DELINQUENCY AND EPILEPSY: A CLINICAL AND ELECTROPHYSIOLOGICAL NOTE.*

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The neuropsychiatrist presenting evidence before Court will sooner or later be asked the question, "Was the accused, at the time of committing the offence, labouring under such defect of reason as that he did not know what he was doing, or if he knew what he was doing, he did not know it was wrong?"

Two points of difficulty arise within the question which may be susceptible of clarification: the third remains elusive.

The first lies in the phrase "at the time of committing the offence": the second in "that he did not know what he was doing."

To both these points an answer may commonly be given, though probably in the form of a reasoned inference based on the facts emerging on examination.

Discussion of the attitudes implicit in the third phrase, "that if he knew what he was doing he did not know it was wrong," may involve a disquisition on the accused's appreciation of morality which is fraught with difficulty, and where concise interpretation remains elusive.

When a medical witness can give it as his opinion that an accused person is suffering from epilepsy or some other recognized mental disorder the Court will commonly accept that evidence in mitigation of the offence.

It should never be forgotten that the function of a witness is to offer his evidence, based on such examination as satisfies him—if necessary in the form of reasoned inference from observed facts—while the onus of acceptance or rejection of such evidence and the decision as to the disposal of the case falls entirely upon the Court.

In an attempt to study further the evidence required to answer questions relating to a person's knowledge "of what he was doing" "at the time of committing the act," 140 records of persons of all ages and both sexes were reviewed.

The subjects had been referred for examination following an anti-social act varying in gravity from "being beyond control" to "attempted murder."

Careful study has been made of the electro-encephalographic records of these persons under conditions of "rest" and "stress."

The full investigation of such a case necessarily involves electroencephalographic studies paralleled by biochemical and psychiatric investigation spread over a period of time and conducted within a controlled environment throughout (Hill, D., and Sargant, W., 1943, *Lancet*, and Sessions Hodge, *J. Ment. Sci.*, 1945, **91**, 385), but the curtailed examination detailed here has been found to yield suggestive results.

* A Paper read at the Quarterly Meeting of the Royal Medico-Psychological Association, Gloucester, on 14 May, 1947.

https://doi.org/10.1192/bjp.94.395.439 Published online by Cambridge University Press

For the purpose of this inquiry attention was directed to those cases which could be considered "epileptic": firstly those on "clinical" grounds, secondly those on "biochemical" grounds, and thirdly those on "electrophysiological" grounds.

TABLE I.

Total Records.

Children ("Children and Young Persons Act").		Adults.	
Normal	24	Normal	25
4–7 c.p.s.	33	4–7 c.p.s.	21
"Epileptic"	33	"Epileptic"	4
Total	90	Total	50

Full total, 140.

TABLE II.

"Epileptic" Records.

Children.		Adults.	
Clinical fits	10 (7·1%)	Clinical fits	1 (0·7%)
Loss of consciousness	5 (3·5%)	Loss of Consciousness	1 (0·7%)
"Epileptic" records	18 (12·8%)	"Epileptic" records	2 (1·4%)
Total	33 (23·4%)	Total	4 (2·8%)

TABLE III.

Age Groups in Years.

	<6.	6–10.	10–14.	14–17.	17–25.	>25.
Clinical fit	3	1	4	2	1	0
"Loss of consciousness"	0	3	2	0	0	1
"Epileptic" record	0	5	11	2	2	0
Total cases	3	9	17	4	3	1

The first group satisfied the criterion that they had had one or more observed and recorded clinical fits, either "major" or "minor." This group showed an EEG record characterized by either a peak of energy in the 1·5–4 c.p.s. band which became dominant during hyperpnoea, spread to both frontal areas and persisted for 20 seconds or more following the cessation of hyperpnoea, or a typical "spike and wave" complex with associated spectrum analysis. This group represents 7·8 per cent. of the total.

The second group, none of whom had ever—so far as inquiry could elicit—had a clinical fit, suffered a clouding, diminution or loss of consciousness during hyperpnoea. The onset of this state—characterized by failure to respond to a simple and clearly given command—was preceded for 2 seconds

https://doi.org/10.1192/bjp.94.395.439 Published online by Cambridge University Press

by the appearance in the primary EEG trace of a complex of high voltage waves at about 1·5 c.p.s. which persisted during the phases of disturbed consciousness. The repetition of the record following the ingestion of 50 gm. of glucose modified the record in that consciousness was unimpaired during hyperpnoea, and the appearance of complexes of frequencies in the 1·5–4 c.p.s. band did not occur. Yet the EEG record remained abnormal in that slow frequencies in the 4–7 c.p.s. band remained unaffected and of dominant energy (Plate A).

It is suggested that this group of persons, representing a further 4·2 per cent. of the whole group, might properly be regarded as epileptic pending a more critical examination and definition of "epilepsy."

In the third group (14·2 per cent. of the total) no clinical fit had ever been observed, no diminution, clouding or loss of consciousness could be demonstrated on examination, fasting and/or with hyperpnoea, and the criteria accepted have been purely electrophysiological. The examination in every case was made using a 2 or 4-channel electroencephalograph with standard bipolar electrode placements, the primary tracing being subjected to frequency analysis with Grey Walter's Electronic Wave Analyser in the case of the 4-channel machine. The machines used were the 4-channel EEG at the Burden Neurological Institute—where the bulk of the work was done—and a 2-channel portable machine made available to the Neuro-Psychiatric Department at Musgrove Park Hospital through the courtesy of Dr. Grey Walter. For purposes of inclusion in this group it was required that the EEG record should show:—

(1) A typical "spike and wave" primary trace accepted as evidence of *petit mal*;

or (2) a wide spread of energies in the primary trace on electronic analysis with developing "spike and wave" complexes during and following hyperpnoea;

or (3) activity in the δ and θ bands at rest with the development of high voltage waves in the 1·5–4 c.p.s. band which persist for 20 seconds or more after the cessation of hyperpnoea following the ingestion of 50 gm. glucose (Plates I, II and III).

The comparison of control groups produces the following figures: satisfactory figures for the incidence of "epilepsy" in the general population are difficult to obtain. Turner (quoted by Kinnier Wilson) gives 2·9 per thousand as the incidence in Great Britain—it is doubtful if this is a sufficiently high figure. Penfield and Erickson for the United States give figures of 1·2 per thousand (S. Dakota), 6·2 per thousand (Nassau County), 12·7 per thousand (Vermont), with 5·0 per thousand as the general incidence for the United States of America. They also state that in Korea—with a markedly inbred population—the figure rises to 23·8 per thousand. Accepting the mean of these figures as 12·5 *per thousand* it will be seen that the figure of 7·8 *per centum* is still significant. While if the total figure of 26·2 per cent. can be accepted it suggests that the incidence of "epilepsy" amongst delinquents is indeed high.

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Comparison with further control groups has been made. Dovey (*Proc. E.E.G. Socy.*), in a study of EEG records of 106 unselected normal children aged from 6 months to 10 years, stressed the difficulty of interpreting these "young" records in the light of experience with adults, but states (private communication) that in spite of the occurrence in this group of records showing many "anomalies and 'instabilities'," only two records were considered to be of the "epileptic" type. It is perhaps of importance to state that, of the three children whose cases are reported here in the "under 6 age-group," all had clinical fits. Records have been taken of an unselected group of 109 schoolboys aged 11 to 18 years. Of these 5 (4·5 per cent.), had EEG records which were comparable with those in the third group previously described (Sessions Hodge and J. A. Maddocks).

If the foregoing figures can be accepted it would appear that we have here a group of persons (Table II) subject to episodic disturbance, such disturbance being in the nature of widespread cerebral dysfunction which at some point disturbs cortical integration. This disturbance may be related to consciousness, and, as has been shown, can amount to a diminution, clouding or loss of consciousness. The finer degrees of such a disturbance will need to be the subject of further investigation, and this is projected.

If an accused person is found to exhibit such phenomena, it should be possible to infer that "at some material times" he was in such a state as "that he did not know what he was doing." If by careful reproduction of the alleged circumstances of the crime it can be demonstrated that the necessary factors favouring such an episodic disturbance were present (if, to borrow a phrase from the old Astrologers, "the required [aetiological] constellation were in conjunction"), then one might reasonably infer that "at the time of committing the act" the accused "did not know what he was doing."

The third point remains elusive—"that if he knew what he was doing he did not know it was wrong."

An appreciation of right and wrong must surely involve many factors in the individual's internal and external environment: constitution, birth, upbringing and intellectual endowment being but some. Sherrington has said that "what the mind is concerned with is not the act but the aim" (Sherrington, *Man on His Nature*). There is a wide gulf fixed between the act of pulling the trigger by flexion of a forefinger and hitting the target, with all that that implies in consequence.

It is possible that we are concerned not so much with a lack of knowledge of right-doing and wrong-doing as with faulty inhibition, and that further light may be thrown upon this with the extension of investigation in frontal lobe function.

It is possible also that delayed or disturbed cerebral maturation is another cogent factor. This may account for the higher incidence of the observed disturbance in the juvenile groups. Should this prove to be so then yet another reason is added to the many in favour of extended observation, control and treatment of the young delinquent, and further reinforces Prof. D. K. Henderson's plea for "an indeterminate sentence, discharge to be dependent not upon the expiration of time but upon the proper establishment of adequate

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social patterns." In this plea I concur, and would stress the value of repeated coincidental psychiatric and electrophysiological examinations.

One may perhaps add that even so restricted a study as this clearly indicates the need for further research and contemplation.

The electro-encephalographic findings are, after all, a graphic representation of electrical activity of cerebral tissue. They require to be considered together with both biochemical and psychiatric estimations in every case.

It would be improper at this stage to speak of an " epileptic record " save with the reservation that the nature of " epilepsy " is not yet understood, and that lacking the evidence of a " seizure," we can only state the nature of the electro-encephalographic findings and await their association with other morbid phenomena.

Investigation of the delinquent's appreciation of " morality " probably poses the most difficult question.

Trotter in his paper," Has the intellect a function ? " speaks of the " calibration of the intellect," thus indicating the need for a positive effort at attaining functional cerebral unity. If this desideratum be possible it will surely imply the possession of adequate neuronic substrate not liable to episodic disturbance.

Finally, let it be re-emphasized that this communication should be regarded as tentative and indicative, and that—to quote Trotter again—" . . . the man of science within his own, often narrow, department can cheerfully view all his knowledge as provisional only and indefinitely liable to subversion by further inquiry. . . "

It is my pleasure to thank Dr. J. F. Davidson, Medical Officer of Health, Somerset County Council, for the use of case-material, my colleagues Dr. and Mrs. Grey Walter for their encouraging help on all occasions, and lastly Professor F. L. Golla for his unfailing and stimulating encouragement and bracing criticism.

https://doi.org/10.1192/bjp.94.395.439 Published online by Cambridge University Press