

November 26, 1969

Dr. Reese T. Jones
The Langley-Porter Neuropsychiatric Clinic
401 Parnassus Blvd.
San Francisco, California 94122

Dear Reese,

Following is a summary of our analyses of the EEG analog tapes submitted earlier this year. Separately, I am returning the analog tapes. Xerox copies of the data sheets are enclosed.

We first checked the analog signals and because of differences in peak-to-peak voltages, re-wrote the input programs. Each record was then processed as a continuous record using the period analysis program, with 320 samples/second, 20 second epoch lengths, and frequency bands as on the report. Three records by four subjects were satisfactory. Our initial review of this data showed considerable variability for each drug condition. The summary data of that analysis was sent with Noch Callaway earlier.

We thought that power spectrum may yield better data and repeated the analysis of the 3 records of Harris using our power density program with 50 lags, and a sampling rate of 100 samples/second. The outputs were compared to the period analysis and the data was so similar that it seemed unnecessary to repeat the remaining records.

Concurrently, we were analyzing other drug induced EEG changes and we became concerned that the continuous analysis may have lost some significance because the sample size was too large. We then re-analyzed the continuous record into 3 minute epochs (samples still 20 seconds in length) with means and sigmas for each 3 minute "sample". This data seemed more rewarding, so we "artefacted" the records (deleting those 20 second epochs that contained more than 2 seconds of eyeblink, movement, etc.).

The pre-drug means and sigma for each subject and each trial were calculated. Based on the pre-drug sigma for each variable, we calculated the change in number of sigmas. This statistical maneuver provides standard scores for drug changes in relation to the stability (or variability) of the subject's pre-drug record. The means for each drug condition across subjects was also calculated.

The data was analyzed by regression analysis. For the sample available, only one of the regression coefficients was significantly different, that of delta for drug 3 (marijuana).

Nevertheless, we projected another analysis comparing the drugs in terms of the regression coefficients and intercepts. The slopes of the drug changes were not different between the drug conditions, but there were many changes among the intercepts, particularly for differences between alcohol and placebo, and less so for alcohol and marijuana (least for placebo and marijuana).

An analysis of the pattern of regressions and intercepts for the 20 variables of the study was also carried out, by calculating correlation coefficients. There is little similarity in slope or intercept patterns except for the slopes of marijuana and alcohol (+0.92) suggesting that these have similar effects on the pattern of EEG variables.

At this point, we conclude that analysis of the analog signals from your laboratory is feasible; and that the period analytic and statistical programs are operational. For this specific project, few differences between the two drug conditions (marijuana and alcohol) from placebo are observed. The few differences were in the rate of onset of the changes in some of the EEG variables, particularly between alcohol and placebo. The degree and the rate of change were not discriminable.

The reasons for the failure to identify differences are potentially many:

1. There are no differences in EEG effects of the drugs in the dosages or subjects used in this study.

2. The changes are varied, with different time courses and degrees of change so that for this small sample (4 subjects) a consistent pattern did not emerge. Contributing to the variation in samples were incomplete artefact control, lack of alertness control, and the short length of the period of observation. The artefact control was hampered by the unavailability of the original strip charts with an observer's notes. The alertness control which we are now introducing is a buzzer task which alerts the subject as soon as he inadvertently releases a hand held, spring-loaded key - a release which is associated with drowsiness and sleep induction.

The changes in the marijuana sample may be "real", and for verification we would suggest an expansion of the number of subjects submitted. If this is not feasible, and the study is repeated or expanded, the EEG samples may be analyzed more rapidly and we would suggest the following small changes in the program:

1. Introduce an alertness task
2. EEG recording should be done with
better control for peak-to-peak amplitudes.
3. Submit strip charts with tape.

When you have compared these notes to the data samples, perhaps you would care to visit us to review the procedures to answer the questions you may have.

Sincerely yours,

Max Fink, M.D.
Professor of Psychiatry

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