Brain Hemispheric Activity during Forced Nostril Breathing

A.G.Ramakrishnan and T.M.Srinivasan

Introduction

The existence of an ultradian rhythm of alternating cerebral dominance has been reported [1] together with corresponding changes in the nostril dominance. Further, it was demonstrated that forced unilateral nostril breathing causes lateralization in autonomic nervous system function and changes in blood glucose levels [2]. Backon also reported changes in intraocular pressure and blink rate caused by forced nostril breathing [3,4]. In this study we report the changes in the power spectral distribution of EEG over the scalp under conditions of forced nostril breathing.

Materials and Method

The study involved 10 subjects and the experiment was repeated at least twice on 3 of them. The typical experimental session lasted about two hours. An appropriate size ECI electrode cap was used to pick up EEG from all of the 19 scalp positions given by the 10-20 system in each subject. All electrode sites were prepared to obtain a skin-electrode inpedance of less than 10 Kohms. The subjects were asked to relax on a couch and 5 minutes later, initial baseline EEG was recorded for 100 seconds. Then the subjects were asked to breathe only through the dominant nostril by blocking the nondominant nostril with a paper plug. The subject breathed through this nostril for 15 minutes and during this time, two recordings were taken, each for 100 seconds, one midway through the session and the other, just before the end of the session. Then the subject removed the nasal block and came back to his/her natural breathing. After five minutes of normal breathing, EEG was again recorded. The dominant nostril was then blocked and the subject breathed through the nondominant nostril. This lasted 30 minutes, during which time, 3 records were obtained at equal intervals. Finally the subject returned to normal breathing and a baseline was taken five minutes after this period.

The EEG was recorded in epochs of 2 seconds each. The Neurosearch-24 system used to acquire the data has provisions to separately analyze each epoch of data in the spectral domain, both as power spectra of individual epochs and as topograms of spectral power distributions on the scalp for different frequency bands of user's choice. The epochs containing artifacts due to movement, blinking of eyes, etc. were excluded from the analysis. The topogram of each epoch was observed for each of the records to determine whether right or left side of the brain had more power in each of the theta, alpha and beta frequency bands. The results were tabulated.

Results

Figure 1 shows the spectral distribution shift when a subject switches from left nostril to right nostril breathing. The power spectra at the individual recording sites for one representative epoch has been illustrated for the two conditions. The upper panel corresponds to the dominant nostril breathing, namely left, for this subject. It is clear that the power in the beta frequency band is considerably higher in the right frontal, temporal and parietal regions as compared to the corresponding regions on the left side of the brain. A reversal of this condition occurs during right nosril breathing which is given by the lower panel. This contralateral hemispheric dominance occurred for some of the subjects.

Discussion

The data suggests that perhaps there are different sets of individuals with specific types of responses to forced nostil breathing. One class of subjects always had more total EEG power on the side of the brain contralateral to the nostril they were breathing through. Another set of subjects had no significant change in their EEG activity compared to the baseline levels when they breathed through the naturally dominant side. However, they switched to appreciably higher activity on the contralateral side after a period of breathing through the non-dominant nostril. Yet another subset had the balance of their EEG activity tilted towards one lateral side irrespective of the nostril through which they were breathing. In other words, though there was a response to forcedbreathing, it was not direction sensitive.

It may be possible to categorize people depending upon their specific pattern of EEG activity during forced nostril breathing. The above results are based upon qualitative and semi-quantitative comparison of frequency spectra and topograms. Rigorous quantitative analysis involving and comparing exact amounts of EEG power in each of the hemispheres are being undertaken. The latter analyses are expected to provide a more complete and clear picture of the effect of forced unilateral breathing on cortical activity.

It is possible that in healer-healee interactions, the effectiveness of energy transfer may depend on the relative phases of the ultradian cycles in the subjects involved. Also single nostril breathing could be of therapeutic value to people having unilateral psychosomatic problems.

References

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Communications should be addressed to:

T.M.Srinivasan Ph.D.
Director of Institutional Laboratory
John E Fetzer Institute
9292 West KL Avenue
Kalamazoo MI 49009

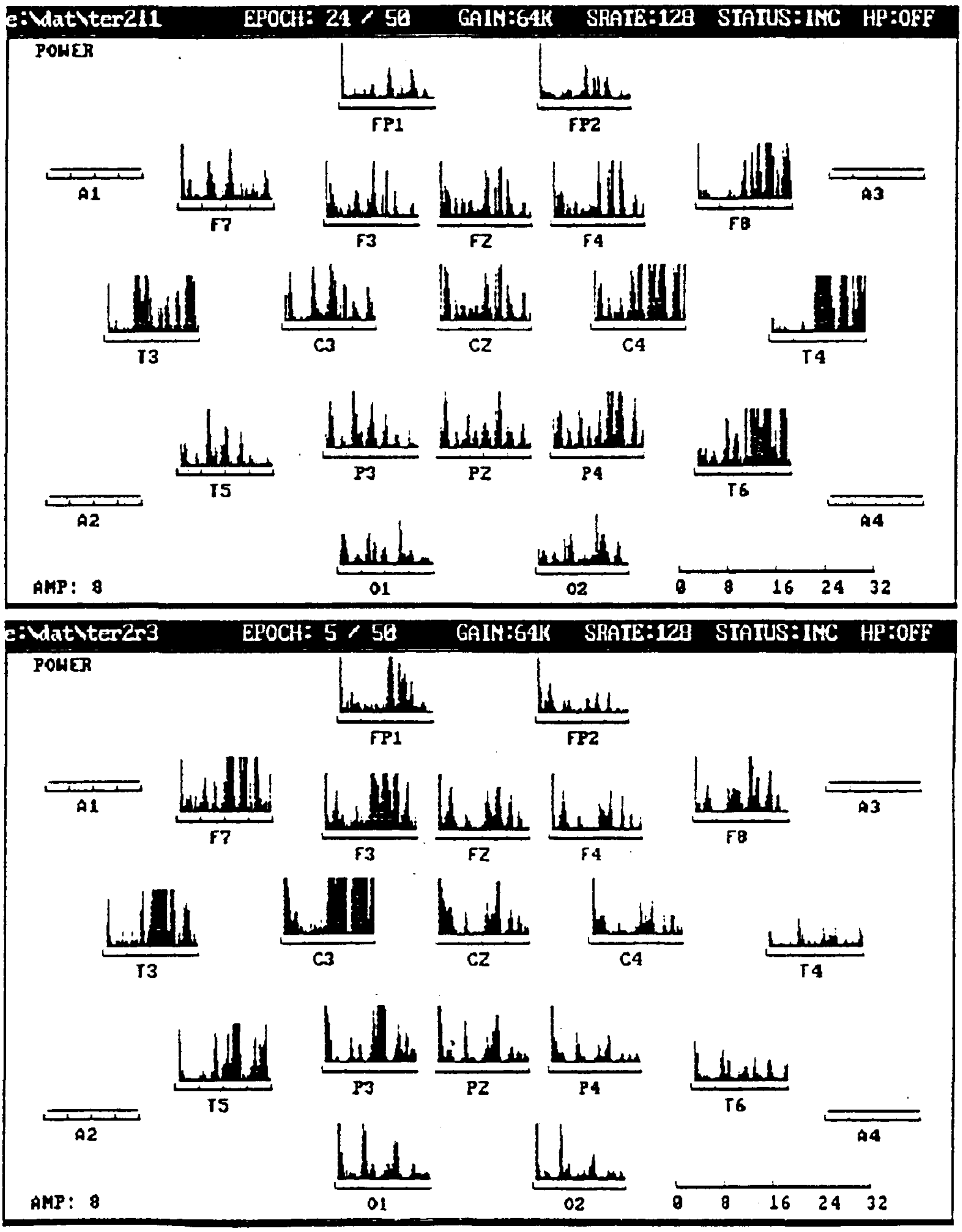

Figure 1. EEG power spectra at different electrode sites during left (dominant) nostril breathing (upper panel) and during right (nondominant) nostril breathing in one subject.