Bulletin of the Psychonomic Society
1974, Vol. 4 (5B), 515-516

Perception of stimulus location during interocular stimulation

B. L. KINTZ
Western Washington State College, Bellingham, Washington 98225

Flashes of white light were presented separately and randomly to the nasal or temporal hemispheres of each retina. Os responded verbally their decisions as to which eye and which hemisphere had been stimulated. The number of correct responses and latencies at each stimulus position were recorded. Differences in both latencies and number of correct responses were found between positions.

The work of Sperry and co-workers (1968) concerning behavioral oddities with patients whose cerebral commissures have undergone midline sections is well known. The apparent production of two separately functioning brains, one in each hemisphere, is the most striking result of the neocortical commissure sectioning.

Some related evidence was presented by Eason, Groves, White, and Oden (1967) who presented colored flashes of light to the various hemiretinas and recorded evoked potentials on the outside of the occipital cortex. They wanted to find whether previously found differences in evoked potentials depending on whether the nasal or temporal retina was stimulated could be explained by cortical hemispheric differences. They stimulated either the left hemiretina or the right hemiretina of both eyes simultaneously, at positions symmetric from the fovea. Evoked potentials were averaged and recorded. They found that for a given visual field condition the secondary lobe responded in much the same manner as the primary lobe, indicating nearly complete interchange of information. They note that such interchange could take place either by diffuse ascending impulses of subcortical origin or by impulses crossing the cerebral commissures. They suggested that both mechanisms are probably involved.

Since the secondary lobe response was approximately as large as that of the primary lobe, the question arises as to whether an O can perceive the position of the stimulus. If so, there must be some information that is not represented by the evoked potential in the occipital region. The present study was designed to provide further information concerning the behavioral correlates of the stimulation of different retinal locations.

METHOD

Apparatus

Flashes of white light were presented to one hemiretina of one eye at a time. A tachistoscopic device was used to present the stimuli for .05 sec. The viewing holes were positioned such that the stimuli subtended a visual angle of 6 deg and were located 16 deg from the fovea along the horizontal meridian. The stimuli were produced by Sylvania F4/T5D bulbs through pinholes in cardboard positioned to produce the size and location stated.

Procedure

The Os were presented with 60 stimuli in each of seven sessions. Fifteen stimuli were presented to each of the four retinal locations during each session. The four positions were: left eye–temporal, left eye–nasal, right eye–nasal, and right eye-temporal retina. The Os responded as quickly as they were ready by saying aloud a number from 1–4; the number corresponding to the retinal position as listed above. The verbal responses activated a voice switch which stopped an electronic printout timer. Two responses were recorded: the latencies of the responses and the number of correct responses at each position.

RESULTS AND DISCUSSION

In viewing such stimuli, it is immediately evident whether the stimulus is to the right or to the left. The hardest decision is whether the left eye or the right eye has been stimulated. The combination of these two decisions produce the Os's choices. A stimulus could be to the left when presented to either the left nasal or to the right temporal retina.

Analyses of variance show that an effect of practice was found for both response measures; latencies decreased and accuracy increased. Also, a positions effect was found for both responses. The left nasal stimuli produced the shortest latencies and the left temporal stimuli produced the longest latencies. The nasal positions were perceived most accurately and the temporal positions least accurately. The results for the two response measures are shown in the figures.

As can be seen a decrease in latency occurred between Trials 4 and 5 (Fig. A). Likewise, an increase in percent correct occurred between trials three and four (Fig. B).

The left nasal stimulus produced the shortest latencies, while the left temporatl stimulus produced the longest (Fig. C). The two nasal stimuli produced the largest percent of correct responses (Fig. D).

A simple explanation of these stimulus position data would refer to the usual scanning pattern used for reading textual material. We scan from left to right. The left nasal and right temporal hemiretinas are first stimulated, followed by the eye movement to the left to focus on the fovea. Thus, the left nasal region gets the

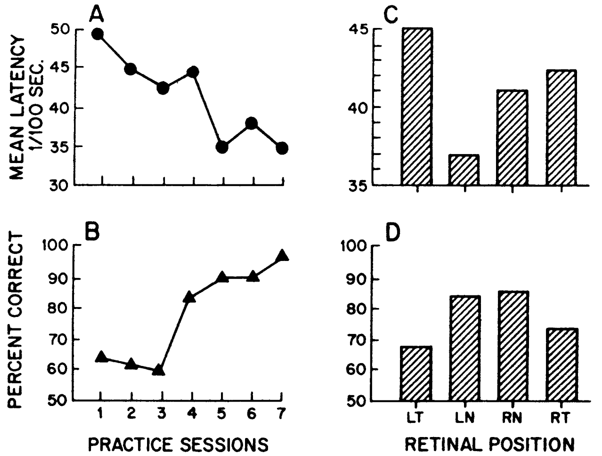

Fig. 1. Mean latencies across practice sessions (A), percent correct across practice (B), mean latencies for each retinal position (C), and percent correct for each retinal position (D).

most practice and actually performed best in the present experiment.

There is an apparent contradiction between the Eason et al, data showing essentially equal evoked responses in both the primary and secondary lobes, and the present data wherein the Os were able to correctly identify the stimulus position initially and to improve with practice. One possible explanation would be that Os can somehow inhibit the amount of information that transfers from one hemisphere to the other by either the ascending pathways or through the cerebral commissures.

The next experiment will monitor evoked potentials during the task reported in this paper. If the above inhibitory explanation is correct, a difference between the primary and secondary responses should be observed as a function of practice.

REFERENCES

Eason, R. G., Groves, P., White, C. T., & Oden, D. Evoked Cortical Potentials: Relation to Visual Field and Handedness. Science, 1967, 56, 1643-1646.

Sperry, R. W. Hemisphere deconnection and unity in conscious awareness. American Psychologist, 23, 1968, 723-733.

(Received for publication August 29, 1974.)