Brit. J. Psychiat. (1974), 124, 534–5

Electroencephalographic Study of Stammering

By AHMED OKASHA, S. ABDEL MONEIM, Z. BISHRY, M. KAMEL and M. MOUSTAFA

Stammering has been and still is one of the most challenging disorders in psychiatry. It may be the result of constitutional or neurological differences (Karlin, 1950; Boland, 1951), of delayed auditory feed-back (Lee, 1951), of neurosis or of a learned response (Wischner, 1950, 1952). Schmoigl *et al.* (1967) studied 50 cases of stammering and found abnormalities in 70 per cent of cases. The possibility of organicity in stammering tempted us to make EEG studies in Egyptian stammerers.

Design of Study

The EEG was recorded in 54 stammerers who were studied (Okasha *et al.*, 1973), and 27 control schoolchildren between the age of 6–12 years. The apparatus used in the present work was an Elema Schönander electroencephalogram. The recording unit was equipped with 16 recording channels. Twenty-one scale electrodes were positioned according to the international system, using a standard electrode paste as contact medium. Both unipolar and bipolar derivations were employed. Hyperventilation for three minutes was routinely used as a provocative procedure.

Results

I. *EEG changes in controls*

1. The dominant rhythm in the age between 6 and 9 years were alpha/theta waves, alpha at 8–9 Hz and theta at 6–7 Hz (13 EEGs).

2. The dominant rhythm in the age of 10–11–12 years was alpha ranging from 9–11 Hz, with superimposed theta in one child aged 10 years (14 EEGs).

The alpha rhythm was present in the postcentral region and responded normally to eye opening (suppression). Low voltage theta activity was present occasionally in the frontal, temporal and central regions. On hyperventilation, building up of slow activity occurred in all cases, and high voltage slow activity (excessive response) occurred in 10 cases of stammerers.

II. *EEG changes in stammerers*

1. *Epileptic changes* (12 cases, i.e. 22 per cent). In these EEGs there were paroxysmal discharges. The paroxysms of 11 EEGs were of high-voltage slow waves, bilaterally synchronous, symmetrical, present without provocation, and augmented by hyperventilation; this is conclusive of primary centriencephalic discharge. In one case, a history of grand mal fits was given by the patient's mother and the patient was still receiving antiepileptic drugs. In another EEG of a patient aged 12 years, the background showed slow alpha waves; there were frequent paroxysmal discharges of high voltage slow alpha waves and spikes of 2–3 Hz, typical of petit mal variant. The mother gave a history of a mixed type of epilepsy. In this particular case it was noticed by the family that the child's stammering increased on the day before the occurrence of his epileptic fit.

2. *Non-specific changes, i.e. maturation defects* (8 cases, i.e. 15 per cent).

(a) In 4 reports the background showed alpha waves and runs of superimposed delta and theta waves; otherwise no abnormalities were recorded even by activation with hyperventilation.

(b) In 3 patients the EEG revealed a normal background with short paroxysmal outbursts of high voltage slow waves on hyperventilation; these were bilateral but persistently more apparent on the right prefrontal and frontal regions. One patient had a strong positive family history of stammering.

(c) In one patient, EEG hyperventilation showed an abnormal response with the slowing, was more apparent on the right side but sometimes shifting to the left especially in the frontal region.

3. *Diffuse changes, i.e. organic cerebral dysfunction* (5 cases, i.e. 9 per cent).

(a) In 4 cases there was diffuse cerebral dysrhythmia (7 per cent), i.e. bilateral diffuse high-voltage slow delta waves, distributed at random and with absence of alpha rhythm. In one of these cases a definite history of encephalitis was given by his mother.

(b) In one case there was a temporal focus in the form of sharp waves with phase reversal element on the left side. Further investigations could not be done because of refusal of the family, but a plain X-ray for the skull was normal.

4. *Normal changes* (29 cases, i.e. 54 per cent). The voltage of apha waves was higher on the left side in 12 cases and on the right side in 10 cases and in 7

https://doi.org/10.1192/bjp.124.6.534 Published online by Cambridge University Press

cases it was equal on both sides (these results were not different from those found in the control group).

The relationship between those cases with paroxysmal discharges in the EEG originating from the diencephalon associated with stammering can be accounted for by three explanations:

(i) Chance combination—this is improbable as the incidence has a greater than chance probability.

(ii) Stammering is caused by these paroxysmal discharges. But against this is the fact that stammering is a more or less constant condition, and rarely do we find an epileptic who stammers; but epileptic discharge, when it is prevented from expressing itself in an ordinary fit or in the classical EEG presentation, may implicate other neural pathways such as those subserving speech function, interfering with the latter function and producing stammering.

(iii) Both the paroxysms in the EEG and stammering are expressions of an underlying pathophysiological mechanism, i.e. a maturation defect and/or an unstable diencephalon, which is liable to produce both EEG discharges and emotional disturbances which interfere with the speech mechanism.

As regards those EEGs with slow alpha and theta waves (4 cases) and those due to over-reaction hyperventilation, we can consider them to have maturation defects in the EEG with occasional non-specific abnormalities. The mean IQ was 97. It seems that immaturity, low IQ, non-specific EEG changes and stammering are all part of a process of faulty development which may be constitutionally determined but reinforced by environmental factors. This defect is not necessarily associated with a specific pathological lesion, but it is dependent on high organized physiological deficits mediated through emotional pathways which may influence the flow of speech. When the individual is emotionally disturbed, this influence may be disturbed and lead to stammering. On the other hand cases with severe diffuse cerebral dysrhythmia are probably due to organic cerebral changes, a probability favoured by the relatively low mean IQ (83) in these cases.

In short, there is a background of cerebral dysfunction in many stammerers. Some stammerers are suffering from frank diffuse or focal cerebral pathology, others are electroencephalographically and emotionally immature. We can add to the various lines of treatment for stammering the antiepileptic drugs, especially in cases with paroxysmal changes in the EEG, or at least on an empirical basis.

References

Boland, J. L. (1951). 'Type of birth as related to stuttering.' *J. Speech Dis.*, **16**, 40.

Karlin, I. W. (1950). 'Stuttering—the problem to-day.' *J. Amer. Med. Ass.*, **143**, 732.

Lee, B. S. (1951). 'Artificial stutter.' *J. Speech Dis.*, **16**, 53.

Okasha, A., Bishry, Z., Kamel, M., and Hassan, A. (1974). 'Psychosocial study of stammering in Egyptian children.' *Brit. J. Psychiat.*, **124**, 531–3.

Schmoigl, S., and Ladisich, W. (1967). 'Investigation in stutterers.' *E.E.G. Journ.*, **23**, 182–5.

Wischner, G. J. (1950). 'Stuttering behaviour and learning: a preliminary theoretical formulation.' *J. Speech Dis.*, **15**, 325.

—— (1952). 'An experimental approach to expectancy and anxiety in stuttering behaviour.' *J. Speech Dis.*, **17**, 139.

Ahmed Okasha, M.B., M.R.C.P.(EDIN.), M.R.C.Psych., D.P.M., *Assistant Professor of Psychiatry*

S. Abdel Moneim, M.D., D.P.M. & N., D.M., *Assistant Professor of Neurology*

Zeinab Bishry, M.D., D.P.M. & N., D.M., *Lecturer in Psychiatry*

M. Kamel, M.D., D.P.M. & N., D.M., *Assistant Professor of Psychiatry*

M. Moustafa, M.D., D.P.M. & N., D.M., *Professor of Neurology*

Ain Shams University Hospitals, Neuropsychiatry Department, Cairo, Egypt

The full text can be supplied on request from the first author.

(*Received 28 December 1972*)

https://doi.org/10.1192/bjp.124.6.534 Published online by Cambridge University Press