Psychological Research

Short Communication

Visual Imagery and Evoked Responses

by

Keith M.T. Hearne, University of Hull, England

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Department of Psychology, University of Hull, England

Summary. Two experiments were performed to determine whether a physiological correlate of visual imagery could be measured from visually-evoked-responses (VERs). 'High' and 'Low' imagery groups were used. There was no direct effect of imagery, although some differences between the groups emerged. These differences are thought to be due to factors associated with imaging, but not imagery per se.

Introduction

Herrington and Schneidau (1968) claimed that VERs were altered by which of 2 shapes the S thought about. The studies reported here further investigated the possibility of a link between VER wave-form and imagery. Experiment 1 sought to ascertain whether imaged background light (IL), in the dark, had the same attenuating effect on the VER as actual light (White and Eason, 1966). Wave-forms for that condition were compared to those obtained in a light (LNI) and dark (DNI) room, when not imaging. Compared to Low-imagers, it was anticipated that High-imagers should have shown a greater difference in wave-form between DNI and IL conditions, and a greater similarity between IL and LNI conditions. Experiment 2 compared VERs obtained when Ss imaged a scene of their own choosing (IS), to a nonimaging (NI) condition. Additionally, wave-forms were measured when Ss imaged a colour (ICF) to the (white) light flashes. It has been claimed that VER wave-form varies with colour (Clynes 1967).

Method

There were 2 groups of 6 Ss - all young (19—23 y.o.a.) adult females from a College of Education, and obtained by canvassing approximately 100 students. High-imagers reported

*Now at the Department of Psychology, University of Liverpool, P.O. Box 147, Liverpool L69 3BX, England

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a consistent ability to externalise images. Low-imagers reported no imagery.

The S sat in a totally dark cubicle (4' x 7') and fixated a luminous spot (1 cm diameter) on the wall at a distance of 42". In the LNI condition in Experiment 1, the cubicle light (a 40W fluorescent strip) provided background illumination. A stroboscope illuminated the fixation area from outside a window situated above and behind the S. A fan masked any discharge noise from the stroboscope. The active electrode was placed 2 cm above the inion, and reference positioned on the left mastoid. Signals were fed to an Elema-Schonander Mingograf EEG machine. Time-constant setting was 0.3 s. Filters attenuated activity above 15 hz. The EEG chart record provided information as to whether artefacts were being produced. The amplified EEG was relayed to a Digital Lab 8/E computer. The stroboscope was fired remotely by the E at irregular intervals, averaging approximately 3 s. Averaging parameters were: epoch: 500 mS; data points: 250; sweeps: 50 (Experiment 1), 100 (Experiment 2). The S dark-adapted for 5 min before each average (except for the LNI condition in Experiment 1). The first 4 flashes were not included in each average, to eliminate any novelty effect. 6 averages were obtained from each S (2 for each condition), balanced to control for habituation and recency effects. The wave-form baseline was taken to be that amplitude at the moment of stimulation. Figure 1 illustrates an average VER. Wave-form measures compared in the experiments were 4 easily identifiable peaks occuring at approximately 65, 100, 150 and 200 mS after stimulation, and 3 measures of total area above and below the baseline, in 3 area blocks: 50–200, 200–350 and 350–500 mS. All Ss' VERs displayed the 4 measured peaks.

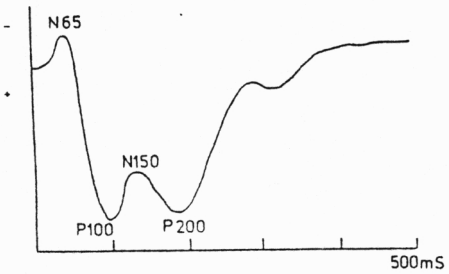

Fig. 1. Typical averaged VER wave-form

Results

Analyses of variance were performed on the combined averages of each of the 3 conditions for the 2 groups. Newman-Keuls analyses identified those conditions causing effects within groups.

In Experiment 1, imaging light did not produce wave-form changes typical of background illumination (Table 1). Paradoxically, the LNI condition was significantly different from the other 2 conditions only for High-imagers, for the P100 latency (LNI-DNI, $P < 0.05$; LNI-IL, $P < 0.05$), and N150 amplitude (LNI-DNI, $P = 0.05$; LNI-IL, $P = 0.01$) measures. High-imagers also showed an increase in area at the 350–500mS area-block when imaging light, whereas Low-imagers showed a decrease (Table 2). This interaction was significant at the $P < 0.05$ level. The difference between the 350–500mS area-blocks in IL and LNI conditions for High-imagers was significant at the $P = 0.01$ level. In Experiment 2, an overall decline effect, for Low-imagers only,

Table 1. Mean peak measures for High and Low imagers (Experiment 1)

		N65			P100			N150			P200		
		DNI	IL	LNI	DNI	IL	LNI	DNI	IL	LNI	DNI	IL	LNI
Laten-	High	62	65	74	101	102	113	151	151	168	197	198	208
cy	Low	62	60	73	107	108	115	149	148	148	189	191	182
Ampli-	High	12	11	9	- 31	- 32	- 10	- 7	- 11	1	- 36	- 34	- 13
tude	Low	10	9	6	- 31	- 31	- 13	- 9	- 8	- 2	- 22	- 23	- 11

DNI = dark room, S not imaging. IL = S imaging light in dark room. LNI = light room, S not imaging.

Table 2. Mean area-block measures

	Experiment 1									Experiment 2		
	50–200 mS			200–350 mS			350–500 mS			200–350 mS		
	DNI	IL	LNI	DNI	IL	LNI	DNI	IL	LNI	NI	IS	ICF
High	1459	1519	608	774	748	435	528	729	357	767	679	918
Low	1161	1144	517	679	589	303	385	300	286	581	567	537

NI = S not imaging. IS = S imaging scene of own choosing. ICF = S imaging a colour to stroboscope flashes.

was found by Page's L test, for N65 latency ($P = 0.05$) and P100 amplitude ($P = 0.05$) measures. The former increased, the latter decreased during the experiment. There were no significant differences between conditions for any measure of peak amplitude or latency. The only effect found was for High-imagers between ICF and other 2 conditions at the 200–350mS area-block (Table 2), (ICF-NI, $P < 0.05$). The area measure significantly increased during imagery in High-imagers and slightly decreased in Low-imagers.

Discussion

Experiment 1 indicated that the 2 groups were somehow behaving differently, but imagery itself may be discounted as causing the effects since (for the area measures) it would seem unlikely that the imaging process should result in opposite measures for the groups. Also, although High-imagers reported seeing light, the VERs were not like those from a light environment. Linking the findings of both experiments, the unusual request to image light caused the 2 groups to respond differently, whereas imaging a meaningful scene produced no such effects. Since an imaged scene must be subjectively light, that reinforces the view that the response must be of some factor other than imagery. Another unusual request, to make a flash of light appear to be coloured, also caused a significant effect for High-imagers. Both resulted in an increase in area of the evoked response. The effect was limited to the 200–350 mS area-block for the coloured-flash, whereas the 350–500mS block contained the effect for the imaged-light condition – possibly indicating separate processes. Conceivably, the decline effect for Low-imagers in Experiment 2 resulted from boredom at being unable to image. However, in Experiment

1, the same latency measure decreased for Low-imagers for the IL condition. Overall, it would seem that several psychological and/or physiological factors related to imaging were operating, however it appears unlikely that electrical activity in the brain as a result of imagery per se directly affects VERs.

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