

## Efficacy of Voice therapy for treatment of Puberphonia: Review of 20 cases

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### Abstract

**Introduction:** Puberphonia or Mutational Falsetto is the failure to eliminate the higher pitched voice of pre-pubescence and to substitute the lower pitched voice of post pubescence and adulthood in the presence of a structurally normal larynx (Prater and Swift, 1984). The voice of a person with puberphonia is high pitched, breathy, and hoarse. They also may have pitch breaks.

**Aim of the study:** This study was carried out with the goal of documenting the efficacy of voice therapy in terms of lowering pitch as well as documenting the effect of voice therapy on quality of life in persons with puberphonia.

**Methodology:** 20 male patients diagnosed as persons with puberphonia underwent a pre-voice therapy subjective assessment using GRBAS scale and objective assessments using Praat software. The psychosocial impact of puberphonia was assessed with the Voice Handicap Index (VHI). Post-voice therapy program reassessment was carried out and the results were compared with the pre-voice therapy assessment findings.

**Results:** All 20 patients achieved appropriate pitch range following voice therapy. Objective assessment using Praat software showed lowering of fundamental frequency (f0). Scores on VHI also improved significantly.

**Conclusion:** This study showed that voice therapy is an effective treatment modality of puberphonia which improves the quality of life of a person with puberphonia.

## Introduction

Voice is an auditory sound produced by the larynx which embodies such parameters as pitch, loudness, quality and variability (Arnold AE, 1990). Five kinds of information can be extracted from the voice. It is an indicator of a speaker's: 1) physical health 2) emotional health 3) personality 4) identity and 5) aesthetic orientation (Perkins, 1971).

Puberphonia or Mutational Falsetto is the failure to eliminate the higher pitched voice of pre-pubescence and to substitute the lower pitched voice of post pubescence and adulthood in the presence of a structurally normal larynx (Prater and Swift, 1984). This condition is rare in women as the amount of vocal pitch change at puberty is only three to four semitones but in males the change is about one octave. In females this condition is known as childlike or juvenile voice disorder. The incidence of Puberphonia is 1 in 900,000 (Bannerjee, et al., 1995). Puberphonia has social and psychosocial impacts. Males with puberphonia are thought of as being effeminate, passive, immature, and frequently face teasing from peers. In certain situations, such as the telephone, there is often difficulty in identifying the speaker's sex (Behlau & Bridges, 1995b).

**Pathophysiology:** The high pitched voice is produced by a larynx which is high in the neck and tilted downward. This causes arytenoids to adduct so tightly that the posterior portion of the vocal folds is prevented from vibrating when the individual attempts to phonate. This phonatory posture tends to reduce the mass of vocal folds thus increasing the pitch of the voice.

**Etiologies:** Puberphonia frequently results from psychosocial factors which may include:

- Strong feelings of feminine attachment.
- Embarrassment about newly developing low pitched voice.
- Rejection of responsibilities and roles of adulthood.
- Increased laryngeal muscle tension causing laryngeal elevation.
- Puberphonia may be related to the larynx or an undeveloped natural tenor voice, changes in hormonal development, congenital anomalies of the larynx and vocal fold asymmetries, minor structural changes (particularly the sulcus), unilateral vocal fold paralysis, laryngeal diaphragm, debilitating disease during puberty, neurological disease with hypotonia, incoordination of the vocal folds, deep breathing or hearing impairment (Anelli, 1999; Behlau & Bridges, 1995b).
- In men, organic causes are rare and often fits cases with a psycho-emotional etiology (Anelli, 1999; Behlau & Bridges, 1995b).

**Symptoms:** The voice of a person with puberphonia is high pitched, breathy, and hoarse. Pitch breaks are also present in most puberphonia patients.

**Laryngoscopy Findings:** Laryngeal examination reveals a structurally normal larynx.

**Management:** Puberphonia has been treated by the following methods:

- Voice Therapy
- Laryngeal manipulation
- Surgery

**Aim of Study:** This study was carried out with the goal of documenting the efficacy of voice therapy in terms of lowering pitch as well as documenting the effect of voice therapy on quality of life in persons with puberphonia.

## Methods

The present study was carried out at the Speech Therapy Department of C. U. Shah Medical College and Hospital between March 2010 to March 2012. The subjects consisted of male patients who reported to the Center with the complaint of high-pitched voice and high F0 (fundamental frequency) on Praat software and who were diagnosed as persons with puberphonia.

A detailed ENT evaluation was carried out and a direct laryngoscopic evaluation was done using a Hopkin's telescopic examination in the ENT clinic.

GRBAS scale (Hirano M, 1981) was used to assess the voice, perceptually. This scale evaluates voice on five scales - Grade (G), Roughness (R), Breathiness (B), Asthenia (A), and Strain (S). Each parameter is rated on a 4-point rating scale ranging from 0 (normal), 1 (slight), 2 (moderate), and 3 (extreme). Praat software was used for acoustic assessment of voice. Praat is a software tool used to analyze, synthesize, and manipulate speech and has an built-in voice report tool.

The psychosocial impact of puberphonia was assessed with the Voice Handicap Index (VHI) (Jacobson, Johnson, Grgnalski, et al., 1997). It is a 30 item, 5 point (0 to 4) scale, where 0 denotes "never" and 4 denotes "always". From the scores, the impact of the voice disorder may be classified as mild, moderate or severe. Low scores (greater than 30) indicate that there is a minimal amount of handicap associated with the voice disorder. A score of 31 to 60 denotes a moderate amount of handicap and a VHI score from 60 to 120 represents a significant amount of handicap due to a voice problem. VHI is a useful instrument to monitor the treatment efficacy for voice disorders.

Pre and post therapy testing was performed using VHI administration and perceptual and acoustic analyses.

**Voice Therapy:** All patients underwent a voice therapy schedule with the following techniques: Counseling regarding the basics of patient anatomy, physiology and human growth to understand what is happening. It aims to alleviate anxiety, depression and other psychosocial impacts of puberphonia. The patient is counseled about the effects of childish voice communication and the likely positive changes resulting from the use of a new voice.

Therapy techniques included:

- Vegetative sounds – patient is asked to produce a cough or throat clear to initiate voicing.
- Hard glottal attack – patient is asked to produce vowels and words in a sudden plosive manner.
- Glottal fry – patient is asked to produce the lowest possible pitch on vowels and words then on short phrases and short sentences.
- Confidential voice therapy – patient is asked to use a breathy, soft, gentle speech.
- Humming while sliding down the scale
- Yawning technique
- Inspiratory phonation (Anelli, 1999, Boone & McFarlane, 2003)
- Incomplete swallowing sonorous (Anelli, 1999, Boone & McFarlane, 2003)
- Use of nasal sounds

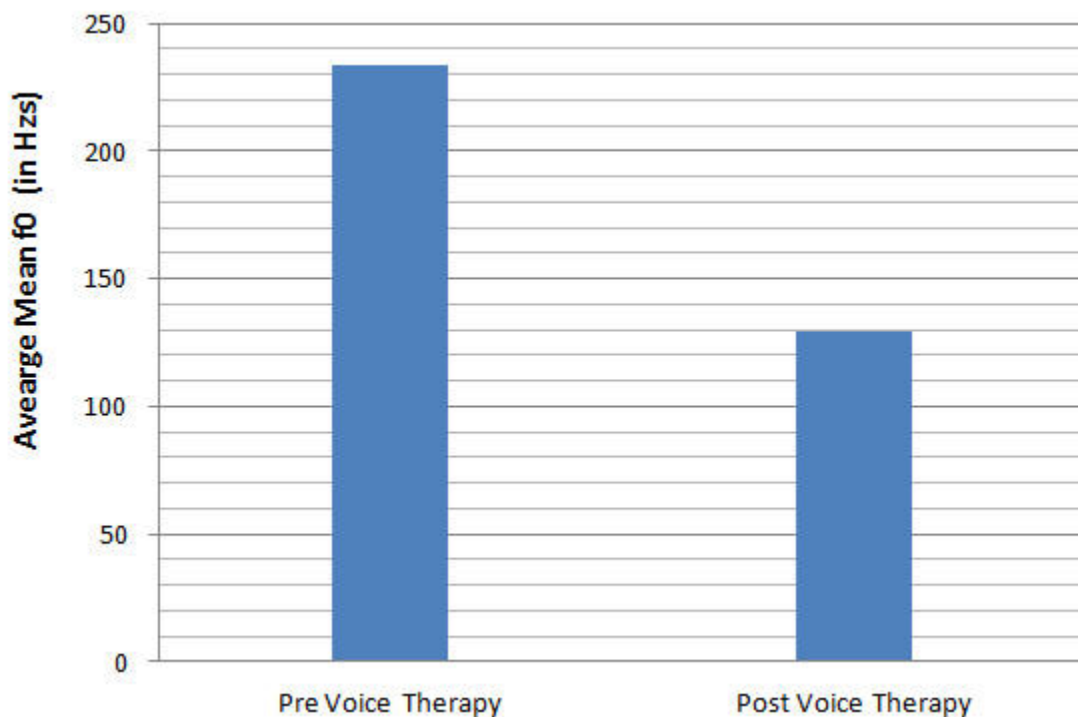
Voice therapy consisted of two sessions per week. The patients were made aware of their newly acquired low-pitched voice and were counseled to accept it as their own voice. When the patient was able to produce the low-pitched vowel, the same was used to produce nonsense syllables, words, phrases and sentences in a hierarchical manner.

At the end of therapy, both the perceptual and acoustic assessment was carried out using GRBAS scoring and Praat software. The quality of life post voice therapy was evaluated using VHI.

**Results**

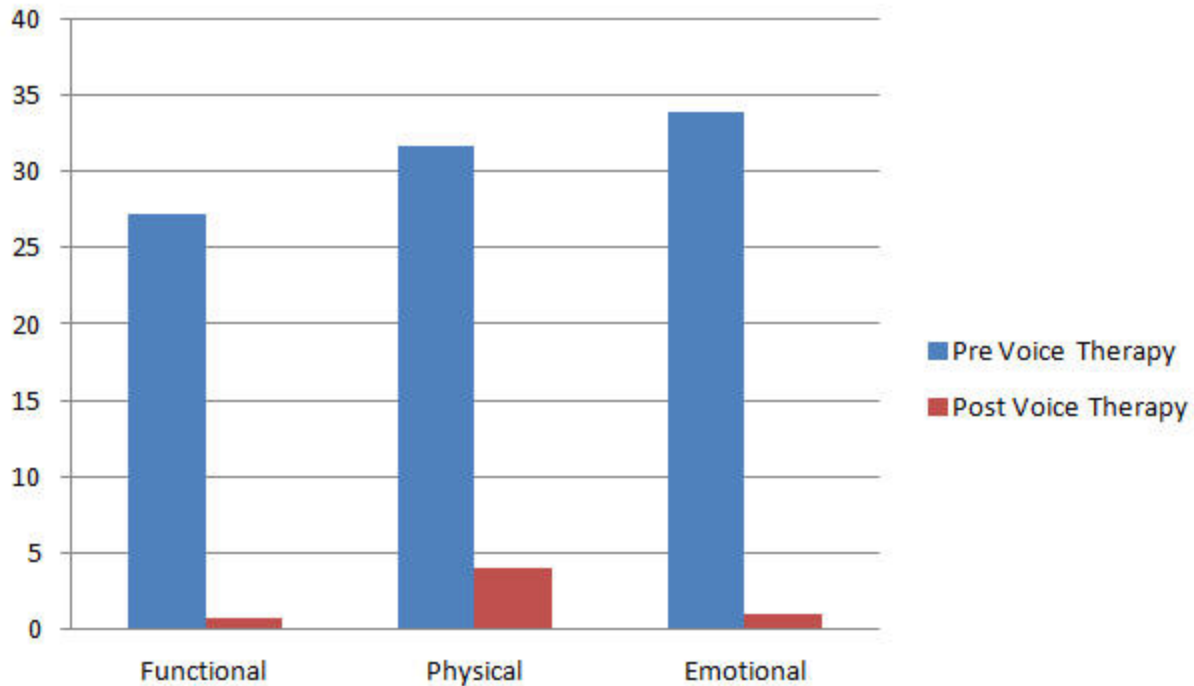
**Perceptual Analysis:** On the GRBAS scale, all the patients had abnormal scoring Pre Voice Therapy while Post Voice Therapy all the patients showed normal scoring that is G0R0B0A0S0.

**Acoustic analysis:** On Praat, the Pre Voice Therapy average f0 was 233.85 Hz (SD 14.90) while Post Voice Therapy average f0 reduced to 129.28 Hz (SD 8.09). The Two-tailed t test was administered. Significant change ( $p < 0.0001$ ) was observed between the Pre and Post Voice Therapy.



**Figure 1: Treatment Result of Voice Therapy on the Average Mean f0**

Psychosocial impact analysis: On VHI, the average Pre Voice Therapy for functional, physical and emotional component scores were 27.15 (SD 1.69), 31.7 (SD 2.10) and 33.9 (SD 1.37), respectively, while Post Therapy scores were 0.7 (SD .97), 4.05 (SD 1.19) and 1.05 (SD 1.63), respectively. Voice handicap has reduced significantly ( $p < 0.0001$ ) on all the components of VPI as a result of voice therapy.



**Figure 2: Treatment Result of Voice Therapy on VPI Subsets**

## Discussion

Results suggest that voice therapy helps to reduce the mean fundamental frequency of the persons with puberphonia significantly. It may be done by training the patient to use the correct position of the larynx during phonation as well as to use various techniques to induce a low-pitch voice.

Voice therapy helps to improve the overall quality of life as the self-perceived handicap of puberphonia is significantly reduced post therapy. The psychosocial impact of puberphonia plays an important role in this self-perceived handicap. Voice therapy aims, not only to reduce the pitch, but also to normalize the self image of the speaker. A careful case history is needed to obtain data on the picture of the patient's childhood, family environment and personality. It is also necessary to achieve the full cooperation of the patient on the first interview; to be sure he is really willing to adhere to treatment with awareness of the probable results of the voice.

Adolescence is a period of conflict, an age of transition between childhood and adulthood, a stage of search for identity, the most critical in human life. It coincides with the awakening of the sexual glands, vocal and physical change, change of personality and the discovery of morality, which are new to the young individual who does not know what's going on with them (Anelli, 1999). Thus, the adolescent voice altered by functional etiology needs guidance and family support in the course of speech therapy (Anelli, 1999).

## Conclusion

This study shows that voice therapy is an effective management option for persons with puberphonia which helps in lowering the pitch as well as for improving the quality of life as the negative psychosocial impact of puberphonia is significantly reduced using voice therapy techniques along with proper counseling.

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