A Few Objective Measurements Of Voice Quality In Hearing-Impaired Children

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Deafness, even profound deafness, does not prevent an individual from producing voice. However, the loss of hearing does affect the control of voice production, and when people listen to the speech of a deaf person, a typical reaction is that the speaker's voice sounds "abnormal".

The present study aims to investigate the laryngeal mechanism of the hearing-impaired children by measuring the following parameters:

I. Pitch and Intensity measurements:

a) Fundamental frequency (Phonation) b) Fundamental sigma (Phonation) c) Frequency Range (Phonation) d) Extent of fluctuation in fundamental frequency (Phonation) e) Speed of fluctuations in fundamental frequency (Phonation) f) Extent of fluctuations in Intensity (Phonation) g) Speed of fluctuations in Intensity (Phonation)

II. Perturbation measurements:

a) Jitter ratio b) Shimmer ratio

III. LTAS measurements:

A) Alpha-ratio (a) B) Beta-ratio (b) C) Gamma-ratio (g)

These parameters were studied in a sample of 10 hearing-impaired subjects (6 males and 4 females) and 10 normals (6 males and 4 females) ranging in age from 9-11 years. Experimental (Hearing-impaired) and control (Normal) group were matched in all aspects except in hearing sensitivity. All hearing-impaired subjects had a hearing level of not less than 80 dBHL in the better ear, with no significant associated problems.

The collection of sample consisted of recording of phonation for vowels /a/ /i/ and /u/ (3 trials) using laryngograph. These EGG waveform were digitized into computer using 12 bit ADC (VSS-data l/o cord) at the rate of 8000 Hz for pitch and intensity measurements and perturbation measurements.

For the purpose of measuring the spectral parameters (LTAS) voiced Kannada passage was chosen which is being routinely used at the Department of Speech Sciences, AIISH Mysore for speech and voice analysis. The speech samples were recorded using the tape recorder (Philips deck). These recorded samples were fed to a computer (PC/AT) through an A to D converter (voice and speech system) developed by Anantha Padmanabha for spectral analysis.

After the statistical analysis of the data, thus obtained, the following conclusions were drawn:

1. There was a significant difference between hearing-impaired and normal subjects in fundamental frequency for vowels /a/, /i/and /u/.
2. There was a significant difference between hearing-impaired and normal subjects in Fo sigma for vowels /a/, /i/ and /u/.
3. There was a significant difference between hearing-impaired and normal subjects in frequency range for vowels /a/, /i/ and /u/.

4. There was no significant difference between hearing-impaired and normal subjects in extent and speed of fluctuations in fundamental frequency and intensity.
5. There was a significant difference between hearing-impaired and normal subjects in jitter ratio and shimmer ratio.
6. There was a significant difference between hearing-impaired and normal subjects in LTAS measurements. (Alpha, Beta and Gamma-ratios).

It is clear from the present study that the voice quality and speech of the hearing-impaired differed from that of the normals in the parameters mentioned above. In addition to the deviations from the normals, there were large individual variations among the hearing-impaired individuals.

To improve the voice quality or speech of the hearing-impaired, some of the above parameters may be worked upon through the use of different feedbacks, thus improving their intelligibility of speech.