

## Research Article

# A Retrospective Chart Review of Cranial Electrotherapy Stimulation for Clients Newly Admitted to Residential Drug Treatment

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## Abstract

Cranial electrotherapy stimulation (CES) has been shown to produce improvements for insomnia, depression, and anxiety among individuals afflicted with these conditions both with and without primary substance abuse dependence. This report presents findings from a retrospective chart review examining the impact of CES on the retention rates of newly abstinent substance dependent individuals in community-based residential treatment. Clients who received CES sessions during their first month in residential treatment exhibited better retention rates during the first 30 days, as well as at 60 and 90 days in treatment, compared to clients who did not receive CES. Sessions were well tolerated and clients reported improved sleep and reduced stress.

## Introduction

Cranial electrotherapy stimulation (CES) is approved by the Federal Drug Administration (FDA) for the treatment of anxiety, depression, and insomnia. CES encompasses a category of medical devices that applies microcurrent pulses of electrical stimulation across the head via transcutaneous electrodes. CES is thought to work by increasing the ability of neural cells to produce serotonin, dopamine, DHEA, endorphins and other neurotransmitters, and correcting imbalances in the neurohormonal system [1,2].

CES has also been used with good effect with substance abuse patients [3-7] among whom anxiety, depression, and insomnia are common features of those undergoing drug abstinence syndrome. A large part of the high early attrition rates seen in residential treatment may be attributed to inadequate management of the drug abstinence syndrome. Early drop-out rates have been shown to be as high as 30%-40% in the first 30 days of residential treatment, with sharp decreases in attrition thereafter [8]. In national studies [9-11], only 42% to 53% of clients are retained in residential treatment for 90 days or more. For opiate dependent individuals, the addition of buprenorphine has been shown to significantly decrease early attrition rates [12,13]. With the exception of alcohol however, there have not been comparable pharmacological treatments for clients who are dependent on other psychoactive substances.

The goals of this retrospective chart review are (a) to determine the feasibility of using cranial electrotherapy stimulation (CES) as an adjunct treatment in a residential drug treatment setting,

(b) to examine clients' acceptance level of CES treatment and any positive or negative experiences, and (c) to look at the effects of CES on client retention in treatment. For this last goal, we formulated the following hypotheses:

1. We hypothesized that clients who received CES during their first month of treatment would have better retention rates when compared to clients who did not receive CES.

2. We hypothesized a dose relationship where greater number of CES sessions would be associated with longer retention in treatment beyond the duration of CES treatment in the Induction unit.

## Method

Phoenix House is a national not-for-profit substance abuse treatment provider. Phoenix House programs in New York treat more than 2000 men, women, and adolescents for drug and/or alcohol addiction in residential and outpatient programs. All adult clients who are admitted to Phoenix House residential treatment in New York City are admitted to the Induction Center, a 60-bed unit located within a larger facility in Brooklyn, NY. Newly admitted clients reside within the Induction unit for the first 14 to 30 days of treatment for general orientation to treatment, psychosocial assessments, and medical and emotional stabilization, before transferring to one of five specialized residential treatment programs for primary treatment with lengths of stay from 3 months to 1 year duration.

The sample consists of 392 clients who were admitted to the Induction unit during the CES implementation period and completed their 3-day admission process. They were predominantly male (85%); 57% were Black, 30% were Hispanic, 12% were White, and 2% were of other ethnicity. The sample had a mean age of 38.2 (SD = 10.2) and had completed 11.2 years (SD = 1.6) of school. Primary drugs of abuse were cocaine/crack (36%), heroin/opioids (23%), alcohol (22%), and marijuana (19%); and over half of the sample (56%) abused more than one illicit substance. Clients entered treatment through criminal justice referral (54%), self-referral (23%), referral from another drug/

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alcohol treatment provider such as a detoxification or short-term rehabilitation center (12%), medical/healthcare provider (5%), social service agency (4%), and family, friends, or employer (2%).

Cranial electrotherapy stimulation (CES) was offered to all clients in the Phoenix House New York Induction Center who entered treatment between February through May of 2009 and completed the admission process. Newly admitted clients go through a three-day admission process which includes various intake psychosocial assessments, medical check-up, and mental health screenings. During this time they are introduced to the idea of CES as an adjunctive therapy, and the senior counselor who runs the CES sessions meets with them to explain the benefits and risks. Clients who complete the admission process and choose to participate in CES sessions are provided with a standing medical order allowing them to participate in 20 minutes of CES per day for three weeks (average length of stay in the Induction unit). These 20-minute sessions are offered twice a day from Monday to Friday, with a morning session and an afternoon session each weekday, to accommodate different clients' schedules.

Sessions are held in a small group room that can comfortably seat 6 to 9 clients. The senior counselor who monitors the CES treatments prepares the devices, introduces each session with a brief explanation of the treatment and instructions for group behavior, and ensures proper placement of the device electrodes on the clients' heads. The clients sit quietly in the darkened room and listen to soothing background music that is provided during these sessions. The counselor remains in the room with the clients for the duration of these sessions.

Clients are free to attend as many daily sessions as they wish during their 3week period, and they are free to discontinue if they wish to do so. Some clients in the Induction unit who initially were not interested in participating in CES sessions but became more interested after seeing their peers participate may "sign up" for sessions later on during their Induction stay. Once a week, the CES counselor queries the participants about their experience using open ended questions: What did you think about the session? Would you like to continue participation?

## Results

### Client demographic information

Of the 392 clients who were admitted to the Induction unit during the CES implementation period and completed their 3-day admission process, 99 clients (25%) volunteered to receive at least one CES session. A higher proportion of female clients volunteered for CES than did male clients. In addition, there were fewer criminal justice referred clients among those who volunteered for CES. As detailed in Table 1, with the exception of these two demographic factors, there were no significant differences between groups in terms of age, educational level, ethnicity, polysubstance use, or primary drug of abuse.

### Client participation in CES and retention in treatment

Because the highest rates of attrition in residential treatment occurs during the first few weeks, we examined attrition rates at the end of the first and second weeks of treatment, and at 30 days, and then again at 60 and 90 days in treatment. At the end of the first week of treatment, everyone in the CES group remained in residential treatment while 9.9% of the rest of the client population not receiving CES had dropped out. Similarly, at each timepoint examined, those receiving CES had lower attrition rates (Table 2). The survival curves in Figure 1 depict this finding graphically.

Is the difference in survival rates mainly accounted for in *early* retention, i.e. due to differences in retention on the Induction unit

while CES is being offered, or do we find that CES participants continue to have better retention rates past their Induction phase of treatment? Because there was a significantly greater proportion of females and smaller proportion of criminal-justice referred clients in the CES group, we also wanted to adjust for differences due to sex and criminal-justice referral status. Using Cox proportional-hazards regression to analyze the risk of attrition between the two groups and controlling for the number of days in Induction, sex, and criminal-justice referral status, we still found a 60% decrease in the risk of dropping out of treatment before completion ( $\beta = .598, p = .003$ ) among clients who participated in CES.

### Client participation in CES and treatment status

In addition to length of stay in treatment, we also wanted to know whether participation in CES would result in more treatment completions and fewer terminations. Premature termination of treatment can either occur voluntarily (client decides to exit against clinical advice), by administrative discharge (expulsion due to chronic non-compliance or violence), by criminal justice remand (client arrested or taken back into custody), or by being referred to another level of treatment (discharge to a medical or psychiatric facility).

A comparison of the treatment status of clients in this sample on 8/24/09 (date of this report) show that over 64.6% of clients in the CES group were still in treatment (mean days in treatment

= 148.8, SD = 32.6) while only 44.4% of the clients who did not participate in CES were still in treatment (mean days in treatment = 134.9, SD = 31.8). Conversely, there were fewer clients dropping out of treatment against clinical advice among CES participants (25.3%) than among clients who did not receive CES (40.6%). There was little difference between groups in the proportion of clients who

**Table 1:** Comparison of client demographics between those who received CES and those who did not receive CES.

Demographics	Total sample	no CES (n = 293)	received CES (n = 99)	p
Age in years, mean (SD)	38.2 (10.2)	38.1 (10.4)	38.7 (9.8)	.621
Education in years, mean (SD)	11.2 (1.6)	11.3 (1.6)	11.2 (1.6)	.572
Male sex, %	85.2	90.1	70.7	<.001
Ethnicity, %				
Black	56.9	56.3	58.6	
Hispanic	30.1	30.7	28.3	.920
White				
Primary drug, %	11.5	11.3	12.1	
cocaine/crack	36.0	34.5	40.4	
heroin/opioids	22.7	24.2	18.2	.565
alcohol	21.7	21.5	22.2	
marijuana	18.9	18.8	19.2	
Polysubstance abuse, %	56.1	55.3	58.6	.326
Criminal justice referral, %	54.1	57.7	43.4	.010

**Table 2:** Comparison of attrition rates between clients who received CES and clients who did not receive CES.

Residential treatment attrition	no CES n = 293	Received CES n = 99
	n (%)	n (%)
at day 7	29 (9.9)	0 (0.0)
at day 14	62 (21.2)	3 (3.0)
at day 30	89 (30.4)	10 (10.1)
at day 60	120 (41.0)	17 (17.2)
at day 90*	131 (48.3)	23 (24.0)

\*Note: Sample sizes were n=271 and n=96 for the no-CES and CES groups respectively. Excluded from 90-day attrition analyses are 8 clients who completed residential treatment between 60 and 90 days, and 17 clients admitted at the end of May 2009 who have not reached the 90 day timepoint.

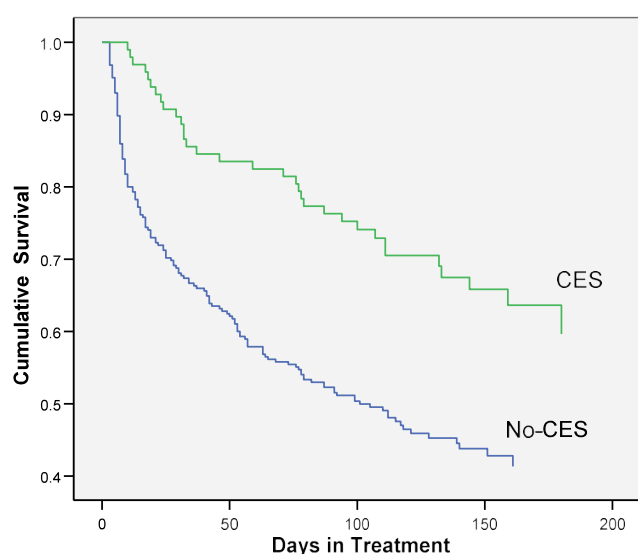


Figure 1: Cox regression model (unadjusted) showing treatment retention for clients who participated in CES and clients who did not.

were administratively discharged for non-compliance, referred out to another level of treatment, or remanded by criminal justice. It is interesting to note that there was also little difference between groups in the proportion of clients who completed treatment during the CES implementation period. Table 3

### Number of CES sessions and retention

The clients who volunteered for CES attended an average of 4.1 sessions (SD = 2.1). The number of sessions ranged from 1 to 11. Because of the voluntary nature of the CES sessions, clients were not required to attend sessions and did so whenever they chose to. Despite the availability of two sessions being offered per day, clients may still have had scheduling issues that interfered with their participation. The maximum number of sessions that a client can receive is also determined by his or her length of stay in the Induction unit. The average client successfully completes the Induction phase of treatment in just under three weeks (with the potential to participate in up to 15 CES sessions). However, some clients may be transferred to their primary treatment units after just one week, and some clients who are difficult to place (either due to client treatment issues or due to lack of available beds in the designated primary unit) may remain in the Induction phase for as long as two months.

Despite these limitations arising from conducting a retrospective chart review of a pilot implementation of CES in a real-life treatment setting, we wanted to see whether there was any association between the number of CES sessions that clients participated in and their length of stay in residential treatment. Pearson correlation analysis show that greater number of CES sessions attended was positively correlated with higher number of days in residential treatment ( $r = .22, p < .05$ ). However, because CES sessions were offered only in the Induction unit, clients who received more CES sessions were also those who spent a greater number of days in Induction. Because the number of days a client spends in Induction is highly correlated with the number of CES sessions they attend ( $r = .39, p < .01$ ), we included both variables as covariates in the regression analysis. After controlling for the number of days in Induction, the number of CES sessions clients attended was *not* a significant predictor of their length of stay in residential treatment.

### Feasibility and acceptance of CES in residential treatment

Both treatment staff and the clients themselves reacted positively to the inclusion of CES as an adjunct therapy in residential drug

treatment. After two initial staff meetings to receive an introduction to CES therapy and its uses, proper operation of the device (with the opportunity for staff to try the device on themselves), and discussions of logistics in terms of general protocol and procedures, the clinical staff at the Induction unit were able to successfully integrate CES sessions into the daily treatment schedule.

Overall, clients viewed the CES sessions very favorably. Table 4 above breaks down the types of client statements that were collected. The majority (92.6%) of the comments received were positive, with the most frequent remarks being general observations by clients that they liked the sessions, and that it was calming, helped them to relax, and reduced stress. Some clients reported that CES helped them to sleep better, and a few reported that they were able to concentrate or focus better. Less common were client observations that they “felt better” in general, felt less anxious, and that CES helped to reduce their anger.

There were eight unfavorable comments (4.2%) made by clients: Four of them were non-specific statements from clients that they did not want to continue with the CES sessions; one female client reported that she had a headache the morning after a CES session (she returned for additional sessions during her stay on the unit and reported that she did not experience a headache again); and there was one report each from clients who “saw lights” (this client reported both that it felt weird and that the session was relaxing), felt pain (unspecified) or physical discomfort with the placement of the device on her head.

Anecdotal reports by treatment staff at the Induction unit also support the overall impression that clients responded favorably to the CES sessions. Treatment staff were asked by a number of clients whether CES would be available in the primary treatment units they would be transferring to once they completed Induction. In some instances, clients who initially expressed no interest in attending CES sessions later changed their minds after hearing from their peers who were participating in the sessions.

## Discussion

### Key finding: overall success of CES

This retrospective chart review sought to determine whether cranial electrotherapy stimulation (CES) could be successfully integrated in a residential drug treatment program, and whether CES provided to newly admitted clients would decrease drop-out rates which are very high during the first several weeks of treatment. We found that CES was well accepted by both clients and treatment staff, and that it could be easily integrated into the treatment regimen. Staff and clients viewed it as an alternative therapy that was similar to meditation but with the addition of small electrical stimulation, and the CES sessions were actually called the “meditation group” by clients and staff alike. This meditation group was integrated into a daily schedule along with psychoeducation, cognitive-behavioral therapy (CBT), and other therapeutic groups.

Another key finding from this retrospective chart review were that clients who participated in CES had better retention rates during their first weeks of treatment in the Induction unit where they received CES, and also that they continued to be retained in primary residential treatment well beyond the Induction phase. Historical retention rates for Phoenix House NYC programs over the past 4 years (2005-2008) show that approximately 62% of clients are retained in treatment for 30 days, 53% are retained for 60 days, and less than half (47%) are retained for 90 days – which many consider to be the minimum retention threshold for treatment effectiveness [14-16]. These historical retention rates have matched those displayed in the large national studies [8, 9, 11].

Because of the current economic climate facing treatment providers, residential programs like Phoenix House are paying much

**Table 3:** Comparison of treatment status between clients who received CES and clients who did not receive CES.

Treatment status	no CES n = 293	received CES n = 99 p
client left against clinical advice	n (%) 119 (40.6)	n (%) 25 (25.3)
administrative discharge for non-compliance	23 (7.8)	7 (7.1)
referred out (medical, psychiatric)	9 (3.1)	1 (1.0)
criminal justice remanded	4 (1.4)	0 (0.0)
completed treatment	8 (2.7)	2 (2.0)
still in treatment as of 8/24/09	130 (44.4)	64 (64.6)

**Table 4:** Client statements commenting on their experience(s) with CES.

Types of statements	#	%
<b>Favorable</b>		
<i>I liked the session(s)</i>	73	38.4%
<i>It helps me relax, reduces stress, is calming</i>	67	35.3%
<i>It helps me sleep better</i>	18	9.5%
<i>It helps me concentrate, focus, clears my mind, helps me think</i>	6	3.2%
<i>I feel better (nonspecific)</i>	3	1.6%
<i>I feel less anxious</i>	2	1.1%
<i>It helps reduce my anger</i>	2	1.1%
<i>It improves my attitude</i>	1	0.5%
<i>I get less headaches</i>	1	0.5%
<i>It helps with my cigarette cravings</i>	1	0.5%
<i>It helps me distract from (physical) pain</i>	1	0.5%
<i>It improves my memory</i>	1	0.5%
	<b>176</b>	<b>92.6%</b>
<b>Neutral</b>		
<i>I feel nothing, it's ok</i>		<b>3.2%</b>
<i>I feel nothing, it's ok</i>		<b>3.2%</b>
<b>Unfavorable</b>		
<i>I want discontinue (reason not specified)</i>	<b>4</b>	<b>2.1%</b>
<i>I had a headache the next morning</i>	<b>1</b>	<b>0.5%</b>
<i>It felt weird; I saw lights</i>	<b>1</b>	<b>0.5%</b>
<i>I don't like the way it feels on my head (physical discomfort)</i>	<b>1</b>	<b>0.5%</b>
<i>I don't like it - painful</i>	<b>1</b>	<b>0.5%</b>
	<b>8</b>	<b>4.2%</b>
	<b>190</b>	<b>100%</b>

more attention to “census issues” and working to increase the number of client-occupied treatment beds. In this current sample, while overall retention rates for 2009 exceeds historical rates (due in large part to regional management’s focus on maintaining high occupancy rates), those clients who participated in CES still exhibited far superior retention rates with over three-quarters (76%) remaining in treatment 90 days or more.

### Study limitations

Because this was a retrospective chart review of data from a pilot implementation, there are a number of questions that need to be addressed by designing a prospective study. In order to test feasibility, we allowed implementation of the CES therapy to develop organically within the natural treatment environment. Except for initial orientation training, treatment staff were not provided with a script for introducing and talking about CES with clients. This may have contributed both to the low number of participants (25% of new clients who completed the 3-day admission process) and to the overrepresentation of female clients among the participants.

Studies show that women are much more likely than men to try alternative therapies such as chiropractic treatment, yoga, meditation, and acupuncture [17,18]. Another limitation was that we did not establish a standard protocol determining how many sessions clients

would optimally be prescribed, or how many days they would be allowed to miss between sessions. This led to wide range of treatment “doses” with clients receiving anywhere from 1 to 11 sessions, and high variability with respect to whether sessions were attended consecutively or with many days in between sessions. Finally, we had not attempted to conduct a prospectively designed study which would have included a control group with random assignment of clients to treatment conditions. We thus cannot rule out the possibility that the CES participants were as a group more highly motivated for treatment and would nevertheless have stayed longer in treatment.

### Directions for future research

Results from this retrospective chart review of the pilot implementation are promising and show that cranial electrotherapy stimulation (CES) can be a very useful adjunct therapy for clients in residential drug treatment, particularly for helping clients stay in treatment. Future study will need to examine the effects of CES on clients’ stress, sleep, concentration, and other factors that may mediate the relationship between CES and retention. Of particular interest to residential drug treatment providers is testing the use of CES and its effect on attenuating cigarette cravings, especially in states such as New York where regulations have banned clients and staff alike from smoking on/near facility premises. After one year of these regulations being in effect, facility directors are still grappling with the problems of contraband cigarettes, treatment drop-out due to inability to smoke, and discharging clients who are in treatment for alcohol or drug problems but violate the no-smoking policy.

Future studies will also need to include random assignment to a placebo control. We are currently investigating one such design using identical CES devices which are modified to not deliver any electrical stimulation. Because of the low stimulus intensity (1 milliampere) of these CES devices, most patients do not report feeling anything during sessions. Patients who are randomly assigned to either the active treatment or the placebo treatment, as well as the treatment staff, will be blind to treatment condition. We will also implement a standardized protocol to examine dose effect, optimal number of sessions, and effect duration.

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