Averaged occipital responses to stimulation of sites in the nasal and temporal halves of the retina

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Responses of the right occipital lobe to flashes imposed on the nasal retina of the right eye were smaller than responses to flashes imposed on the temporal retina. Since reaction times are shorter to nasal than to temporal stimulation of the retina, the above result is inconsistent with existing evidence for an inverse relation between evoked response amplitude and reaction time. The inconsistency may be related to the fact that the right occipital lobe receives no projections from the nasal retina of the right eye.

It is known that shorter reaction times are obtained to stimuli appearing in the nasal than in the temporal retina (Woodworth, 1938); also, that both reaction time and retinal sensitivity vary as the site of stimulation is shifted from the fovea progressively more peripherally in either the nasal or temporal retina (Wentworth, 1930; Sloan, 1947; Rains, 1964; Payne, 1967). In a recent study Eason, Oden, & White (1967) demonstrated that changes in reaction time are accompanied by changes in latency and amplitude of cortical evoked potentials as the retina is stimulated progressively more peripherally. With red light stimulation, variations in amplitude of the evoked responses tended to vary inversely with reaction time. An inverse relationship between evoked potential amplitude and reaction time also has been observed by others (Dustman & Beck, 1965; Donchin & Lindsley, 1966).

The purpose of the present study was to demonstrate that evoked potentials of greater magnitude would occur to nasal than to temporal retinal stimulation, thereby providing further evidence for the existence of an inverse relation between evoked response amplitude and reaction time.

Method

Averaged evoked responses were obtained from the right occipital lobe of one S upon sequential stimulation of the fovea and 14 peripheral sites symmetrically positioned about the fovea along the horizontal plane of the right eye. Order of stimulation of the various retinal sites was counterbalanced. Two replications of the averaged responses were obtained for each site. Recordings were obtained monopolarly. The active electrode was located 1 in. above theinion and 1 in. to the right of the midline; the reference electrode was attached to the right ear lobe. The responses were averaged with a Computer of Average Transients (CAT), each average being based on individual responses to 100 light flashes. Stimulus flashes were generated with a Grass photostimulator at a rate of one per sec. The flashes subtended

a visual angle of 1 degree. Flash intensity was approximately 1 log unit above a background luminance level of 2 mL. Further details of the stimulus setup and recording procedures are given in previous reports (Eason et al, 1964, 1967).

Results and Discussion

The averaged responses obtained upon stimulation of the various nasal and temporal positions are typical of those evoked by a small spot of light (Eason et al, 1967). Each is composed of multiphasic, sinusoidal deflections having a frequency of 10-12 cps (see Fig. 1), and the deflections vary in magnitude and latency as the site of stimulation is shifted from the fovea to more peripheral locations in accordance with the changes noted earlier (Eason et al, 1967).

The low amplitude response to stimulation of the nasal retina at the 15-degree position (see Fig. 1) is associated with the fact that the flashes fell almost entirely on the blind spot and were perceived by S as being extremely dim, if perceived at all. This result supports the notion that the averaged evoked cortical response may be used as an objective index of the visual threshold.

Contrary to expectations, the evoked responses obtained upon stimulation of symmetrical sites located in the two retinal halves were consistently smaller for the nasal half. Reaction times for the S are at least as short to nasal as to temporal stimulation

Fig. 1. Occipital responses of right hemisphere to flashes imposed on the temporal and nasal retina of the right eye at various distances from the fovea. Double tracings show degree of consistency with which each condition was replicated.

of the retina, except for the blind spot; also, his sensitivity threshold for the nasal retina of the right eye is as low as for the temporal retina of that eye. Thus, the smaller evoked responses to nasal stimulation of the retina are not related to reaction time or retinal sensitivity. Since the nasal retina of the right eye projects to the left cerebral hemisphere and the temporal retina to the right hemisphere, the smaller responses of the right occipital lobe to stimulation of the nasal retina may be due to the absence of afferent impulses arriving at that lobe via the classical visual pathways. Studies are currently being conducted in our laboratory to determine the extent to which the amplitude and latency of the averaged occipital response of either hemisphere is dependent on which of the two lobes receives primary impulses from the retina.

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Note

1. This work was supported in part by NSF grants GB-231 and GB-4067.