

Confirming Evidence of an Effective Treatment for Brain Dysfunction in Alcoholic Patients

RAY B. SMITH, PH.D., M.P.A.¹

In earlier studies we found that cranial electrotherapy stimulation (CES) was associated with significant improvement in several areas of brain dysfunction commonly found in alcoholic persons. In this study we compared the effects of CES among treatment and control groups on each of the six subscales of the Revised Beta Examination (Lindner, R. M., and Curvitz, M. *Revised Beta Examination*. Psychological Corp., New York, 1957) and found CES related to significant improvement on the two subscales which are below the norms in alcoholic patients and which have been correlated with other measures of brain dysfunction. It is concluded that CES can be an important therapeutic strategy in reducing to weeks the time required for recovery of several reversible brain dysfunctions in alcoholic persons which usually require months or years of abstinence.

In an earlier study we tested the effects of cranial electrotherapy stimulation (CES) in reducing anxiety and depression in our alcoholic patients (15). In addition to finding significant reductions in anxiety and depression among treated patients as compared with simulated treatment controls, we discovered significant improvement on a Profile of Mood States factor designated "Confusion-Bewilderment." Later we found that the Confusion-Bewilderment score was significantly related to short term memory loss in our Korsakoff and pre-Korsakoff patients, so we designed a study to assess the effects of CES on short term memory loss as measured by the Benton Visual Retention Test. In that study (14) CES-treated patients improved significantly over simulated treatment controls. In fact, as a group the treated patients moved back to within the range of published norms, while several members of the control group continued to deteriorate over the 35-day test-retest period. We had learned to expect such continuing deterioration in up to 30 per cent of our alcoholic inpatients (12). It was difficult to know what to make of these findings other than that they involved some kind of general cognitive functioning and that the dysfunction was reversible with CES treatment.

Earlier, Kapur and Butters (4) had noted that alcoholics, especially those with Korsakoff-type memory loss, had a relative incapacity to learn new associations, plus a problem in visuoperceptive analysis. Other studies (2, 3, 7, 10) confirmed the presence of visuoperceptive difficulties in long term alcoholics and found such dysfunction to be on an apparent continuum, becoming worse as the patient approached the Korsakoff condition. They confirmed Page and Lin-

den's (8) earlier finding of poor performance among alcoholic patients on the Wechsler Adult Intelligence Scale (WAIS) Digit Symbol subtest and related it to this more generalized visuoperceptive problem. Page and Linden, however, had suggested that the dysfunction denoted by the Digit Symbol performance deficit was reversible, at least to some extent, over time.

We hypothesized that if this were true then a treatment that had been effective in reducing short term memory loss, a major symptom in Korsakoff psychosis, might also be effective in reducing visuoperceptive dysfunction in alcoholics in general. We decided to test this using two visuoperceptively demanding tasks on the Revised Beta Examination (Beta IQ Test) which was in routine use at our center. In our testing of more than 10,000 patients with this instrument, we have found their inability to complete the maze and spatial relations subsections to be almost diagnostic of alcoholism. The maze task requires them to begin at an entrance on the left and trace with their pencil a path through a maze before exiting on the right. They may not cross any printed lines and are not to lift their pencils once they have begun. The visuoperceptive demand is to look ahead for the path in the maze, remember what was seen while tracing to the last point visualized, and then repeat the process. As the mazes increase in complexity, the patients have to look farther and farther from their current position and through more convolutions in the maze before they can feel confident in entering the next maze alley.

In the spatial relations subtest, they are asked to mentally pick up two or more shapes that have been drawn to the left of an empty square and draw each of them into the square so that aU fit perfectly. That necessitates mentally turning pieces at angles, upside down or rotating them in various planes before seeing how they will fit together to form the square, then

¹ Director, Addiction Services, Neuro Systems, Inc., Garland, Texas 75041.

remembering those relationships until they are drawn in. Apart from the occasional architect or draftsman who enters a treatment center, alcoholics as a group find this a nearly impossible task. The inability to complete it correlates well ($r = .70$) with measures of short term memory loss as measured by the Benton Visual Retention Test.

Method

Subjects

One hundred male patients from the treatment units volunteered for the study. Their average age was 42.2, average education level was 10.2, and 70 per cent were Blacks, a reflection of racial composition of the District of Columbia. They had been drinking for an average of 21 years, with an average of 5.3 years of heavy drinking.

Apparatus

The Revised Beta Examination (5) was used as the criterion variable. Its six subscales are: I, Maze; II, Digit Symbol; III, Error Recognition; IV, Formboard (spatial relations); V, Picture Completion; and VI, Identities. Each subscale was structured from the norms to have a mean of 10 and a standard deviation of 3 (5).

Neurotone 101 machines were used for the CES. These promised a series of low intensity, sinusoidal electric pulses (100 Hz/2 msec) with current variable from 0.0 to 1.5 mA, as varied by the therapist. Unlike most CES devices, these promised a zero net transfer of energy between the electrodes; thus, there were no anodes or cathodes as such, and current did not flow through the head directionally. The current was applied to the head via two ear stethoscope electrodes placed just below the ears at the maxillo-occipital Junctionure.

Procedure

Patients were randomly assigned to the experimental or control group after administration of the Beta IQ Test. Testing was within 10 days following detoxification. CES patients were given stimulation for 40 minutes once a day for 15 successive days, excluding weekends, our normal treatment procedure for inpatients at our center. The therapist turned the current up above sensation threshold, as signaled by the patient, then lowered it until the patient indicated that he felt nothing. Controls were handled identically except the machine was turned completely off once the current was below sensation threshold. Therapists were rotated every 2 hours to avoid systematic error via inadvertent therapist feedback. The principle researcher and statistician remained blind to the treatment conditions, as did all patients. The patients

participated in all other phases of the treatment program at the center throughout the 15 days of the study.

Following the CES procedure, treatment and control subjects were retested on the Beta IQ Test. The lapse in time between pre- and post-testing averaged 35 days.

Results

Five treatment and ten control subjects left the center early and were not included in the final tabulations. Since we have shown elsewhere that a personality-related selective factor can be present among those leaving CES studies early (15) and that the response to CES is not linear across differing levels of pathology, as reflected in personality scores on the Minnesota Multiphasic Personality Inventory (13), we matched the treatment and control subjects who completed the study on each subtest as measured in the pretesting and compared their post-test results. The comparison of the groups, both against each other and when their scores were compared with Z-tests against the published norms, are given in Table 1.

Subscales I and IV are significantly below the norms on the pretest scores of both the treatment and control groups. Both the treatment and control groups remain below the norm on subscale IV following CES though the treatment group improved significantly on this subscale. The controls did not. In addition, the treatment group improved significantly and came back within the norms on subscale I, while the control group did not improve and remained significantly below the norms. The difference between the treatment and control groups at the end of the study was significant when they were compared with each other on both subscales I and IV. There were no other significant differences on any of the other subscales or in the total Beta IQ Test scores either between treatment and control groups or between either group when compared with the published norms. The control group did improve significantly on subtest V when compared against itself. This is not readily explicable by theoretical construct. The most parsimonious explanation is that this was the *t-test* out of 21 such tests that would be expected to reach significance on chance alone.

As a last check against inadvertent skewing of the scores during the matching process, the matched pretest mean of each subscale was tested against the overall mean of the pretesting on that subscale ($N = 85$). There were no significant differences.

Discussion

Several studies have shown what is becoming increasingly apparent in the field of alcoholism studies,

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TABLE 1
Comparison of Means of Control and CES Treatment Groups On Subscales of the Revised Beta IQ Examination

Scale	Number of Subjects Matched	Group Means		I-Scores (Matched) (Control <i>vs.</i> Treatment)
		Control	Treatment	
I. Maze	32			
Pretest mean		8.48 ["]	8.53 ^a	
Post-test mean		8.37 ["]	10.74	
z-Score pre- <i>vs.</i> post-test		.20	2.41 ⁶	
II. Digit Symbol	28			.91
Pretest mean		9.64	9.52	
Post-test mean		9.93	10.68	
t-Score pre- <i>vs.</i> post-test		.20	.68	
III. Error Recognition	34			.23
Pretest mean		9.43	9.23	
Post-test mean		10.43	10.26	
t-Score pre- <i>vs.</i> post-test		1.49	1.15	
IV. Formboard	36			2.17 ["]
Pretest mean		7.21 ["]	7.18 ["]	
Post-test mean		7.32 ["]	8.80 ["]	
z-Score pre- <i>vs.</i> post-test		.20	2.50 ^b	
V. Picture Completion	30			.19
Pretest mean		10.06	10.01	
Post-test mean		11.35	11.22	
zScore pre- <i>vs.</i> post-test		2.08 ^b	1.76	
VI. Identities	31			.61
Pretest mean		9.78	9.87	
Post-test mean		9.65	10.09	
t-Score pre- <i>vs.</i> post-test		.30	.29	
Total Beta IQ	35			.01
Pretest mean		97.60	97.28	
Post-test mean		101.36	101.32	
t-Score pre- <i>vs.</i> post-test		1.20	1.34	

["]Significantly different from published norms at or beyond the .05 level of confidence.

^bSignificant beyond the .05 level of confidence.

namely that certain kinds of dysfunction in alcoholic persons do not represent permanent brain damage as we thought in the recent past. Page and Schaub (9) have shown changes in some aspects of intellectual functioning in alcoholic persons during 6 months of abstinence. Sharp *et al.* (11) have shown the recoverability of the acquisition of meaningful synonyms function following alcohol abuse, and Berglund *et al.* (1) found several reversible dysfunctions among alcoholic persons during a follow-up study.

But what of CES as a potential aid to this process of recovery? O'Leary *et al.* (6) found cognitive recovery in alcoholic persons using the Trail Making Test, a test that measures quite similar cognitive skills as our Beta IQ Test, subtest I (mazes). However, these authors found that it took months of abstinence to achieve improvement we obtained in 3 weeks. It would appear, then, that CES may be an important tool in speeding the recovery of cognitive dysfunctioning in alcoholic persons well short of the time required by the usual process of recovery.

In addition to the obvious considerations for the patient such treatment and recovery denotes, as a treatment adjunct in a treatment center, it also ap-

pears to be a thoughtful thing to do for those involved in other areas of the treatment effort, and whose efforts usually depend heavily on the cognitive functioning of the patient. It should aid treatment immeasurably, for example, if the patient can remember from one treatment session to the next what transpired in the session just preceding.

A final consideration is that researchers wishing to test the effects of CES in other areas of brain functioning perhaps need not feel constrained to use simulated treatment controls as we did in the current study, providing they are treating against published norms and in brain function areas not thought to be recoverable from suggestibility alone. That would surely encourage more research in this important area while allowing more patients to receive the benefits of CES already seen.

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