A NEW OBJECTIVE PERIMETER

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In recent years, attempts have been made to develop objective perimetric methods.

Kluyskens and Titeca [1-3] have made use of the inhibition of the α-rhythm in response to the light stimulus in the field of view. However, their method suffered from the fundamental defects encountered in the subjective method. Only the α-rhythm of the electroencephalogram (EEG) were recorded on the oscillograph, whereas all the remaining information (indication of the light stimulus in the perimeter, response of the patient) remained subjective, and were not recorded automatically on paper together with the EEG. The authors also failed to observe another fundamental condition for measuring the field of view; there was no provision for fixation of the eye of the subject investigated.

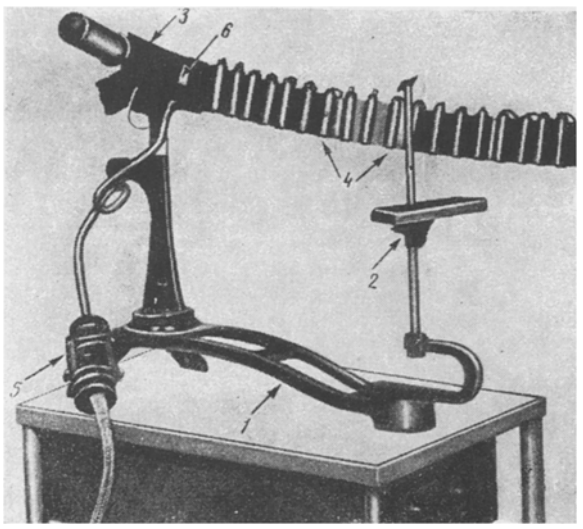

Fig. 1. Perimeter. 1) Base; 2) chin support; 3) perimeter arm; 4) holders for electric lamps, placed at 5° intervals; 5) connector; 6) fixation point.

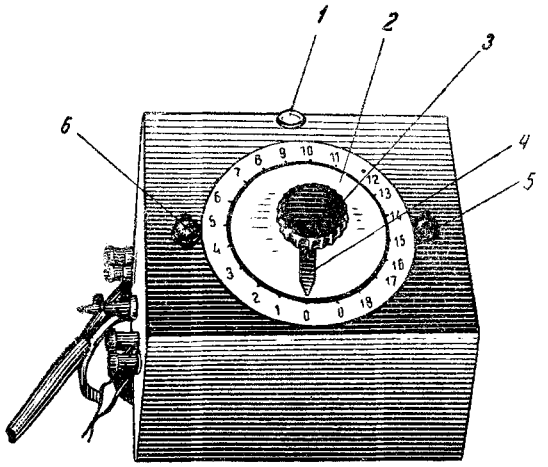

Fig. 2. Control box. 1) Signal lamp; 2) scale; 3) knob; 4) pointer; 5) switch for fixation point; 6) switch for lamps on the perimeter arm.

To eliminate these shortcomings, together with the engineer V. K. Zhdanov we have designed an apparatus for objective perimetry based on suppression of the α-rhythm; the apparatus is an electrical perimeter with a remote desk control. It consists of two main portions: the perimeter (Fig. 1), which is placed in a screened room in which the subject sits, and the control desk (Fig. 2), which is outside the room near an oscillograph, together with the observer.

From the control desk electrical lamps situated 5° apart on the perimeter are lighted, so that the experimenter has no need to enter the room to measure the field of view. By means of a string galvanometer these signals are recorded on film together with the EEG, and with the responses of the subject (who presses a knob, or announces his impression verbally).

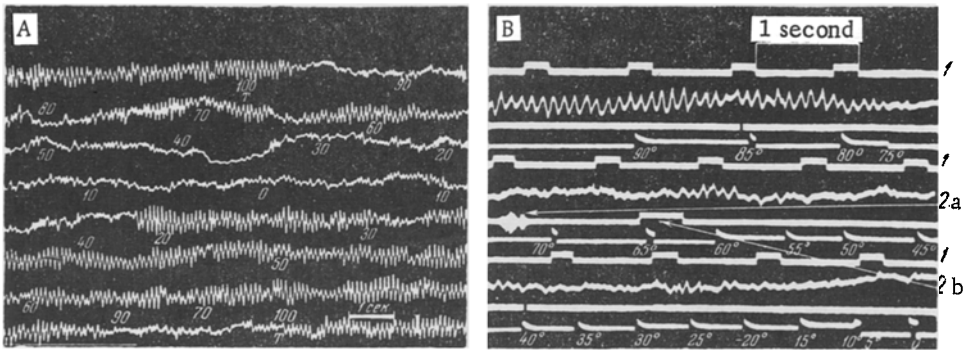

Fig. 3. Objective perimetric records obtained from inhibition of the EEG α-rhythm. A. From Kluyskens and Titeca. Figures indicate notes made by the experimenter of the moment of application of light stimulus on the perimeter. B. Author's method: 1) time marker (1 sec); 2) signal from patient; a) verbally, "I see"; b) by pressing knob. The figures indicate the angular subtense of the light in perimeter arm.

In the center of the perimeter arc a red fixation point which is very much less bright than the other luminous lamps is provided. Fixation has no influence on the α-rhythm. The reason is that it does not attract the attention of the subject, who becomes familiar with it, whereas each new illumination of one of the lamps (placed at 5° intervals) represents a signal which demands an active response from the subject and, therefore, causes inhibition of the α-rhythm when perceived.

To compare our method with that of Kluyskens and Titeca, we show the corresponding records (Fig. 3).

By means of this perimeter we carried out investigations on 48 subjects (5 healthy, 5 malingerers, 4 patients who were practically blind, and 34 suffering from various field defects). From the results of these investigations we may draw the following tentative conclusions.

Perimetry based on inhibition of the α-rhythm is an objective method of determining the limits of the field while simultaneously recording the stimulus, and the response of the patient. By controlling the electrical perimeter from a distant control box, simultaneous records may be made on film of the α-rhythm of the electroencephalogram, the 5° angular markings on the perimeter, and the subject's response made while he maintains a constant fixation. Used in conjunction with established perimetric methods, the objective perimetry may be applied in cases requiring a careful study of the limits of the field in various disturbances, and also in cases of malingering or simulation of symptoms.

SUMMARY

The perimeter is designed for presenting test stimuli in any part of the field of view by remote control. It permits the examination of the potentials of the visual cortical area and their relation to the position of the stimulus in the field of view. If the subject perceives the test object, the α-rhythm is inhibited; if he does not, it remains unchanged. If subjective examination has revealed irregularities of the field, the method described allows it to be measured objectively. The instrument was tested on 48 persons, some healthy and some sick.

LITERATURE CITED

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