

Speech Range Profile (SRP) Findings Before and After Mutational Falsetto (Puberphonia)

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Summary: Introduction. Mutational falsetto is a temporary adolescent voice. Voice therapy support in mutational falsetto helps the individual to regain a healthy voice. Speech Range Profile (SRP) is considered to be a method requiring less time in the pretherapy and posttherapy evaluations of voice patients.

Objective. The purpose of this study was to determine the differences between the SRP results of male subjects experiencing mutational falsetto before and after therapy.

Methods. Sixteen male participants have been included in this study. F_0 , $\text{Min}F_0$, $\text{Max}F_0$, $F_0\text{Range}$, $F_0\text{Range (st)}$, MindB SPL , and MaxdB SPL have been taken to evaluation. SRP recordings of all subjects have been performed. All the recordings have been repeated before and after therapy.

Results. A statistically significant difference has been observed between the F_0 and $\text{Min}F_0$ values before and after therapy ($P < 0.001$).

Conclusions. SRP provides important information about frequency and intensity. In mutational falsetto, SRP is a useful technique in terms of evaluating success in therapy.

Key Words: Mutational falsetto–Speech Range Profile–Voice therapy.

INTRODUCTION

Mutational falsetto (puberphonia) is a functional voice disorder being persistence of patients' adolescent voice characteristics after puberty. The higher pitched voice or voice register shifts are the main symptoms of mutational falsetto that persists beyond puberty. Patients' voice is weak, thin, breathy, hoarse, effeminate, and immature which is too high continuously and in the long term. The other symptoms are pitch breaks, inadequate resonance, and shallow breathing.^{1,2}

During puberty, mutations due to age are seen both in girls and boys. However, this change is more apparent in boys compared with girls. During this period, the larynx descends and its dimensions in the infrasagittal and transverse planes increase. In men, the thyroid cartilage angle decreases to 90° , the length of vocal chords increases, and the dimension of the epiglottis decreases. Sound frequency in men falls about 1 octave. Therefore, girls' and boys' voices which show similarities before the puberty period separate significantly to create gender differences, and the voice quality in specific low frequencies in males is created.^{1,3,4} It is considered that voice mutation in males is completed at the age of 17 years, and mutational falsetto is frequently seen between the ages of 11–15 years.^{2–6}

Although mutational falsetto is a temporary adolescent voice, in cases where it is not treated, it can transform into a chronic voice problem. In particular, decreases in voice control and resonance breaks during vocal performance negatively affect men in their early adolescence period psychosocially.^{7–12}

Voice therapy support in mutational falsetto helps the individual to regain a healthy voice in accordance with his age and gender, just like in all other voice problems. The applied voice therapy increases the voice quality of young adults and helps them to control the expected vocal performance.^{5,7–12}

There are many objective and subjective methods, which are used to evaluate the efficiency of voice therapies. Phonetograms among the objective voice evaluation methods are used in determining vocal usability and efficiency of voice therapies.¹³

A phonetogram is a graphic which evaluates the voice frequency-intensity profile.¹⁴ In 1935, Wolf, Stanley, and Sette have mentioned the first figures resembling the phonetogram; however, when these figures have been published in 1952 by Calvet and Malhiac, it was defined in the literature. In the following years, along with publications with theoretical and practical contexts which dealt with the relationship of voice function and its usability with the phonetogram, the usage areas of the phonetogram have increased in practice. Some of these usage areas include

- Obtaining information on the voice potentials of individuals,
- Studying the effects of a given treatment or surgical intervention, and
- Comparing data between the selected groups.¹⁵

Phonetograms are studied in two groups as “Speech Range Profile (SRP)” to determine the profile of speech voice and as “Voice Range Profile (VRP)” to determine vocal capacity. SRP defines the voice limits during the functional speech activity. According to traditional VRP recordings, SRP is considered to be method which is simpler and which can be applied within a shorter time in the evaluation of voice patients.¹⁶

The purpose of this study was to determine the differences between the SRP results of male subjects experiencing mutational falsetto before and after therapy.

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METHOD

Sixteen male participants (13–38 years; mean age, 18.56; standard deviation, 6.93) have been included in this study, which applied to our hospital's Otorhinolaryngology Department because of mutational falsetto and were directed to voice therapy. All subjects have gone under laryngeal examination, and only those who were determined not to have nodule existence, mass lesions, bleeding, redness, movement disorders, arytenoid edema (reflux), or other anatomical disorders were included in the study.

Voice recordings of all participants have been performed in the Voice Analysis Laboratory, and Multi-Dimensional Voice Program (MDVP) and SRP which are included in Kay Elemetrics (KayPentax, Montvale, NJ, USA) CSL (model 4300 B) have been used.

- The voice recordings have been performed in the voice-recording laboratory with a noise level <40 dB, where echo production has been prevented.
- The voice recordings have been performed taking care that all participants were standing up and had good postures.
- The voice recordings have been performed with microphones from 15 cm distance from the participants' mouths.
- To determine the basic frequency, [a] vocalization has been asked for a minimum of 4 seconds.
- Shure SM 58 "hand-held" microphone has been used.
- Because it was advised to calibrate the microphone pressure sensitivity within its own systems, it was taken care that the selected microphone used on the program was selected as "hand held" and that the energy shift value was "0" dB SPL.
- For the SRP recording, the subjects were allowed to read the first paragraph of the "Diet Passage" (a duration approximately about 50–60 seconds; indicated in the Appendix) in a manner comfortable to them and in normal intensity. All the recordings have been repeated before and after therapy.

For mutational falsetto, intervention was applied by modifying voice therapy techniques, such as larynx manipulation, larynx-depressing exercise, and producing vegetative voice.

Participants were seen for intervention once a week for 4 weeks, in 20-minute sessions.

For statistical analysis, SPSS 16.0 Version (SPSS Inc., Chicago, IL) for Windows statistics package program has been used. To be able to compare the numeric data of the dependent groups which displayed normal distribution, the paired sample *t* test has been used.

RESULTS

Among the participants' voice recordings taken with MDVP and SRP within the CSL program before therapy, fundamental frequency (F_0), minimum fundamental frequency ($\text{Min}F_0$), maximum fundamental frequency ($\text{Max}F_0$), frequency range ($F_0\text{Range}$), frequency range in semitones ($F_0\text{Range [st]}$), minimum decibel sound pressure level ($\text{Min}dB\text{ SPL}$), and maximum decibel sound pressure level ($\text{Max}dB\text{ SPL}$) have been taken to evaluation (Table 1). A statistically significant difference has been observed between the F_0 and $\text{Min}F_0$ values before and after therapy ($P < 0.001$). However, a statistically significant difference has not been observed between the $\text{Max}F_0$, $F_0\text{Range}$, $F_0\text{Range (st)}$, $\text{Min}dB\text{ SPL}$, and $\text{Max}dB\text{ SPL}$ values ($P > 0.05$).

DISCUSSION

The anatomical and physiological differences between males and females in terms of vocal fold, larynx, body dimensions, vibration also cause differences in phonation frequency and intensity between the two genders. However, although mutational falsetto is not an organic problem, it has been determined that the basic voice frequency, in especially males, is higher than it should be.^{2–6}

It is important for the clinician to determine the efficiency of voice therapies practically, which are applied to obtain the required frequency characteristic of the voice. Phonetograms which are being used increasingly more in the latest years constitute an alternative method in objective voice evaluations.

Phonetogram defines a person's voice limits.^{17–22} Frequency (Hz) typically determines the physiological limits of an individual's voice, by forming the phonetogram's horizontal axis, intensity, or Sound Pressure Level (SPL) vertical axis.²⁰

TABLE 1.
 F_0 and SRP Parameters Before and After Therapy

Parameters	Pretherapy				Posttherapy				P Value
	Mean	Standard Deviation	Median	Min–Max	Mean	Standard Deviation	Median	Min–Max	
F_0	268.67	16.95	259.93	250.14–294.84	120.48	32.76	112.85	92.15–183.82	<0.001
$\text{Min}F_0$	147.51	55.13	159.73	58.27–196	90.71	16.67	92.50	69.3–110	<0.001
$\text{Max}F_0$	468.86	83.3	523.25	349.23–523.25	442.97	276.76	351.56	246.19–987.77	>0.05
$F_0\text{Range}$	321.35	84.79	327.25	225.76–464.98	352.49	279.8	270.66	136.94–895.27	>0.05
$F_0\text{Range (st)}$	21.25	8.32	17.50	17–38	25.37	10.14	25.50	14–41	>0.05
$\text{Min}dB\text{ SPL}$	75.81	10.99	77.50	60–86	74.87	13.83	78	57–89	>0.05
$\text{Max}dB\text{ SPL}$	104.87	2.3	105.50	102–107	98.75	5.1	97.50	94–105	>0.05

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