ELECTROENCEPHAGRAPHIC ACTIVITY UNDER HYPNOTISM[1]

By

G. S. CHHINA, AINSLIE MEARES[2], B. K. ANAND, AND BALDEV SINGH[3]

From the Department of Physiology, All India Institute of Medical Sciences, New Dehli.

(Received February 11, 1961)

Electroencephalography has been used by various workers for investigating the neural mechanisms involved in hypnotism but there is no unanimity in their observations. Darrow *et al.* (1950) reported that EEG during hypnotism has characteristics which distinguish it from true sleep and full consciousness. Paul Schilder (1956), and Goldie and Green (1960), on the other hand, have shown that EEG of the hypnotised person may resemble either the waking or drowsy EEG obtained before hypnosis, depending upon the situation and suggestion given. Anand, Chhina and Singh (1961) have made certain observations on EEG activity during certain states of Yogic *samadhi* (trance). The present investigations were undertaken to study EEG activity during the state of hypnotism (hypnotic trance) and compare it with EEG changes during Yogic meditation (Yogic trance).

METHOD

A staff member of this department was hypnotised several times by one of the authors (A. M.) with passive or permissive technique. With suggestions, the subject was made to relax and abondon himself and thus hypnotised. After the subject had been hypnotised on 3-4 sittings, his electroencephalographic tracings were taken on the Grass 8 channel EEG machine through conventional scalp leads. The EGE was first recorded before the subject was hypnotised and the effects of various sensory stimuli i. e. auditory, visual, tactile, thermal and noxious (cold water at 4°C.) on the normal brain activity noted. The recording was again taken after the subject had been hypnotised, and the effects of the various sensory stimuli again studied. Under hypnotism the subject was made to perform various movements and the EEG recorded even during these acts.

RESULTS

Both before and during the hypnotised states EEG recordings of the subject displayed persistent alpha activity (Fig. 1). The alpha rhythm was blocked by the application of all the different sensory stimuli when the subject

1. Aided by a grant in aid from the Indian Council of Medical Research.

2. Present address: Psychiatrist, 45 Spring street, Melbourne, Australia.

3. Present address: Neurologist, Tirath Ram Shah Charitable Hospital, Delhi.

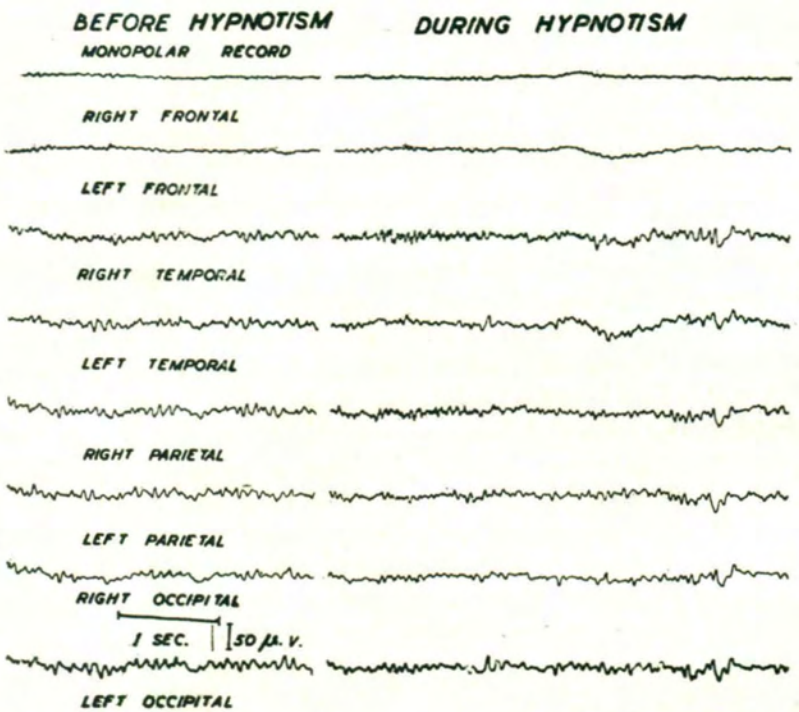

Fig. 1 Monopolar EEG scalp recordings of S.K.M. before hypnotism and during hypnotism. Reference electrodes on both ear lobes joined together. Both before and during hypnotism alpha activity was recorded. The frequency ranged between 11 cps to 12 cps and average maximum amplitude in occipital leads was 50 μ v both before and during meditation.

was not hypnotised (Figs. 2 and 3). On the other hand, during hypnotism the alpha activity was not blocked by any of the sensory stimuli (Figs. 2, 3, and 4), even by keeping his hand immersed in ice cold water for 15 minutes. The alpha activity was not modified in any manner when the subject moved his arm or wrote down few words, with eyes open, during hypnotic state (Fig. 4). Another noteworthy thing was that before being hypnotised the subject could hardly keep his hand in water at 4°C. for 30 seconds, but when hypnotised he was able to keep it in this ice cold water for 15 minutes without feeling any discomfort. This time could further be increased, but was not done for fear of traumatic damage.

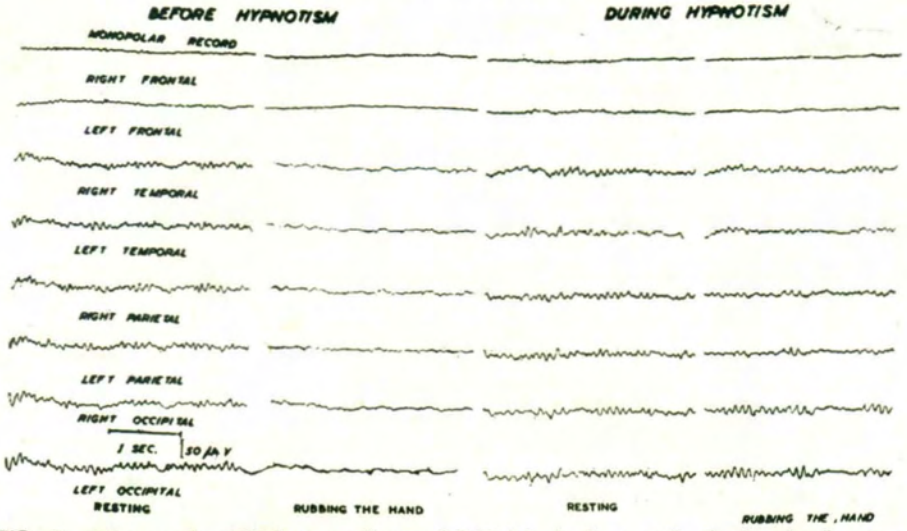

Fig. 2 Monopolar EEG recordings of S.K.M. before and during hydnotism. Rubbing the hand lead to blockage of the alpha rhythm when he was not under hypnotism but no such blockage was observed when the subject was under hypnotism.

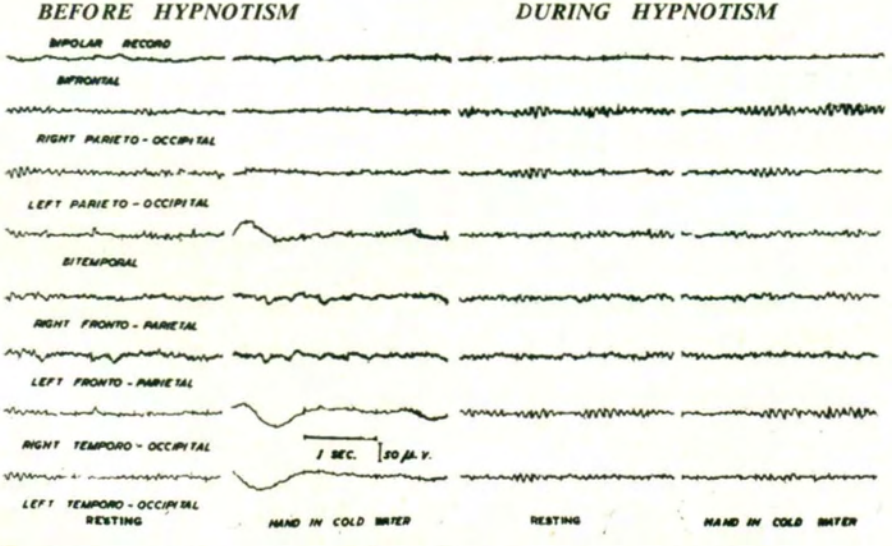

Fig. 3 Bipolar EEG scalp recording of S.K.M. before and during hypnotism. It shows the record taken while he was in a resting state and when his hand was placed in cold water at 4°C. The alpha activity of 11 to 12 cps was blocked by immersion of hand in cold water when he was not under hypnotism-the alpha activity on the other hand was not blocked when this was repeated during hypnotism. Also during hypnotism the alpha rhythm showed increase in amplitude (parieto-occipital leads).

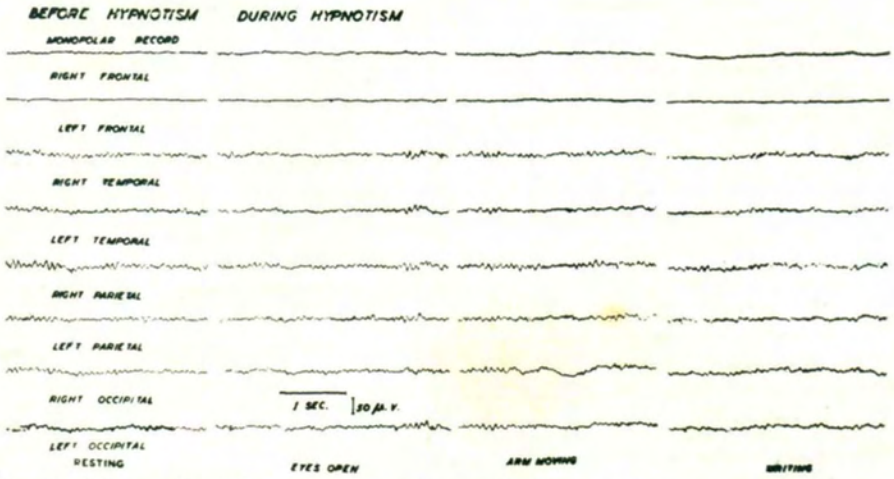

Fig. 4 Monopolar EEG scalp recordings of S.K.M. before and during hypnotism. The alpha rhythm was not blocked during hypnotism even when the subject kept his eyes open, moved his arm or wrote his own name, on being suggested to do so.

DISCUSSION

The EEG of the subject under the influence of hypnotism demonstrated alpha activity and this rhythm was not blocked by various sensory stimuli. It is remarkable that even with eyes open, and the subject understanding the instructions given by the hypnotist and responding by movements and such conscious acts as writing some words, there was no blockage of alpha rhythm.

Sensory stimuli and conscious acts ordinarily convert alpha rhythm into low voltage fast activity, known as EEG arousal. This is achieved by activation of the reticular activating system (RAS) by the peripheral sensory inputs. It, therefore, appears that during hypnotism the peripheral sensory inputs are blocked.

It has been suggested that the RAS is probably capable of some spontaneous or autochthonous discharge (Bremer, 1954; Dell, 1952), and the alpha activity may be due to this discharge. It is, therefore, likely that the brain activity of a hypnotised person has for its basis a type of consciousness which does not depend upon the activation of RAS from external and internal afferents.

Goldie and Green (1960) observed that appearance of alpha activity in the hypnotised individual is an index of arousal and is accompained by the execution of instructions given to the subject. According to Weitzenhoffer

(1953) hypnosis is a dissociation of awareness from the majority of sensory and even strictly neural events that are taking place. The hypnotised person is not only conscious but is more acutely aware of the actions of the hypnotist although unaware of the other things in his surroundings. West (1960) has surmised that at the point of maximum conscious influence on reticular formation activity, deliberate exclusion of external stimuli may be achieved through intense concentration. It is probably in this way that the trained subject quickly enters the 'trance' state on receiving his previously defined signal from the hypnotist.

Barber (1960) feels that awarenese of pain as a sensation is not affected by hypnotism, but it can minimise the discomfort or suffering resulting from the sensation of pain. The present observation that alpha rhythm during hypnotism is not blocked by the painful sensation as a result of keeping the hand in ice cold water, also suggests that the subject could block the afferents from arousing the brain and thus prevent appreciation of pain.

The observations made in the present study are quite significant especially in view of the fact that one of the authors (A. M.) thought that it was not easy to hypnotise the subject "who being a student of Neurophysiology could not abondon his intellect. Also there were difficulties of communication (hypnotist's language being not the mother tongue of the subject) and of an appreciation of the social and cultural background of the subject"

It is interesting to correlate these observations during the hypnotised state with those previously made during Yogic 'meditation' (Anand *et. al.* 1961). During meditation Yogis also show a well modulated alpha activity which is not blocked by various sensory stimuli including immersion of hand in cold water for long periods. Thus it appears that at least the EEG findings are similar both during hypnotism and during Yogic meditation. Apparently there may be something common in the brain mechanisms during these two states. It may be a little premature to bring out the exact comparison between these two states, for which further studies will be needed.

SUMMARY

A normal resting record of a volunteer was taken several times when he was not hypnotised and he was subjected to various sensory stimuli like auditory, visual, tactile, thermal and noxious. This was again repeated when he was hypnotised. The resting EEG record displayed alpha activity which was easily blocked by all the sensory stimuli. EEG activity during hypnotism was similar to the resting record, but the alpha activity was not blocked by any sensory stimuli. In addition the pain threshold of the subject was

considerably raised under the effect of hypnotism. These findings have been compared with similar observations in Yogis.

The authors are grateful to Dr. S. K. Manchanda who very kindly volunteered to be the subject for these experiments.

REFERENCES

Anand, B. K., Chhina, G. S., and Singh, B. (1961). *EEG Clin. Neurophysiol.* (in press).

Barber, T. X. (1960). *J. A. M.* A., **127**, *680.*

Bremer, F. (1954). *In Symposium on Brain Mechanism and Consiousness* Oxford Black-well Scientific Publications, 137.

Darrow, C. W., Henry, C. E., Brenman, M., and Gill, M. (1950). *EEG Clin Neurophysiol.*, **2**, 231.

Dell, P. (1952). *J. Physiol., Paris*, **44**, *471.*

Goldie, L, and Green, J. M. (1960) . *Nature.*, **187**, *952.*

Schilder, P. (1956). *"The Nature of Hypnotism"*, Translation by Gorvin, G., New York: International University Press.

Weitzenhoffer, A. M. (1953). *Hypnotism: Objective study in suggestibility.* John Wiley and Sons, Inc.

West L. J. (1960). *J. A. M. A.* **172**, *672.*