

**Research Note**

# **The Effects of Cerebral Electrotherapy on Short-Term Memory Impairment in Alcoholic Patients**

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## **Abstract**

Two hundred twenty-seven male alcoholism patients were placed into four therapy and one control groups. The therapy groups received cerebral electrotherapy (CET) for 40 minutes a day, Monday through Friday, for 3 weeks. Groups I and II assisted the therapist in setting the current to just below sensation threshold, Group I via headbands ( $X = 0.40$  mA) and Group II via ear stethoscopes ( $X = 0.21$  mA). Two other groups received 0.10 and 0.20 mA respectively via ear stethoscope electrodes. It was found that CET significantly reduced brain dysfunction in all treatment groups when compared with controls as measured by the Benton Visual Retention Test.

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Earlier studies have shown a positive effect of Cerebral Electrotherapy (CET) on the mood of alcoholic patients (Smith and O'Neill, 1975), on personality and other related psychological test scores in other subjects (Rosenthal, 1972), on several hormonal variables in yet other subject populations (Henderson et al., 1973), and in gastric acid secretion responses in others (Kotter et al., 1975). All of these are among the problems reported by alcoholic patients coming to the District of Columbia Government's Rehabilitation Center for Alcoholic Persons and are summarized in Table 1.

More importantly, we have reported elsewhere that over 70% of these patients tested scored in the acquired dysfunction category on the Benton Visual Retention Test, administration A: the immediate recall function (Smith, 1972). We also noted that the retest score showed deterioration over 107 days in 31% of the patients and improvement in 44%. The present study attempts to ascertain the effects of CET on the short-term memory function in alcoholic patients.

## METHOD

### Subjects

Two hundred twenty-seven male alcoholism patients were assigned to the study in the order in which they arrived on treatment units at the D.C. Rehabilitation Center for Alcoholics from March through December 1974. While all had been screened for psychosis, peripheral neuritis, and brain damage as measured by the Bender Gestalt and/or House-Tree-Person tests, they almost exactly mirrored the characteristics of the modal patient at our Center. Their average age was 42, with an average of 10th grade education. Sixty percent were Black. Patients were not screened into the CET treatment since all patients at our Center are routinely given CET if they are not screened out as above.

### Apparatus

The Beta nonverbal IQ test, and the Benton Visual Retention Test (BVRT), Forms C and D, were used to measure brain function. Neuro-tone 101 machines were used for the CET (Neuro Systems, Incorporated, 2709 National Drive, Garland, Texas, 75041).

**Table 1**  
*Summary of Studies Cited*

Author	Year	Type of subjects	Number of subjects	Technique used	Significant findings	Study limitations
Smith and O'Neill	1975	Alcoholic patients in a rehabilitation center	36 treatment, 36 controls	Subsensation CET via frontal and occipital electrodes; controls received no current	Significant improvement in Profile of Mood States Test scores by treated subjects when compared with controls	More disturbed placebo controls left study early; <i>post-hoc</i> matching excluded the more disturbed treated patients whose mood shift was greatest
Henderson et al.	1973	Student patients in a university counseling center	45	From 3 to 34 CET treatments (mean = 14), pre- and postpsychological and physiological measurements	5 of 7 psychological and physiological factors studied improved significantly for majority of subjects	Lack of controls; large variety of presenting complaints; wide variation in amount of CET given
Rosenthal	1972	Patients being treated for chronic neuroses, and "normal" controls	41 patients, number of controls not given	Standard CET for 5 days, 30 minutes/day	Increases in 24-hour urinary catecholamines, in serum thyroxine, and in 17 keto-steroids.	No clear relationship of the findings to clinical symptoms being treated or clinical observations made
Kotter et al.	1974	Adult male volunteers	12; acted as their own controls	Intragastric titration, gastric histamine challenge, CET	Gastric secretion reduced during CET, both in the normal stomach and in the histamine challenged condition	Study limited to normal subjects with no known gastric pathology

## Procedure

The patients were IQ tested and given the BVRT, Form C, Administration A, then assigned to either the control group or one of several electrotherapy treatment modalities. The treatments were given either by headbands (frontal and occipital electrodes) with the patient assisting in setting the current level just below sensation level [ $\bar{X} = 0.40$  milliamperes (mA), range 0.21 to 0.71], or to one of three ear stethoscope groups, one of which was patient assisted setting (PAS) of the current to just below sensation threshold ( $\bar{X} = 0.21$  mA, Range 0.10 to 0.44). In the second, the current was preset at 0.10 mA. In the third, the current was preset at 0.20 mA.

Treatment was 40 minutes once a day for 15 days, excluding weekends. The controls, serving as time controls only, remained in routine therapies throughout the study, as did the CET patients. At the end of the CET treatment period, all patients were retested on the original test instruments, with BVRT Form D replacing Form C.

## RESULTS

Table 2 shows the short-term memory function scores for all groups before and after the CET treatment and for the controls. As in our earlier study which had placebo controls (Smith and O'Neill, 1975), the controls who were more dysfunctional went AWOL from our treatment center before the study was over, while the CET patients who were more dysfunctional remained. This necessitated *post hoc* matching of CET patients with controls who remained on the study. Only the headband and PAS stethoscope patients were matched with the controls since the effects of preset amps was less familiar to us, this being a first use of this treatment strategy.

As with our earlier findings, the dysfunctional process continued to deteriorate in many of the controls, with a mean loss of 55% over an average 21-day period. The matched CET treatment patients improved an average of 84% during the same period. Or looked at another way, while the two groups as a whole did not test in the acquired dysfunction category at the beginning of the study, the controls were testing in this category after the study while their matched treatment group ended the study the least dysfunctional of any other group. In every function

**Table 2**  
*Brain Dysfunction Scores on the Benton Visual Retention Tests Obtained by Controls and Patients Who Received Varying CET Treatment Parameters*

Group	Scores: obtained minus expected		Dysfunctional patients, %	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Controls ( $N = 29$ )	1.59 <sup>a</sup>	-2.14	45	62
CET patients matched with controls ( $N = 29$ )	-1.66	-0.90	45	31
CET with headbands ( $N = 28$ ) <sup>b</sup>	2.00	-1.04	57	36
CET with ear stethoscopes, PAS ( $N = 21$ ) <sup>b</sup>	2.19	-1.00	62	33
CET with ear stethoscopes, 0.10 mA ( $N = 40$ )	-2.33	-1.95	65	53
CET with ear stethoscopes, 0.20 mA ( $N = 27$ )	2.74	-2.78	74	70
All CET patients ( $N = 116$ )	-2.32	-1.69	65	49
All CET patients minus 0.20 mA group ( $N = 89$ )	-2.17	-1.33	63	43
Patients AWOL from study controls ( $N = 32$ )	2.50		69	
CET, all groups ( $N = 50$ )	2.20		60	

<sup>a</sup>Patients with acquired brain dysfunction would be expected to score  $-2$  or more.

<sup>b</sup>Both the Headband Group and the PAS Ear Stethoscope Group were allowed to determine their own current setting. PAS is patient assisted setting of the current level.

category measured, the CET patients ended superior to the controls, an outcome unlikely (beyond .001, sign test) due to chance alone.

Among the CET treatment groups, the two groups that helped set their own current level (at just below sensation threshold) fared best, followed by the 0.10 mA group. A few of the latter stated they were receiving current above the sensation threshold, while all of the 0.20 mA patients stated they were. (The PAS and Headband groups appeared to habituate, requiring more current to reach sensation threshold as the study progressed.) The 0.20 mA group was the most stable group during the study, testing approximately the same at the end of the study as at the beginning. It should be noted, however, that more seriously dysfunctional patients stayed in the study for this mode of treatment.

It can be inferred from Table 2 that the best method of CET treatment is via ear stethoscope with the patients assisting in setting the current just below their sensory threshold.

In Table 3 it can be seen that while almost one-fourth of the control patients entered the dysfunctional category during the study, fewer than 10% of the overall CET patients did so, and none of the PAS ear stethoscope group did. On the other hand, only 7% of the control group recovered from the dysfunctional category during the study, while almost one-fourth of the CET treatment patients did. The CET patients matched with the controls did not leave the dysfunctional category in such great numbers, however, suggesting that it is the more dysfunctional persons who improve in CET, but keeping in mind that only 45% of this group were dysfunctional at the beginning of the study (Table 2, Column 3), a lower percentage than in the other CET groups.

In Table 4 a more detailed look at the effects of above threshold current (0.20 mA ear stethoscope group) is shown. Among those matched with controls, the overall dysfunction score was greater at the end of the study compared with the controls, but the percent of patients scoring in the dysfunctional category remained the same, while the controls were increasing slightly (10%). The number of controls leaving the dysfunctional category during the study was less than half of that of the 0.20 mA group (10% compared with 25%), but the number entering the dysfunctional category was less (20% compared with 25%).

**Table 3**  
*Pattern of Movement across Functioning-Dysfunctional Line by Controls and CET Patients during the Study as Measured by the Benton Visual Retention Test*

Group	Began damaged <sup>a</sup> and ended undamaged, %	Began undamaged and ended damaged, %
Controls ( <i>N</i> = 29)	7	24
CET patients matched with controls ( <i>N</i> = 29)	14	3
CET with headbands ( <i>N</i> = 28)	25	4
CET with ear stethoscopes, PAS ( <i>N</i> = 21) <sup>b</sup>	29	0
CET with ear stethoscopes, 0.10 mA ( <i>N</i> = 40)	21	10
CET with ear stethoscopes, 0.20 mA ( <i>N</i> = 27)	22	19
All CET patients ( <i>N</i> = 116)	23	9
All CET patients minus 0.20 mA group ( <i>N</i> = 89)	24	6

<sup>a</sup>“Damaged” and “dysfunctional” are used synonymously.

<sup>b</sup>PAS is patient assisted setting of the current level.

**Table 4**  
*A Comparison of Some Results of 0.20 mA CET with That of Random Amp CET and Controls*

Group	Benton Visual Retention Test Scores: obtained minus expected		Patients Dysfunctional, %		Began damaged <sup>a</sup> and ended undamaged, %	Began undamaged and ended damaged, %
	Pretreatment	Posttreatment	Pretreatment	Posttreatment		
Controls matched with 0.20 mA patients (N = 20)	-2.10 <sup>b</sup>	-2.45	65	75	10	20
0.20 mA patients matched with controls (N = 20)	-2.15	-2.60	65	65	25	25
0.20 mA patients matched with treatment groups <sup>c</sup> (N = 25)	-2.84	-2.84	76	72	24	20
Treatment group matched with 0.20 mA patients <sup>c</sup> (N = 25)	-2.84	1.56	76	52	28	4

<sup>a</sup>"Damaged" and "dysfunctional" are used synonymously.

<sup>b</sup>Patients with acquired brain dysfunction would be expected to score -2 or more.

<sup>c</sup>Patients from both the Headband and PAS Ear Stethoscope CET treatment groups were used in the matching.

When the PAS and headband patients were matched with the 0.20 mA patients, the results are striking. Marked improvement occurred in the PAS-headband patients in every category of measurement, while the 0.20 mA patients remained about the same throughout. These results suggest that while 0.20 mA via the ear stethoscopes may be helpful to some patients, it may be detrimental to approximately the same number of other patients, and the best CET strategy apparently is to let the patient determine his own current setting at the beginning of each session.

## DISCUSSION

Again, we have found that the more seriously disabled alcoholic patients entering our center for treatment tend to leave early while the less seriously involved stay on for treatment. And, again, it appears that putting patients in CET treatment halts or reverses this trend. This would be helpful if only because it holds the patients here for other kinds of therapy offered. We have found no other treatment that alters the short-term memory impairment of our patients, however, just as we had found no other way to alter mood disturbance prior to our use of CET, making CET a valued adjunct to our other treatment approaches.

We are currently in a 3-year patient follow-up study of CET.

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