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Further Observations of Evoked Potentials in Obsessional Patients

H. R. BEECH, K. T. CIESIELSKI and P. K. GORDON

Summary: This study was designed to replicate and extend earlier findings. Evoked potentials (EP) were recorded, using a task of varying complexity involving shape discrimination, with matched groups of obsessional and normal subjects. Results confirmed previous findings that obsessional patients are characterised by reduced amplitudes and decreased latencies of late EP components; divergencies between the groups were more marked for tasks of increased complexity.

It has been suggested (Beech, 1971; Beech and Vaughan, 1979) that the primary difficulty of the obsessional patient involves a special potential for becoming aroused and exhibiting strong defensive reactions to minimal stimulation. This proposition, taken together with evidence relating to a deficiency of inhibitory neurohormones in these patients (Yaryura-Tobias *et al*, 1977, 1978; Thoren *et al*, 1980), suggests that cortical responses to sensory stimulation are abnormally enhanced due to a low level of inhibitory activity. Given this enhanced cortical responsiveness, it might be hypothesised that visual cognitive potentials of obsessional patients would evidence increased peak amplitudes and shorter peak latencies. But, in a preliminary study (Ciesielski, Beech and Gordon, 1981), while reduced peak latencies (N220 and P350) were observed for the group, peak amplitudes appeared generally lower than for normal controls.

The present study was designed to cross-validate the results of our first experiment concerning the differences observed between obsessionals and normal controls, and to extend the range of observations by examining performance on a task of increased complexity. Regarding this latter point, our earlier study had suggested an association between the visual evoked potential (VEP) abnormalities observed and task complexity, but the study had involved a substantial shift from a simple passive task to an active task of considerably greater complexity. The present study was designed to examine the relationship between task complexity and degree of VEP abnormality by employing two levels of difficulty of the *same* task.

Method

Eight patients (three male and five female) with a firm diagnosis of obsessional neurosis took part in the study. The average age of this group was 40 years. Three patients were taking small amounts of antidepressant medication, which was stopped 48 hours before testing. On the Harris Lateralisation Scale, all patients obtained a strong dextral score.

Eight normal controls were chosen to match the patients for age, sex, social background and lateralisation.

All subjects had normal or corrected to normal vision.

Procedure

The experimental procedure has been described previously (Ciesielski, Beech and Gordon, 1981). Briefly, testing took place in a darkened room, subjects facing a white screen with a central red fixation spot. Black and white line drawings of amoeboid nonstructural figures, as shown in Fig 1 and based on those used by Nevskaya (1974), were used as stimuli. They were shown in vertical pairs, an equal number of identical or different pairs (32 of each kind) being presented tachistoscopically in randomised order, in the centre of the screen just below the fixation spot. The luminance of the screen and stimuli were 1.7 cd/m^2 and 4.1 cd/m^2 respectively. Inter-stimulus intervals were controlled manually, ranging from 10–15 seconds with a mean of approximately 13 seconds.

Subjects were required to decide whether the stimuli in each pair were the same or different, and to indicate this choice as quickly as possible by pressing an appropriate button. The task was judged by subjects to be of high difficulty level.

The adaption session was followed by four experimental trials. After the first block of 32 trials, a short rest was given. Following the second block, a longer break was given and subjects were informed that the

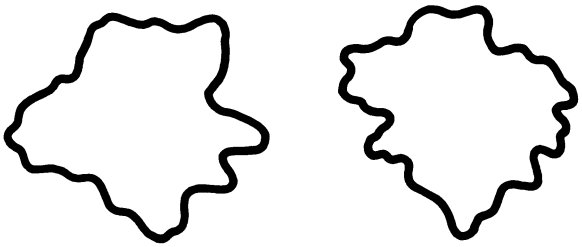

FIG 1.—Example of two of the figures used in the experimental task. S's were required to decide if they were identical or different.

difficulty level would increase by including three shapes instead of two in each set. In this part of the experiment, either the three shapes were all identical ('same') or one differed from the other two ('different'). The whole experimental procedure lasted approximately one hour and 20 minutes.

Apparatus and recording

Silver chloride cup electrodes were placed at P3 and P4 according to the 10–20 system (Jasper, 1958), with common linked earlobe reference. Resistance of the electrodes was maintained below 5KΩ. Both homologous electrodes were equalised to within 1KΩ. Signals were amplified by Fylde Electronics amplifiers with a frequency band of 0.7 to 30 Hz. The evoked response was recorded from the onset of the stimulus for a period of one second. Sixteen trials were averaged, using a Medelec averager and recorded on light sensitive paper.

Results

Two components of the EP waveforms were selected for analysis; a negative peak with latency 190–260 msecs (N220) and a late positive component (P350) with a peak latency of 310–410 msecs. Examples of these waveforms are shown in Fig 2.

The components were scored manually, latency being defined as the time from stimulus onset to the peak of the component, and amplitude as the voltage difference from the peak of the preceding component of opposite polarity to the peak of the component under analysis. For each subject, EP records were available for each of the two tasks and from both electrode positions. Additionally, each task was repeated, providing a total of eight EP records per subject. For statistical analysis, the mean latency and amplitude over the two repetitions were used. All comparisons were made using a non-parametric test (the Wilcoxon matched pairs signed ranks test) because of the small number of subjects involved. The main comparison was between the patient and normal

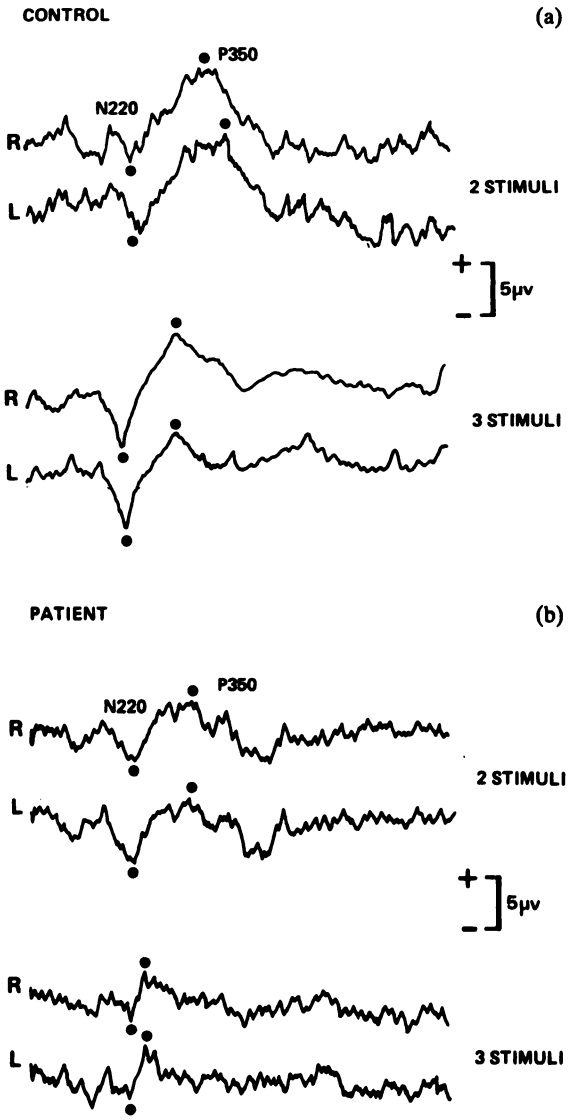

FIG 2 (a) and (b)—E.P.'s from two representative subjects (one patient and their matched normal control) recorded from active electrodes at P3 (L) and P4 (R).

group for each component of the EP on both tasks. Data were analysed separately for left and right electrode positions. The results are summarised in Table I.

It can be seen that, on the simpler task, differences between the groups are small on amplitude measures, with only the N2 amplitude on the right side showing a significant difference. However, on the more complex

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TABLE I

Group comparison of Obsessional Patients and Normal Controls under each experimental condition and for each E.P. measure

TASK	EASY (2 SHAPES)				DIFFICULT (3 SHAPES)			
COMPONENT	N 2		P 3		N 2		P 3	
Electrode Position	L	R	L	R	L	R	L	R
Patients AMPLITUDE	5.6 (1.8) —	5.1 (1.8) *	8.5 (2.5) —	8.6 (3.0) —	4.6 (1.8) *	4.2 (1.4) ***	7.1 (2.8) ***	7.0 (2.0) ***
Normals	6.6 (2.5)	7.2 (2.7)	10.8 (1.7)	10.2 (2.1)	7.4 (1.8)	8.2 (1.6)	12.0 (2.0)	12.4 (2.9)
Patients LATENCY	205 (15.3) ***	206 (24.6) *	327 (37.4) **	328 (37.0) *	204 (17.2) **	202 (21.4) ***	318 (39.1) **	319 (38.7) ***
Normals	237 (25.8)	237 (29.3)	356 (21.0)	357 (27.4)	252 (31.6)	250 (35.0)	365 (26.5)	368 (23.1)

Values shown are Group Means with standard deviation in brackets. Probability levels (Wilcoxon Test, Two Tailed) are indicated as follows: *** = .01 ** = .02 * = .05

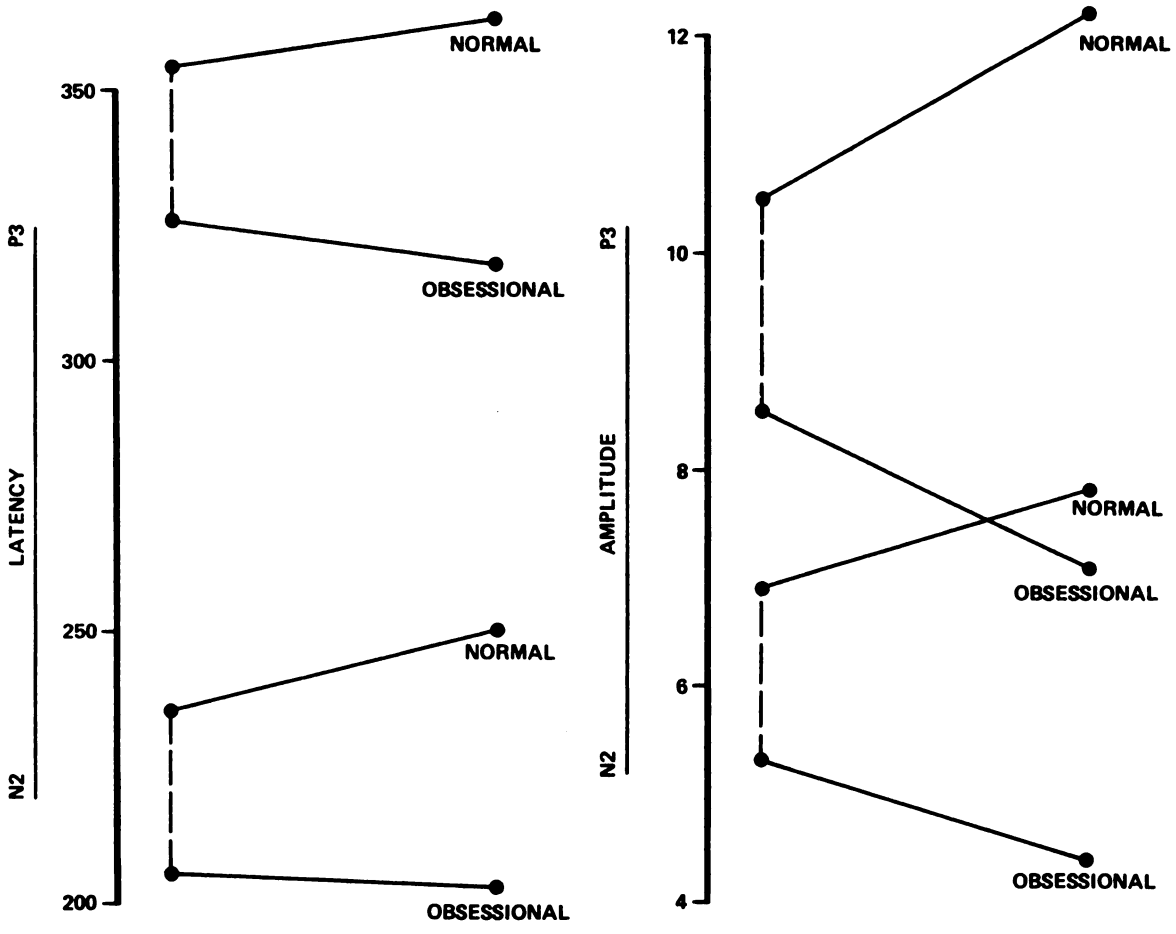

FIG 3 (a) and (b)—Mean latency (in milliseconds) and amplitude (in microvolts) for the normal and obsessional groups on the N220 and P350 components, plotted against task complexity (2 or 3 shapes as the stimulus).

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TABLE II

Comparison of responses to easy task (2 stimuli) versus difficult task (3 stimuli) within groups

	OBSESSIONALS				NORMALS			
	N2		P3		N2		P3	
	L	R	L	R	L	R	L	R
LATENCY	3<2	3<2	3<2***	3<2***	3>2**	3>2**	3>2*	3>2***
AMPLITUDE	3<2*	3<2	3<2***	3<2	3>2	3>2**	3>2*	3>2**

Where responses are greater on the difficult task, the Table show 3>2, where they become smaller, this is shown as 3<2.
Where the differences reach significance on the Wilcoxon Test, probabilities are indicated as follows:
*** = .01 ** = .02 * = .05

task, amplitude comparisons reveal significant group differences for each component and from each electrode, with a higher level of significance being observed on the right side for N220. Considering latency measures, all group comparisons are significant, with the levels of significance being a little higher for the more complex task.

Because of the tendency for group differences in amplitude to be more marked on the right side, data from the left and right electrode were compared within each group of subjects. However, no significant differences due to laterality were found.

Inspection of the data reveals that obsessionals generally have shorter latencies and smaller amplitudes than normals, as described in the group comparisons above. But, while increased task difficulty tends to lengthen latency and increase amplitude among normals, the opposite effect is observed among obsessionals, so that the group differences become more marked on the complex task (Fig 3).

The trends, shown in Fig 1, were analysed statistically by comparing scores on the easy task with those on the difficult task within the groups for each measure. The results (Table II) confirm that on seven of eight comparisons, normals significantly increase amplitude or latency on the difficult task, while obsessionals show significant amplitude or latency decreases on this task in four of the eight comparisons, three of which are on the P350 component.

Discussion

The results obtained in the present study confirm those found in our previous investigation (Ciesielski, Beech and Gordon, 1981). Significant differences between obsessional patients and normal controls were observed on both peak amplitudes and peak latencies, the former being lower and the latter being shorter for the obsessional patient, when compared to normals. These differences were greater for tasks of increased complexity, suggesting the possibility that the differences between obsessionals and normals represent a function of the demands made upon information processing capacity.

These results only partially confirm Beech's proposition, since the lowered peak amplitudes are contrary to what might be expected in states of enhanced arousal. While it is possible to speculate upon the ways in which the abnormalities noted may be reconciled, the authors feel that further investigations should precede the formulation of complex explanations; more experimental work of this kind is now in progress.

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