

Correspondence

Dr Lippold and the Alpha Rhythm

SIR,—The article on the origin of the alpha rhythm (*Nature*, 226, 616; 1970) suggests that occipital alpha waves are generated by the standing potential across the eyes. We have described¹ a patient of 55 with no eyes and a good alpha rhythm. Such evidence led us to look more critically at Dr Lippold's interesting hypothesis.

He states that "subjects with both eyes enucleated have no alpha rhythm" and quotes Adrian and Matthews in *J. Physiol.* (1934)². We are sure he meant to refer to Adrian and Matthews, *Brain* (1934)³, as there is no reference to this point in the former paper; a single case quoted in the *Brain* article (p. 370) had no alpha rhythm and "had had both eyes removed in 1918 as the result of a shell wound". However, this surely begs the question, for alpha rhythm is not always present even in normal people, and the existence of a single example of a normal alpha rhythm in the presence of bilateral enucleation is what must be reconciled with Lippold's view.

The statement made in relation to Parkinson's disease that "if the disease involves the eye muscles the predominant cortical rhythm is at 5/s" is supported by the reference to England *et al.* (1959)⁴. However, in this article it is stated that "the electroencephalogram was generally normal in Parkinson's syndrome. Electromyograph tracings of the tremor at the same time as the electroencephalogram further identified scalp discharges as pure artefact".

Even if Dr Lippold's provocative hypothesis cannot be allowed to stand in the face of these contradictions, he has certainly performed a service in stimulating thought on a subject which has for too long been neglected.

Yours faithfully,

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¹ Upton, A., *Lancet* (May 22, 1970).

² Adrian, E. D., and Matthews, B. H. C., *J. Physiol.*, 81, 440 (1934).

³ Adrian, E. D., and Matthews, B. H. C., *Brain*, 57, 355 (1934).

⁴ England, A. C., Schwab, R. S., and Peterson, E., *Electroenceph. Clin. Neurophysiol.*, 2, 723 (1959).

Outside the Orbit

SIR,—Widespread publicity has recently been given to Dr Olof Lippold's controversial views on the origin of the alpha rhythm in the EEG, printed as they have been in *Nature*, *The Times* and *New Scientist*. A considerable body of clinical confidence is invested in the interpretation of alpha rhythm in the EEG. Before such confidence is undermined, we should welcome the opportunity to reply to some of the points used by Dr Lippold in developing his hypothesis.

(1) It is true that 2–5 per cent of the population do not have an alpha rhythm, but it is generally accepted that they are not strictly normal and are tense and frequently neurotic on personality assessment.

(2) Dr Lippold¹ states that there are no perceptual or motor changes accompanying the presence or absence of the rhythm. There is, however, evidence (see Drever²)

for the influence of visual imagery on alpha rhythm, and there is abundant evidence of suppression of both amplitude and prevalence of alpha activity during cognitive activity such as mental arithmetic (from Berger and Adrian, Kreitman and Shaw³, Legewie, Simonova and Creutzfeldt⁴ and Glass⁵).

(3) The amplitude of truly neural phenomena such as the auditory evoked response is not necessarily small compared with alpha rhythm. It may be larger when the subject is drowsy.

(4) Adrian is quoted as saying that subjects with both eyes enucleated have no alpha rhythm. Berger⁶, knowing of Adrian's work, describes the case of A. F., aged 40, who had two glass eye prostheses, having lost both eyes by injury by shell fragments and presumably without cornea, retina or eye muscles. Berger recorded a normal alpha rhythm at about 9 Hz—he explained Adrian's early finding as due to apprehension on the part of the blind subject.

(5) If the thickness of the skull frontally prevents conduction through the scalp, considerable attenuation must also be produced by the not-much-less thick occipital skull. Thus depth recording in man should show very prominent alpha activity within the cerebral white matter, if this is the case. It does not show this so far as we are aware.

(6) Cortical atrophy of senile dementia produces a progressive loss of alpha rhythm corresponding to the clinical progress of the disease⁷.

(7) Lippold concedes that the wave form of the EEG with the eyes open is due to "true cortical activity" or an attenuated signal from neck muscles. This wave form is either suppressed by eye closing which would be strange or it must be superimposed on the alpha rhythm which it is manifestly not.

(8) Berger emphasizes the appearance of an alpha rhythm on one part of the scalp simultaneously with its disappearance from another part of the scalp. This would not be readily explicable if the rhythms were produced by conduction from a distant source.

Lippold's simple introspective observation must imply a tremor of the eye—detectable by external observation. In a recent (not yet published) study in this laboratory, simultaneous recordings of alpha rhythm and eye movement (independent photoelectric method) were subjected to time series analysis. The cross-correlation at alpha frequency was insufficient to support the view that ocular tremor generates the alpha rhythm.

For these reasons we feel that the theoretical basis for Dr Lippold's interpretation of the origin of alpha rhythm within the orbit leaves much to be desired.

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¹ Lippold, O. J. C., *Nature*, 226, 616 (1970).

² Drever, J., *Amer. J. Psychol.*, 71, 270 (1958).

³ Kreitman, N., and Shaw, J. C., *Electroenceph. Clin. Neurophysiol.*, 18, 147 (1965).

⁴ Legewie, H., Simonova, O., and Creutzfeldt, O. D., *Electroenceph. Clin. Neurophysiol.*, 27, 470 (1969).

⁵ Glass, A., *J. Physiol.*, 207, 7P (1970).

⁶ Berger, H., *Hans Berger on the Electroencephalogram of Man*, translated by Pierre Gloor; *Electroenceph. Clin. Neurophysiol.*, Suppl. No. 28, pp. 248–251 (Elsevier Publishing Co., Amsterdam, 1969).

⁷ Sim, M., and Gordon, E. B., *J. Neurol. Neurosurg. Psychiatol.*, 30, 285 (1968).