did not reveal a positive difference.

When the data from PAS (Phonatory Aerodynamic System) were evaluated, there was no significant difference in the parameters Maximum SPL, Mean SPL, SPL Range, Mean SPL During Voicing, Mean Pitch, Expiratory Volume. Since the Soft Phonation Index increased in the experimental group, a significant difference emerged. According to the statistical evaluations obtained from the CSP (Comfortable Sustained Phonation) data; the averages of the scores obtained from the Maximum SPL, Mean SPL, Mean SPL and SPL Range tests of the last test (Sig. Since their values are less than 0.05, there is a significant difference between the experimental group and the control group. Dec. There is no significant difference between the Expiratory Volume, Mean SPL, AbsoluteJitter, Shimmer and Dec scores obtained from dB tests between the experimental group and the control group.

According to the statistical evaluations obtained from the VSPL (Variation in Sound Pressure Level) parameters; Mean PITCH, Pitch Range, Target Airflow, Average Fundamental Frequency, Mean Fundamental Frequency, AbsoluteJitter, Shimmer in Dec tests, there is no significant difference between the experimental group and the control group.

Ethical Text

In this article, research and publication ethics rules are followed. The responsibility of any violation regarding the article belongs to the author(s).

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