Acoustic Analysis of Speech of Children *

KUSHALRAJ, P.

The acoustic analysis to study the speech development in children has been found to be useful, as such studies, reflect: (1) the adjustment of phonatory apparatus, (2) the shaping of the vocal tract and (3) the timing and co-ordination of articulation and thus provide evidence regarding the anatomical and neuromuscular maturation of speech mechanism. This information has been found to be useful in early identification diagnosis and treatment of various speech and language disorders.

The present investigation was undertaken to study the F_0, formant frequencies (F_1, F_2 and F_3) and voice onset time in hundred children—age ranging from 4–12 years, both males and females.

Three sentences were elicited from each child by showing three picture cards (picture showing a baby, a monkey and red colour). Thus the three sentences [*idu papu* (ಇದು ಪಾಪು), *idu koti* (ಇದು ಕೋತಿ) and *idu kempu banna* (ಇದು ಕೆಂಪು ಬಣ್ಣ)] were elicited and considered as spontaneous speech for the purpose of the study. Each child was given three trials. All the speech samples were recorded using tape recorder of the spectrograph (VIC VII). One of these samples was considered for analysis.

Five vowels [a, i u, e and o] extracted from these test sentences using signal gate of the spectrograph were analysed to obtain F_0, F_1, F_2 and F_3 with the help of High Resolution Signal Analyzer (B and K 2033). Further the voiceless stop consonants [p, t] and [k] in the words of the test sentences were analysed using HRSA to obtain VOT values for all the subjects.

Procedure to obtain F_0, formant frequencies (F_1, F_2 and F_3) and VOT using HRSA was validated by analysing the speech samples of 10 adult males and 10 adult females both spectrographically and using HRSA. The procedure using HRSA was found to be valid and reliable.

Conclusions

After the necessary statistical treatment, the following conclusions were drawn :

(1) The fundamental frequency both in case of males and females decreases with age, males showing a sudden decrease around 11 years of age.

(2) No significant difference in fundamental frequency was found until the age of 11 years between males and females.

(3) The F_0 in vowel [a] has been the lowest in both males and females and

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highest [u] for males and [i] for females among the five vowels studied.

(4) No sex difference was found in terms of formant frequencies in the age range studied.

(5) No systematic variations in formant frequencies, of all the five vowels, with increasing age were observed.

(6) F_1 of vowel [a] was found to be highest among all the vowels in both males and females, throughout the age range studied.

(7) F_2 and F_3 of vowels [i] and [u] were found to be having the highest frequencies.

(8) No variations in VOT values for the voiceless stop consonants studied with age was noticed in both the sexes.

(9) No sex difference was found in VOT values throughout the age range studied.

(10) No systematic variation in VOT values with the articulatory constriction moving backwards from lips was found.

Recommendations

(1) To study these acoustic features with wider age range and a larger number of subjects.

(2) This study may be tried with various other languages.

(3) To study these features in comparison to clinical population.

(4) To study these acoustic features in repeated utterances of the same subject.

(5) To study other acoustic features, like duration of vowels and words along with these acoustic features.