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THE ELECTROENCEPHALOGRAPHIC APPROACH TO THE OLIGOPHRENIC CHILDREN

—ON THE DIAGNOSTIC SIGNIFICANCE OF E. E. G.—

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Since in 1930 the electroencephalographic study on the oligophrenics was reported by Hans Berger, the pioneer of EEG studies, a number of referent studies have been carried by Kreezer, Posey, Gibbs and many other researchers over the world. Thus, problems such as the relationship between the patterns of electroencephlograms of subjects and their intelligence scores or etiological types, the abnormal patterns of either background activities or paroxysmal activities, the thlesholds to the activations and so forth have been discussed.

Summerizing the results of those studies, it may be said that the characteristic dispositions indicated on electroencephalograms of the oligophrenic children are illustrated with such activities as follows ; abnormal background activities in which the so-called slowing tendencies represented by poor alpha type waves and diffuse theta type slow waves, the right and left asymmetric patterns and so forth are included, moreover, paroxysmal fast or slow activities such as spikes, spikes and waves, or the lack of spindle waves during sleep and so forth.

To say with special reference to the etiological types of the oligophrenia, the abnormal background activities such as the slowing tendencies have been regarded as the indications of the retardations in the brain growth caused by some genetic factors, because those activities were frequently observed on electroencephalograms of normally developed infants of two to three years old. While on oligophrenic children, those activities were commonly observed up to the pubertal stage. Likewise, paroxysmal activities such as spikes have been regarded as the indications of the brain damages caused by some exogenous factors such as prenatal injuries, birth trauma, encephalitis and any other attackes dealed on early stages, because those activities were dominantly observed on EEGs of brain damaged patients.

Those findings on EEG are definitely significant especially for the diagnostic etiological approaches to the oligophrenia. Etiologically, in general, oligophrenics are classified into two types, the endogenous type and the exogenous type, or the physiological type and the pathological type in terms of the categories adovocated by G. A. Jervis in 1959. Since any symptom depends upon its causes, such etiological classifications of oligophrenics are quite significant not only in medical fields but also in educational or industrial fields. However, there are many difficulties in such etiological classifications of oligophrenics especially of those on early stages in clinical practice. Consequently the electroencephalographic approaches have been anticipated as a kind of conveniences to get more objective data of reference which would be much helpful

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for the diagnostic classifications of the patients. However, unfortunately, some diversities of the results of referent studies have been remained. Inevitably few discussions have been confirmed. Some studies concluded, for instance, that slow activities such as diffuse theta were scarcely found on EEGs of exogenous or pathological types. While others concluded that no such dispositions were confirmed on EEGs of the same type.

It might be presumed, however, that those diversities of opinions might be derived mainly from some confusions in categorizing oligophrenic subjects at analysis of the obtained data. In most referent studies, oligophrenic subjects were classified etiologically at first, then observed EEG activities within each type were analyzed to find any significant difference between categories. It must be pointed that such analytic procedures as described above were quite doutful. It might be unquestionable to classify subjects who had developed no symptoms of the brain damages into the endogenous or the physiological type. Contrary, however, it must be the most careful not to categorize subjects who had developed some exogenous symptoms simply into the exogenous or pathological type. Because both foctors, brain immaturations and brain damages are not always exclusive each other. It cannot be presumed that some brains of the brain damaged children would have mature normally, if they were not to be attacked by some injuries, because their brain might have matured subnormally being due to some endogenous factors. The possibility of the double disturbances should never be overlooked, in which case some genetically immatured brains might be injured exogenouslly. It may be supposed if data of those studies were to be analized more carefully, the results would not be so diversed each other.

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The subjects of the presented study were composed of sixty oligophrenic children, thirty five boys and twenty five girls of the university schools or of the child welfare institution which stands in close distance to the university. Ages of the subjects range from six to fifteen, whose mental capacities range from twenty four to eighty five in terms of I. Q..

The electroencephalograms of the subjects were recorded by means of the eight channell system apparatus for about one hour for each subject in the special room sheltered with black curtains (Fig. 1.). As activations, hyper ventilation, light flashing and narcotic sleep were applied. Narcotic sleep was conducted by the medicalist by means of doses of proper amount of pentobarbital (Fig. 2.). Data of this study were collected within fourteen months from June 1971 to July 1972.

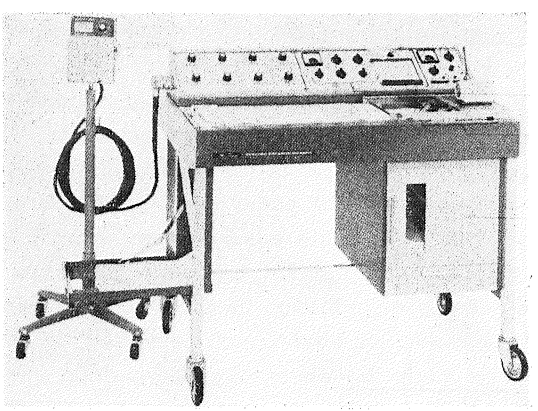

Fig. 1. The applied apparatus.

Results :

On EEGs of fourty nine subjects among sixty −81.67%, the so-called

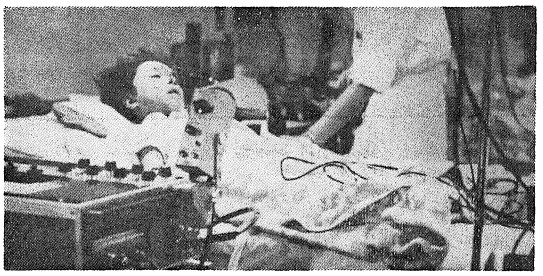

Fig. 2. The test position of a subject. (presented as an illustration, not an actual scene)

slowing tendencies with poor alpha activities and diffuse theta activities, and asymmetric patterns were remarkable. While, on twenty seven subjects among sixty −45. 33%, some pathological activities such as spikes, spikes and waves, paroxysmal slow waves were observed. Among all subjects, as presumed, the double disturbance types were found, whose came to sixteen −26.67%.

All subjects were categorized into two groups, "the mildy retarded" and "the severely retarded" according to their each mental capacities. The latter were composed of subjects whose I. Q. were under 55, the former, avobe 55 in terms of Binet scores.

The cross-sectional distributions were exhibited in the following table.

Table of the Cross-Sectional Classification of Subjects

Class of Subjects :	Pattern of EEG Activities :			
	Subnormal :	Pathological :	Doubled :	Total :
Mildy Retarded :	21(63.64)	4(12.12)	8(24.24)	33(100.)
Severely Retarded :	13(46.43)	7(25.00)	8(28.57)	28(100.)
Sum :	33(55.00)	11(18.33)	16(26.67)	60(100.)

According to the exhibited table, it might be implied with higher rate of distributions of pathological activities within the category of the severely retarded that the severe mental retardations might be caused by brain damages emerged in early stages. Such implications, however, were not always be called a fresh finding, because such assumptions were already confirmed earlier without electroencephalographic studies. Nevertheless, it should be noticed that old assumptions were thus affarmed more significantly with some objective data collected through the electroencephalographic approaches.

It had been presumed by Berger and others that significant correlations between the numerical value of I. Q. and the quantitative scores of EEG activities would be scarcely obtained. It might be natural since both variables represent considerably different factors. Either brain immaturations or brain damages indicated on EEG activities might be categorized as pure physiological changes. While, various mental activities such as speaking, writing, caliculating, drawing or handling all of which were indicated on the scores of I. Q. might be conceptualized as bio-cultural changes acquired through the growth and the learning. By such reasons as discussed above, in this study, no quantitative analysis were tried in detail. As being exhibited avobe, however, rather rough categories of "the mildy retarded" and "the severely retarded" were applied in classification of subjects, because it was presumed that such rough classification as described above might be significant on some extent for the applied crosssectional

analysis of EEG activities of oligophrenic children. Even if such vague relations between the mental capacities and EEG activities were to be neglected, majority of significancies of the electroencephalographic approaches to the development of the brain functions had to be neglected too.

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Since the main concern in this study was focussed on the diagnostic significancies of the electroencephalographic approaches to the oligophrenic children, it may be profitable to exhibit the following a few cases in order to promote discussions.

Case I:

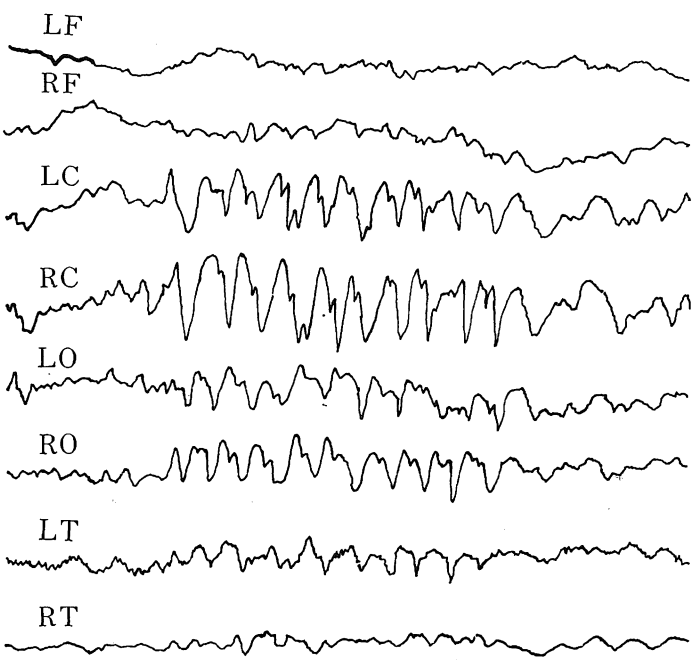
The subject: H. S, sixth grade, female, age 12, IQ 54, severely retarded, brain injuried.

In clinical obsevations, her brain damages had been obviouly presumed being indicated by some pathological symptoms such as arm spasm. Likewise, on the EEG of the subject, some epileptic indications such as spikes and waves focussed to the central sphere were remarkable during narcotic sleep. In actual, several months later she was attacked by the epileptic seizure on the way school.

Moreover, on EEG of the subject, some indications of the latent brain immaturations such as spindles focussed to the frontal sphere were observed, which were consistent with clinical findings such as microencephalis and so forth.

Consequently this case was categorized into the double disturbance, likewise into the severely retarded. Thus the cross-sectional locating of the subject by means of EEG was considerably profitable for the guidance and care of the subject (Fig. 3.).

Fig. 3.



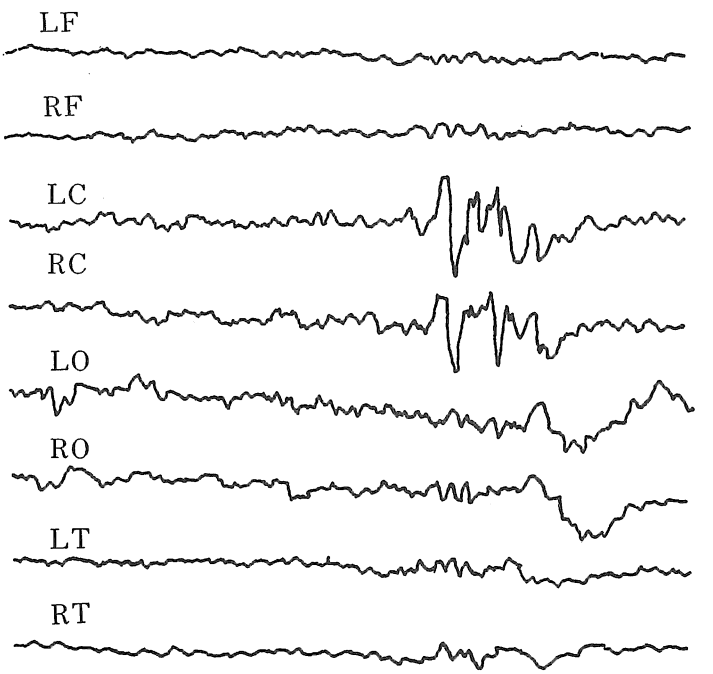
Case I. H. S. f. 12, IQ 54. 1 sec.

Case II :

The subject : K. A. seventh grade, male, age 12, IQ 65, no clinical symptoms of exogenous factors.

The subject had been looked a funny submissive boy among his classmates. Since no pathological symptoms had been developed on him, the subject had been classified into the endogenous at school. Some pathological indications, however, such as dysrythmic background activities and paroxysmal spikes and waves focussed to the central sphere appeared during narcotic sleeps (Fig. 4). Consequently the subject was classified into the double disturbances-mildy retarded. This locating of the subject would be effective for training and care of him in future.

Fig. 4.



Case II. K. A. m. 12, IQ 65.

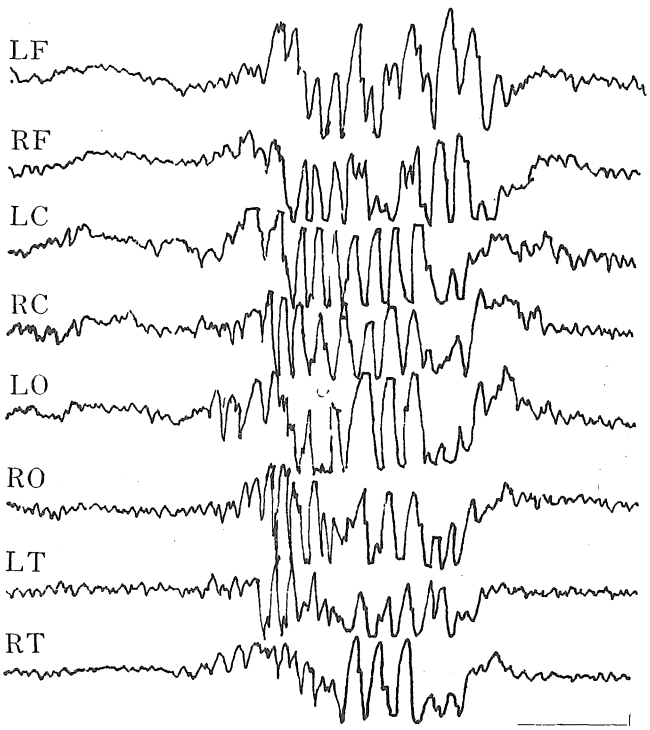
Case III :

The subject : M. F., eighth grade, female, age 13, IQ 73, epileptic under medical treatment.

Hyper synchronous theta activities were remarkable on the EEG of the subject during narcotic sleeps despite daily medical care (Fig. 5.). Concerning the epilepsy, the approaches to the subject by means of EEG might be less significant because of its unnesessity. By the careful studies of the EEG, however, the latent brain immaturations were indicated by some findings such as poor alpha in the frontal sphere, diffuse slow alpha activities focussed to the occipital sphere and so forth (Fig. 6.).

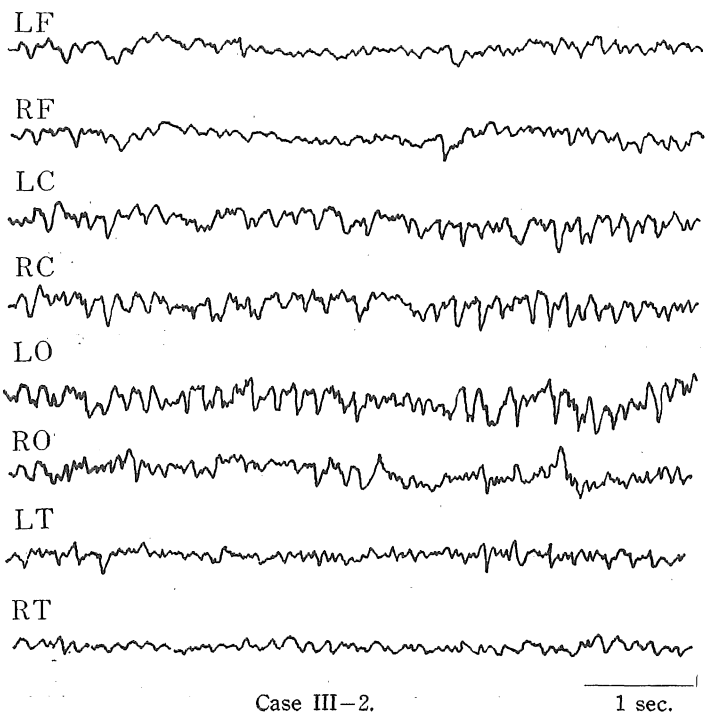
In many referent studies carried by others, epileptics were unexceptionally excluded out of the subject for the reason that the epilepsy and the oligophrenia were entirely different kinds of disturbances. However, principally some possibilities of the double

Fig. 5.



Case III−1 M. F. f. 12, IQ 73. 1 sec.

Fig. 6.



Case III−2. 1 sec.

disturbances with two of them could not be neglected. Therefore EEGs of children who have developed symptoms of the double disturbances such as this case should be studied as much as possible.

Because of the lack of apparatus such as EEG analyzers, it was unable to carry more significantly detailed studies. Moreover, because of various maladjusted behaviors which had been commonly conducted by mentally retarded children, it was unable too to apply some activations effectively except of the narcotic sleep. Actually not a few subjects of the severely retarded were frequently too scared to adjust to the test situations. Even some materials such as sweet candies, hot tea, dolls and so forth could not be utilized successfully to so much scared rigid subjects. In spite of such obstacles, this study has been carried on, any way, which was due to co-operation and assistance offered by Dr. Teruo Inoue, Chief of the University Health Center, and Miss Mayumi Yamane, assistant operator, moreover, Mr. Hiroshi Moriwaki, Atsushi Anjiki and others of University Schools, and Mr. Shudo Wakazuki and others of Matsue Gakuen. To all of them the author want to express sincere gratitude.

References

1. Kugler, J., Elektroencephalographie in Klinik und Praxis. 1963.
2. Wada, T., Electroencepharography in Clinc. 1966.
3. Okuma, T., Clinical Encephalography. 1969.
4. Nakagawa, S., Electroencephalographic Studies on Mental Deficiency. Jap. J. Child Psychiat. vol. 4, 126–133, 1963.
5. Kamide, H., Etiological classification and Electroencephalograms of Mental Deficiency. Jap. J. Child Psychiat., vol. 2, 257–265, 1961.
6. Fukushima, Y., Electroencephalographic Study of the So-called Behavior Problem Children. Psychiat. et Neurol. Jap., vol. 63, 1199–1212, 1961.
7. Kajitani, T., Electroencephalographic Studies of Mentally Retarded Children, Part I. Psychiat. et Neurol. Jap., vol. 65, 192–210, 1963.
8. Oka, E., An Electroencephalographic Study of Mentally Retarded Children. Psychiat. et Neurol. Jap., vol. 72, 555–578, 1970.
9. Suzuki, Y., A Follow -up Study of EEG's in Healthy Japanese Children. Psychiat. et Neurol. Jap., vol. 72, 812–820, 1970.
10. Ando, N., Studies on the Development of Physical and Mental Functions in Normal Children with Special Reference to the Multiple Graduation of EEG Development. Psychiat. et Neurol. Jap., vol. 73, 478–494, 1971.
11. Kurusu, E., A Study on the Mental and Somatic Development in Normal Children with Special Reference to the Relationship with EEG Development. Psychiat. et Neurol. Jap., vol. 73, 478–494, 1971