AGE RELATED CHANGES IN RISE TIME AND FALL TIME IN SPEECH

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While investigating the possibility of Sound Spectrography for multidimentional analysis of pathological voices. Imaizumi et. al., (1980) measured the raising time and falling time of sustained vowels as two of the parameters, among the nine acoustic parameters studied. These parameters were measured on amplitude display. The rising time was defined as time required for the increase of overall amplitude from a value of 10% of the steady level to 90%. The falling time was defined as the time span required for decrease from 90% to 10% of steady level.

Howell and Rosen (1983) measured the rise times of voiceless affricate and fricatives when the test material occured in sentences, in isolated words and in isolated nonsense syllables. The risetimes of affricates were siggificantly shorter than those of fricatives. Rise time varied with the type test material and for all types of material were significantly longer than those reported by Gerstman (1957). They also reported that, because rise time varies with the type of test material, no auditory sensitivity at a single risetime value can be responsible for perceptual distinction between voiceless affricates and fricatives.

Many pathological conditions are more apparent during transitional phase of phonation, Including the onset and the termination of phonation and hence of speech. In this connection, further extensive clinical and extensive research is required (Hirano, 1981). Further studies have reported that the intiation and termination of voice in stutterers are delayed (Miller 1979, Basu, 1979).

Recent study in acoustic analysis of speech in children shows that there is gradual decrease in rise time of phonation of all vowels with increase in age in both males and females. A slight increase in rise time seen in the 9 to 10 years old group and 10 to 11 year old group females (Rashmi 1985).

Inspite of the fact that these measurements very simple and important, it is surprising to note that there are no attempts to note changes in these parameters with age and

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different pathological conditions. Present study aims at investigating these aspects in different age groups of the Indian population.

Methodology: The study aimed at investigating the rise and fall times as a function of age.

Subjects: Adults, both males and females age ranging from 16 to 65 years were randomly selected for study. The criteria for selection of the subjects is the absence of any speech and/or hearing and/or respiratory problems with no observable deformities of nasal, oral or pharyngeal cavities.

One hundred subject were selected such that ten males and ten females were included in each of five groups with 10 years interval from 16 to 65 years of age.

Test material: Three Kannada sentences were selected for analysis of speech.

1. Idu pa:pu (This is baby)

2. Idu ko:ti (This is monkey)

3. Idu Kempu banna
   (This is red colour)

These three sentences were chosen, as they have been used in earlier studies of acoustic analysis of speech in children (Kushalraj 1983, Rashmi 1985).

Data Collection:

The data was collected in the following manner.

Speech samples of subjects were recorded. The subjects were instructed as follows.

"Now I will say three sentences. Repeat each sentence three times". The sentences "Idu pa:pu" "I du ko:ti" and "Idu kempu banna", were spoken by the investigator and repetation of these sentences by the subject was recorded.

The recordings were made using a philips tape recorder with built-in-microphone and coney casettes. Recording was done in quite, isolated room, where the noise is minimum and does not interfere with the recording.

Analysis:

The following instruments were used for measuring rise and fall time.

1. Tape recorders (Philips F 6112 stereo cassette deck)

2. Pitch analyser PM 100

3. Speaker (Sois 2211, Amplispeaker)

Signal was fed from tape recorder to pitch analyser PM-100 through line jack. Out put from tape recorder was also fed to the speaker which provided an auditory feed back of signal being fed to the

investigator. The instruments were calibrated before and while carrying out analysis. The display duration was set to the one record so that each stimulus sentence could be displayed more clearly and enlarged. The stimuli sentences "Idu pa:pu", "I du ko:ti" and "Idu kempu banna" were fed to the pitch analyser. The rise time in centiseconds was measured by moving the cursor from the point where the inten0sity curve begins to the point where the curve becomes steady. The difference between these two points provided the rise time in centiseconds. Similarly, the fall time was measured by moving cursor from the end of the steady portion of the intensity curve to the last point where the curve is visible. The difference between these two points on the time scale was noted down as the fall time in centiseconds. This was done for all three sentences.

Results and discussions:

The rise time of speech was found for 3 test sentences. The mean valued with the standard deviation for each age group, for both males females is presented in table-1. Inspection of table-1 reveals that there; is no significant difference among different age group in terms of rise time in males. However, when the age group 16-25 years is compared with age group 56-65 years, the older age group shows longer rise time than the younger age group, and similar results were obtained when age group 26-35 years and 56-65 years compared.

The examination of table-1 shows that the age group 16-25 years have obtained lowest rise time (i.e. mean rise time of 6.3 centiseconds) and the age group 56-65 years has highest rise time (mean rise time of 9.74 centiseconds). The table also points out that there is gradual, but not significant, increase in rise time as a function of age in males. Longer rise time in the age group 56-65, years. When compared to other groups may be due to change in neuro-muscular control, with aging process.

Females subjects have shown that the rise time decreases gradually as function of age upto 45 years of age and then increases from 46 years of age. 16-25 years age group found to have longest rise time (mean rise time of 10.7 centiseconds) and the age group 36-45 years has shown shortest rise time (mean rise time of 7.59 centiseconds). Results show that there is no significant difference in rise time

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		16–25	26–35	36–45	46–55	56–65
Males	Mean	6.31	9.21	7.59	8.15	9.74
	SD	1.6	2.67	1.57	3.1	2.69
Females	Mean	10.7	9.4	7.59	8.24	8.7
	SD	2.6	3.4	1.96	2.64	2.3

Table-1 : Mean and standard deviation of rise time (in centiseconds) in males and females.

among different age groups. But when the age groups 16-25 years and 26-35 years compared with the 56-65 years, there is a significant difference. The age group 56-65 years shows shorter rise time (8.7 centi-seconds) when compared with younger groups. Decrease in rise time in females may be due to structural changes and physiological changes due to aging process.

When males, females were compared for rise time, there was no significant difference.

Fall time: The mean and stan-dard deviation for the fall time of speech for all 3 test sentences across the age range from 16-65 years for both males and females were calculated and depicted in table 2.

When males and females were compared for fall time, there was no significant differ-ence upto the age of 45 years. From 46-65 years of age males show longer fall time than females.

Results show that there is gradual increase in fall time with the in male on t-test, it was found that there is no significant difference among different age groups in males

		16–25	26–35	36–45	46–55	56–65
Males	Mean	9.2	10.34	11.54	11.73	12.41
	SD	1.62	2.15	3.36	3.6	2.98
Females	Mean	14.5	12.6	10.79	8.28	11.3
	SD	8.6	2.24	1.96	1.82	3.18

Table-2 : Mean and Standard deviations of fall time (in centiseconds) in males and females.

when compared. But when age group 16-25 years is compared with the age group 46-55 years and 56-65 years there is significant difference. The age group 16-25 years show shorter fall time (9.2 centiseconds) than age groups 46-55 years and 56-65 years. 16-25 years age group -shows lowest fall time (mean fall time of 9.2 seconds) and the age group 56.65 years has shown longest fall time (mean fall time of 12.41 centiseconds). Increase in fall time as function of age may be due to changes in neuromuscular control due to aging process.

In case of females fall time decreases as a function of age till the age of 55 years, then fall time increased from 56 years to 65 years. On t-test it was found that there is no significant difference in fall time as function of age in females, but when the age group 16-25 years is compared with the age group 56-65 years, the age group 16-25 years has shown longer fall time (14.5 centiseconds),

than the age group 56-65 years (11.3 centiseconds).

Decrease in fall time as a function age may be due to changes in due to neuromuscular and other physiological changes due to aging process.

Conclusion:

From present study following conclusions can be drawn.

Males show a gradual increase in rise time and fall time as a function of age. In case of females, rise time decreases as age increases till 36-45 years then rise time increases upto the age of 65 years. Fall time decreases till the age of 55 years after which it starts increasing. There was no significant difference between males and females as far as rise time is concerned. There is significant difference between males and females as far as fall time is concerned in older age groups. Males shows longer fall time than females efter the age of 46 years. But there is no significant difference between males and females from 16 years of age to 45 years of age.

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