

E 383. NEUROMETRICS: QUANTITATIVE ELECTROPHYSIOLOGICAL EVALUATION OF BRAIN FUNCTIONS.

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"Neurometrics" is a new method for quantitative evaluation of sensory, perceptual and cognitive processes and anatomical integrity reflected in EEG and evoked responses. The goal is rapid, objective and automatic evaluation of various brain functions for differential classification as well as mass screening. These objectives required:

1) an amplifier system to record all 10/20 placements, monitor artifacts, test impedances, and construct digital records of valid data plus stimulation protocols;

2) a computer-controlled stimulator programmed to administer more than 50 standardized electrophysiological tests;

3) analytical programs to construct 19 monopolar and 38 bipolar derivations and to extract numerous quantitative indices from the electrical activity in each derivation during every test;

4) evaluation programs which, with a normative data base, achieve automatic identification of unusual features by Z-transformation of all analytical indices, display detected "abnormalities" as a density encoded picture equivalent to a functional brain scan and write automatic reports describing individual features;

5) programs to classify different patterns of abnormal values by numerical taxonomy.

Neurometric analysis has been successfully used to separate normal adults from patients with neuropathology, normal from senile elderly patients and normal children from those with learning disabilities. Cluster analysis reveals different subgroups within the senile population and within a sample of about 1000 learning disabled children.

E 384. DEVELOPMENT OF AN ALCOHOL-BLOCKER, USING COMPUTER-ANALYZED EEG.

K.Z. Itil, N. Polvan, M.F. Huque and T.M. Itil. (Tarrytown, New York, USA).

Psychostimulant (psycho-energizer or nootropic) properties of Lisuride Hydrogen Maleate (LHM), a potent migraine prophylactic with antiserotonin and antihistamine properties, were discovered based on quantitative pharmaco-EEG (QPEEGTM) investigations (Itil et al, 1974). Computer EEG (CEEGTM) profile of LHM was found to be almost a mirror image of alcohol. It was predicted that LHM will block the physiological and behavioral effects of alcohol. The results of a double-blind crossover study in healthy male volunteers demonstrated that LHM, administered prior or post alcohol ingestion, blocks or reduces the EET and behavioral changes induced by alcohol in a majority of subjects. There were showed marked EEG changes after alcohol or the blocking of EEG effects by Lisuride, also presented the most behavioral effects. Whether the alcohol-blocking properties of LHM can be useful in the treatment

of chronic alcoholism is being studied.

E 385. QUANTITATIVE PHARMACO-EEG WITH STEROIDAL HORMONES.

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Animal studies clearly demonstrate that steroidal hormones such as gonadal hormones and corticosteroids significantly alter the bio-electrical phenomena in the subcortical area. Clinical appearances indicate that a variety of hormonal substances produce behavioral alterations. Based on the hypothesis that drugs would change human brain function, the effects of a series of hormones were studied on scalp-recorded computer-analyzed electroencephalogram (EEG). Using the methods of quantitative pharmaco-EEG (QPEEGTM), the immediate CNS effects of a series of steroid hormones were established. Based on the computer EEG (CEEGTM) profiles, the psychotropic properties of a series of active and inactive hormones were also predicted: Mesterolone, an androgen, and Estradiol Valerate, an estrogen, produced CEEG changes similar to those seen after Imipramine and Amitriptyline, respectively; thus, antidepressant properties of these compounds were suggested. Cyproterone Acetate, an anti-androgen, d-Norgestrel, a potent progestational hormone, and 1-norgestrel, a biologically inactive isomer of Norgestrel, induced CEEG profiles similar to those seen after benzodiazepine anxiolytics. Thus, clinically anxiolytic properties of these compounds were predicted. Dexamethasone, a corticoid steroid, produced CEEG profiles similar to psychostimulant compounds. The 17-alpha- and 1-beta steroid isomers of Mesterolone, the anabolic Methalone Acetate, and the glucocorticoid Flucortolone, did not produce any appreciable systematic effects on human brain function.

E 386. QUANTITATIVE PHARMACO-EEG WITH ANTIMIGRAINE COMPOUNDS.

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Based on the observations that Lisuride Hydrogen Maleate (LHM), an analog of LSD-25, a migraine prophylactic with potent anti-serotonin and antihistamine properties, produces systematic and statistically significant effects on computer-analyzed human electroencephalogram, studies were conducted with a series of anti-migraine compounds. Investigations demonstrated that LHM produces EEG effects which are characterized by a decrease of very slow and very fast activities and increase of 8-20 cps waves in the primary wave measurements, and decrease of slow and increase of fast activities in the first derivative measurements of the computer-analyzed EEG. Computer EEG (CEEGTM) profiles of LHM showed similarities to those seen after psychostimulant compounds. Methysergide, another analog of LSD-25, produces in quality similar computer EEG changes to Lisuride, indicating less potent CNS effects of this compound. Higher dosages of Methysergide could

not be given because of side effects.

Another anti-migraine compound, Pizotyline, also demonstrated similar CEEG profiles to Methysergide and LHM. The quantitative changes after Pizotyline were also less than those of Lisuride.

Cyproheptadine, a potent antihistamine and anti-serotonin, did not show typical "psychostimulant" CEEG profiles.

Quantitative pharmac-EEG (QPEEGTM) studies demonstrated that the "migraine prophylactic" effects of LHM and, in lesser degree, Methysergide may be related to their CNS effects.

E 387. HZI SYSTEM X: EEG, EVOKED POTENTIAL ANALYSIS SYSTEMS.

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In order to study psychiatric and psychopharmacological questions, a comprehensive electroencephalographical analysis system, HZI System X, has been developed.

This system is a successor to a series of systems developed by us over the past 10 years on a variety of digital computers. It provides for the digitization, primary data reduction, final statistical data reduction and graphic presentation for EEG, evoked potential and CNV studies. For EEG analysis, the digitization and analysis steps may be performed separately or simultaneously. Available analysis methods include period analysis and power spectral density analysis performed individually or together on the same digitized data. The period analysis system contains a sleep classification sub-system. Up to 4 channels may be digitized simultaneously, the digitizing to be done in up to 1/4 real time. The evoked potential and CNV systems separate the digitizing steps from the analysis steps. The analysis logic for these systems is the integrated absolute amplitude in predefined latency bands. The averages and standard deviations of these measures over a predefined number of stimuli are the primary reduced result. The computer hardware is a PDP-11/45 with 60K of core memory (16K bipolar), 20 megabyte disk, industry compatible type, card reader, line printer, console terminal and laboratory peripheral interface. The operating system is RSX 11/M. Insofar as possible, all of the analysis methods share common routines so that input, operator interface, etc., are exactly the same for ease of use and training.

E 388. MATHEMATICALLY DEFINED CORTICAL EEG CHANGES AND INCREASE OF BRAIN PERFORMANCE DURING OPERANT BEHAVIOUR IN ANIMALS.

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Factor Analysis of EEG spectral values may be regarded as a promising method of obtaining information which can lead to new hypotheses about the structure of the data.

In various functional states of the brain, e.g. during different cognitive function in man or

under the influence of drugs in animals either a new structure of the EEG frequency bands emerged, or the originally observed frequency bands became more or less pronounced as expressed by an increase of the factor loadings.

When a new compound (EMD 21 657) was administered to cats in acute experiments we observed that all frequency bands were more pronounced suggesting that synchronisation within the frequency range had increased. We suspected that the pacemaker had become more effective, reflecting a higher degree of order. Cortical EEG changes of this kind were regarded by us as an electrophysiological correlate of an increase of higher cerebral functions.

In order to check this hypothesis we studied rats during operant behaviour. We found that EMD 21 657 acute and chronically applied reduced the number of commission and omission errors.

These results indicated that there is a correlation between brain performance and organisation of the EEG structure, mathematically analyzed by means of a factor analysis of spectral values.

E 389. EEG-STUDIES IN CHILDREN DURING CHRONIC INTERMITTENT HAEMODIALYSIS.

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(Münster, W. Germany)

A group of children who were under chronic intermittent haemodialysis because of terminal renal insufficiency were studied electroencephalographically during haemodialysis. Many other parameters were monitored simultaneously.

In nearly all cases the initial EEG at the beginning of the dialysis showed more or less severe alterations which were augmented under provocation-tests. The degree of the disturbances depended on the time the children were in the dialysis-program.

As a rule during each dialysis the background activity deteriorated and very often epileptic discharges occurred. Simultaneously the sensitivity to hyperventilation and photostimulation increased.

There was no constant correlation between EEG alterations and special blood-chemical values. But there was a clear relation between the duration of the dialysis and the consequent dehydration (weight loss) on one side and the degree of the EEG disturbances on the other side.

As a result EEG monitoring during haemodialysis was found to be of value especially for early diagnosis and treatment of impending cerebral crises induced by dialysis.

E 390. VISUAL EVOKED RESPONSES IN PATIENTS WITH SUBACUTE SCLEROSING PANENCEPHALITIS.

W. Horyd, W. Myga and J. Kulczycki. (Warsaw, Poland).

In patients suffering from Subacute Sclerosing Panencephalitis (SSPE) averaged pattern-evoked visual responses (VER) were recorded in various phases of the disease. A relationship between the shape of the response and paroxysmal EEG