
SPEECH ERRORS ON DELAYED AUDITORY FEEDBACK

J. BAŠTECKÝ*, O. VINAŘ*, B. BOROVIČKOVÁ, VL. MALÁČ, M. ZICHOVÁ

The study of speech functions can be considered as one of the best methods of investigation of psychic functions. The possibility to evoke a disturbance of a certain function under controlled conditions proved to be a good way to better knowledge of such a function. Therefore we have applied the delayed auditory feedback (DAF, Lee 1950) in experimental psychiatry in a similar way as Goldfarb et al. (1958), Morávek (1961), Spear and Bird (1963) and Hughes et al. (1963).

Our first hypothesis was that the disturbance induced by delayed auditory feedback (DAF) would be smaller in persons who are more independent on exteroceptive signalisation. The intensity of the disturbance of speech during DAF could be a measure of withdrawal. It is very difficult to find a sufficiently valid and reliable criterion of the deepness of withdrawal although it is one of the classical psychiatric syndromes.

Therefore in the beginning of our work we decided to compare the effect of DAF in 3 groups of persons:

1. healthy experimental persons
2. these same persons in LSD (lysergic acid diethylamide) induced state
3. schizophrenic patients

Our hypothesis was the following: the disturbance of speech induced by DAF would be the greatest in healthy persons, smaller in these persons after ingestion of 100 γ of LSD and the smallest in schizophrenics.

This hypothesis was not confirmed, but some other results of our work (Vinař et al. 1965a, Vinař et al. 1965b, Baštecký 1965, Baštecký et al. 1966) show that the method of DAF can contribute to the differentiation of groups of psychiatric patients from healthy controls, that it reflects the effects of some psychotropic drugs and that it can be used as a predictive tool of success of pharmacotherapy in psychiatry.

In the present paper we would like to analyse the kind of speech errors induced by DAF and look for differences among the groups of examined persons.

* Psychiatric Research Institute, Prague 8-Bohnice.

Method: The examined persons read a selected text, consisting of 7 parts and repeated the reading twice. During the reading the delay is presented alternately so that every part is read under normal conditions and with delay. The Jansen tape recorder is used and a delay of 142 msec. and intensity of 65 db are applied. Beside the speech errors, following parameters are registered: speed of reading, vocal intensity measured in db and electrical activity of mimic muscles.

The speech errors are registered by two independent raters listening to the tape record. The following kinds of errors are recorded: repetitions, exchanges, tonic spasms, additions and omissions which are considered as errors in the region of articulation (errors of the type A) and acceleration, deceleration and changes in intonation which are considered as errors in the region of prosodic features (errors of the type B). The inter-rater reliability of this procedure is sufficiently high, and in rare cases of disagreement, there are taken into consideration the mean numbers of recorded speech errors.

Subjects: three groups of persons were examined:

1. 65 healthy controls, 40 women and 25 men, medical students and students of psychology, nurses and physicians, all without any marked mental disorder. The mean age of this group is 25,7 years.

2. 135 schizophrenic in-patients of the Psychiatric Research Institute in Prague, 81 women and 54 men. The diagnosis of schizophrenia had to be confirmed unanimously by all—at least three—psychiatrists on a case conference and by Fould's RSSSI (1963). The examination was performed in the first fortnight after admission of the patient before treatment, i.e. after at least 10 days without any active medication. The mean age of the patients is 32,8 years.

3. 37 persons in a LSD-induced state three hours after ingestion of 100 μ of lysergamide. This group was selected from the control group, they were 18 men and 19 women. Their motivation for the inclusion in this experimental group was a professional interest in LSD experience. The mean age of this group is 22,7 years.

The difference in the age among the compared groups is not statistically significant.

Results: The increase of the absolute number of all speech errors induced by DAF does not differ when we compare the controls with the persons in a LSD induced state, the mean increase is about the same: 27,41 in controls and 27,86 in LSD induced state. However, in the group of schizophrenic patients this increase is greater ($P < .01$) (the mean difference being 38,97) than in both previous groups.

When we separate the two types of errors, we can see that the numbers of errors of the type A (articulation errors) is not different in the three compared groups. However, comparing the increase of absolute numbers of speech errors of the type B, which refer to the prosodic features of speech, we found a greater increase ($P < .01$) in the schizophrenic group than in the both other compared groups.

We have found no statistically significant differences among the compared groups of examined persons in the ratio of the numbers of type A and type B errors.¹

¹ Analysis of variance and Duncan's multiple range test were used for the statistical checking of our data.

Because the difference between the schizophrenic patients and controls in the speech errors concerning the prosodic features was the most interesting finding, we asked whether this increase is not due to the difference which is present already without DAF. The mean number of speech errors of this type is 1,08 in controls, 1,21 in schizophrenic patients and 2,00 in LSD induced state. The differences are not statistically significant. Also the correlations between the numbers of errors without DAF and under the DAF conditions are very low and not statistically significant. We can conclude therefore, that the DAF method is necessary to provoke the greater increase of the type B speech errors in schizophrenics than in controls.

It is not easy to interpret the meaning of our results. We can speculate only on the character of the prosodic features of the speech where we found the difference: it seems that these features are in closer connection with emotional life than the region of articulation. It would mean that the emotional response of a schizophrenic patient to the intrusion induced by DAF differs from the response of a mentally healthy subject. The analysis of the type of the speech errors is then a useful method for elucidating such differences.

Numbers of examined persons

	Controls	LSD	Sch	Σ
men	25	18	54	97
women	40	19	81	140
Σ	65	37	135	237

Average numbers of speech errors

	N	A	B	A + B	A/B
Controls	65	4	22.36	27.41	0.11
Sch	135	4.31	39.61	38.97	0.20
LSD	37	3.87	25.90	27.86	0.08

REFERENCES

- Atkinson, C. J.: Adaptation to delayed sidetone. *J. Speech Hear. Disord.* 18: 386—391, 1953.
 Baštecký, J.: Delayed auditory feedback in psychiatry. Cand. Dissertation, Charles University, Prague 1965.
 Baštecký, J., Vinař, O.: Psychotropic drugs on delayed auditory feedback in schizophrenia. *Activ. Nerv. Super.* (Praha), 8: 222, 1966.

- Black, J. W.: The effect of delayed sidetone upon vocal rate and intensity. *J. Speech Hear. Disord.* 16: 56—60, 1951.
- Fairbanks, G.: Systematic research in experimental phonetics. I. A theory of the speech mechanism as a servomechanism. *J. Speech Hear. Disord.* 19: 133—139, 1954.
- Foulds, G. A.: A quantification of diagnostic differentiae. *J. Ment. Sci.* 108: 389—405, 1962.
- Goldfarb, W., Braunstein, P.: Reaction to delayed auditory feedback in schizophrenic children. In: *Psychopathology of communication*. New York, Grune and Stratton 1958.
- Hughes, F. W., Forney, R. B., Gates, P. W.: Performance in Human Subjects under Delayed Auditory Feedback after Alcohol, a Tranquilizer (Benzquinamide) or Benzquinamide-Alcohol Combination. *J. Psychol.* 55: 25, 1963.
- Koževnikov, V. A., Chistovich, L. A.: Реč, Артикуляција и Воспријатие. Изд. Наука. Москва, 1965.
- Lee, B. S.: Some effects of sidetone delay. *J. Acoust. Soc. Amer.* 22: 639—640, 1950.
- Linsener, J., Linsener, H. J.: Untersuchungen zum Lee Effekt I. Zur Klassifizierung von Sprachfehlern bei verzögerter Rückmeldung der Lautsprache. *Z. Psychol.* 168, 1—2, 26—58, 1963. Untersuchungen zum Lee Effekt II. Sprachstörung und Syntax. *Z. Psychol.* 168, 3—4, 226—230, 1963.
- Morávek, M.: Vliv zpožděné akustické aferentace (Leeův efekt) ve výzkumu vyšší nervové činnosti. *Activ. Nerv. Super.* (Praha) 3: 21—24, 1961.
- Spear, F. G., Bird, R. L.: Delayed auditory feedback. Vocal intensity changes in schizophrenia. *Brit. J. Psychiat.* 109: 240—242, 1963.
- Sutton, S., Roehrig, W. C., Kramer, J.: Delayed auditory feedback of speech in schizophrenics and normals. *Ann. New York Acad. Sci.* 105, 15: 832—844, 1964.
- Vinař, O., Baštecký, J., Borovičková, B., Zichová, M., Malač, V.: Method of delayed auditory feedback in psychiatry. *Activ. Nerv. Super.* (Praha), 7: 193—195, 1965.
- Vinař, O., Baštecký, J., Borovičková, B., Zichová, M., Malač, V.: Delayed auditory feedback in schizophrenia and LSD induced state. *Activ. Nerv. Super.* (Praha), 7: 302—303, 1965.

DISCUSSION

Singh:

(1) Why did you delay the feedback by 0.142 and not by 0.18—0.20 which have been reported maximally deleterious to speech production?

(2) Then you disagree with the previously reported data by Lee, Black, Fairbanks etc. that the maximal distortion takes place with 0.18—0.20 delay.

Vinař:

ad 1. We chose the delay of 0.142 sec because due to our previous experiences in a pilot study we could find maximal changes in parameters measured in our laboratory in the studied persons with this delay.

ad 2. We assume that disagreement with quoted authors is not a great one. For instance Black (1951) in one of his papers found that prolongation of time needed for reading under DAF condition increased as a function of the length of the delay until 0.18 seconds. These results were confirmed by Atkinson (1953) and Fairbanks (1955). The optimal interval of delay might be between 0.18—0.20 but in our experience the delay of 0.142 is sufficient which is not an exception (Sutton, Roehrig and Kramer 1964).