DYSFLUENCIES IN NORMALS UNDER D.A.F. 1

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Lee (1950), showed that experimentally produced delay in air-conducted auditory feedback of speech causes widespread speech disruption. Primarily, delayed auditory feedback (DAF) produces a slower rate of speech, dysfluencies and articulatory errors (Lee, 1950, 1951; Black 1951; Fairbanks and Guttman, 1951). Lee (1950, 1951) has given the term *'Artificial Stutterer'* to a person speaking under delayed auditory feedback. He also says that subjects under DAF might provide insights into the nature and etiology of stuttering. A hypotheses given by Webster and Lubker (1968), was that a disturbance in auditory feedback might be responsible for stuttering. There was an increase in the intensity, fundamental frequency and duration of speech when normals were asked to speak with delayed auditory feedback, (Black 1950). The findings were similar to that of a normal under bilateral application of masking noise.

Several hypotheses have been proposed to explain stuttering, that the auditory system in stutterers—function differently. (Cherry, Sayers, Sklar, Hanley and Steer).

Rejecting the auditory feedback dysfunction hypotheses of stuttering, Wingate (1976), says that there are important differences between the dysfluencies experienced by non-stutterers under DAF and dysfluencies characteristics of stuttering. But neither -Lee (1950), nor Neeley (1961), provided objective quantitative data on the frequency of various types of dysfluencies experienced by non-stutterers under DAF. There is need however, to document the relative frequency of various types of dysfluencies in non-stutterers under DAF. Studies done by Fairbanks and Guttman (1958), and Neeley (1961), viewed speech performances under DAF in terms of articulatory errors rather than dysfluencies.

Thus even though there are disruption of speech in normals under DAF reported, there are variations in the results which may be due to the methodology or interpretation. :

The present study was undertaken to study the effect of DAF on normal speech.

Methodology

Twenty-nine young adults 13 males, and 16 females age ranging from 18 to 23 years with a mean age of 20.5 years with no history of speech having and/ or neurologic disorders were taken as subjects for the study.

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One stereo Uher tape recorder (SG 63) which had provision for providing DAF with a delay of one second (approximately) was used for the study.

The study was conducted in a quiet room. The subjects were comfortably seated. Then two-circumamal ear phones (with the head band) connected to the tape recorder were placed over the ears of the subject.

A microphone was placed approximately 2 ft. from the mouth of the subject. The subject was asked to read the passage. Each subject was given the following instructions and whenever the subject had doubt/question regarding the procedure they were classified.

Instructions

' Now, we want you to read this passage, as you would usually read, Do not stop in the middle, continue until you complete this passage'.

The passage was of non-emotional content which was about ' improving reading'. The passage consisted of 209 words. All the subjects were made to read under DAF and their readings were recorded on a separate cassette tape recorder (National Panasonic) with microphone approximately 2 ft. away from the mouth of the subject. The volume control and other settings were kept constant for all the subjects.

After an interval of 30 days approximately, all the subjects were made to read the same passage in the identical conditions but without DAF. The readings were again recorded as in the previous condition.

The recordings of readings with and without DAF of all the subjects were analysed by four judges. The judges were post-graduate students of Speech Pathology. The judges were requested to listen to the taped samples of readings **and** to analyse them:

1. To obtain the number of dysfluencies and type (repetition, prolongation, hesitation and abnormal pauses) and further to describe the recorded speech in terms of;
2. intelligibility of Speech,
3. Variations in Pitch, Loudness and Prosody and
4. Mis-articulation.

Further, the rate of reading was also determined for each subject under both the conditions.

Results and Discussions

Table 1 depicts the mean number of blocks and the mean rate of reading shown by males and females under delayed auditory feedback conditions, and under normal auditory feedback conditions.

TABLE I

	UNDER DAF				UNDER NAF	
	No	Total No. of blocks	Mean blocks	Mean rate of reading WPM	Mean blocks	Mean rate of reading WPM
Males	13	280	21.54	104.98	3.86	145.57
Females	16	223	13.94	118.87	1.20	151.23

It is evident from the inspection of the Table 1, that there is an increase in the number of blocks for males and females under DAF.

The increase was found more for males than for females. Further, a comparison of mean values indicate that there is an increase in the number of blocks and occurring more in males than in females.

There is statistically significant decrease in the mean rate of reading when reading in normal auditory feedback conditions and delayed auditory feedback conditions are compared both in males and females and indicated by Wilcoxin matched-pair-sign-rank test at 0.01 and 0.05 levels.

However, the decrease was more evident in cases of males than in females.

Intelligibility was judged as being slurred, unintelligible and staccato?

Generally speaking, there was a decrease in the speech intelligibility for both males and females under delayed auditory feedback conditions.

Table 2 depicts the evaluation of readings of all the subjects with DAF by the judges in terms of intelligibility, articulation and voices.

TABLE 2

Under Delayed Auditory Feedback

	Intelligibility			Articulation			Voice				
	Slurred	Unintelligible	staccato	Poor	Fair	Good	Pitch increase	Loudness increase	Normal	Monotonous	Abnormal variations
Males 13	9	2	2	6	5	3	5	6	4	2	11
Female 16	13	2	3	4	8	3	7	14	1	—	16

Nine males out of thirteen are considered as having slow slurred speech under DAF. Similarly, 13 females out of 16 have shown slow slurred speech under DAF.

The articulation of 6 males and 4 females have been judged to be poor.

Three subjects in each of groups of males and females showed no change in articulation. The remaining subjects of the groups showed ' fair' articulation as evaluated by the judges.

The analysis of voice by the judges has indicated that there is an increase both in terms of pitch and loudness in majority of the subjects, i.e., an increase in pitch and loudness is seen both in case of males and females. Further, abnormal variation in proscdy (stress and intonation) is noted in 11 out of 13 males and in all 16 females.

Therefore, it may be concluded that:

Both males and females show disruption of speech in terms of repititions, prolongations, hesitation and pauses under DAF.

This change of speech being more in case of males than in case of females.

Apart from the stuttering-like blocks in the reading of both males and females under DAF an increase in loudness and pitch with abnormal prosody is also observed.

Further, articulation of the subjects is also affected which in turn contributes for poor intelligibility of speech.

The present results are in support of the findings of Lee (1950), according to whom ' DAF causes an increase in intensity, fundamental frequency duration of speech and dysfluencies'. Similar findings have been reported by Black (1951), Fairbanks (1955), Fairbanks and Guttman (1950), Venkatagiri (1980), has also reported that there were dysfluencies and articulatory errors in his subjects under DAF, these being more when the delay was 200 milli seconds.

Thus the present study has indicated that stereo tape recorder with separate control for each channel can be used as DAF apparatus. Even a delay of one second would bring disruptions in speech. These disruptions being more in case of males as reported by earlier investigators, would support the conclusion that males are more prone for disruptions of speech under DAF than females.

' It is possible and necessary to conceptualize the production of speech as involving a series of steps or levels begining with an " idea " and *culminating* in the formation of an acoustic signal. A mal-functioning at a particular " level " irrespective of the casual factors involved, may result in a specific form of disruption. From this point of view, the findings of the present study suggest that DAF and stuttering disrupt speech at approximately the same " level " along the speech production process though the cause of disruption may or may not be similar' (Venkatagiri, 1980).

Wingate (1976), has stated that' stuttering is a prosodic defect which manifests itself during the actualization of " stress increase ". He has further identified fundamental frequency, intensity, and duration as significant variables involved

in effecting changes in stress. These are also the variables that are severely disrupted under DAF, as shown in the present study. It is possible then that both stuttering and DAF disrupt speech at the prcscdic level' (Venkatagiri, 1980).

As Venkatagiri (1980), points out considering the remarkable similarities between—DAF-induced speech disruption and stuttering. It is highly probable that a greater understanding of DAF-induced speech disruption will provide valuable insights into the nature and etiology of stuttering.

Thus information from studies such as the present one would be useful in understanding stuttering.

BIBLIOGRAPHY

1. Black, J.W.: Some effects of delayed sidetone upon vocal rate and intensity., F.*S.H.D.* 1951, 16, 56-60.
2. Fairbanks, G. and Guttman, N.: Effect of delayed auditory feedback upon articulation. F.*S.H.D.*, 1958, 1, 12-22.
3. Lee, B.S.: Artificial Stutter, F.*S.H.D.*, 1951, 16, 53-55.
4. Neeley, J.N.: A study of the speech behaviour of stutterers and non-stutterers under normal and delayed auditory feedback. F.*S.H.D.*, 1961, 7, 63-82.
5. Spilkar, B.: Some vocal effects of different reading passages and time delays in speech feedback. F.*S.H.D.*, 1954, 19, 33-37.
6. Venkatagiri, H.S.: The relevance of DAF-induced speech disruption to the understanding of stuttering. F.*F.D.*, 5 (1980), 87-98.
7. Venkatagiri, H.S.: A study of hemisphere, Asymmetry for Auditory Feedback of Speech. *F.A.R.*, 1975, 15, 289-294.
8. Webster, R.L. and Lubker, B.B.: Interrelationship among fluency producing variables in stuttered speech, *J.S.H.D.*, 1968, 11, 754-766.
9. Wingate, M.E.: Effect on stuttering of changes in audition. *J.S.H.R.*, 1970, 13, 861-873,