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REDUCING SHERIFF'S OFFICERS' SYMPTOMS OF DEPRESSION USING CRANIAL ELECTROTHERAPY STIMULATION (CES): A CONTROL EXPERIMENTAL STUDY

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This article examines the possibility of reducing depression and anxiety in sheriffs' officers using the Alpha-Stim SCS, a cranial electrotherapy stimulation (CES) unit. The dependent measures were the Beck Depression Inventory (BDI; Beck, 1996), the Beck Anxiety Inventory (BAI; Beck, 1990), and the Brief Symptom Inventory (BSI; Derogatis, 1993), which has both depression and anxiety scales. The treatment group used active Alpha-Stim SCS units to provide electrotherapy stimulation at the minimal therapeutic level (100 uA), while a sham control group of officers used inactive units (electric current was at a non-therapeutic level).

When depression scores from the treatment group were compared to the sham control group, significant improvements on the BSI Depression scale ($p<.01$) and the BDI ($p<.05$) scores were found. Results on the two anxiety scales were non-significant.

Because trends were noted in the remaining BSI scales, a Sign test (trend analysis) was completed. Ten of the remaining 11 BSI sub-scales indicated downward directions of difference ($p=<.01$) in the treatment group when compared to the control group. The finding suggested a broad trend toward reductions in the full range of clinical symptoms.

LITERATURE REVIEW

Research has shown stress levels are high in many criminal justice disciplines including jails, correctional facilities and law enforcement agencies (Van Blarcum, 2008; Scott, 2004; Griffin & Bernard, 2003; Zhao, 2002; Finn, 2000). Anti-anxiety medications, biofeedback, and progressive relaxation therapy are among the traditional techniques used to reduce stress. A relatively new approach for the treatment of stress is CES.

The utility of Alpha-Stim SCS for the treatment of many clinical disorders has a 25-year history of supportive research. For example, there have been over 126 human subject studies, as well as, two meta-analyses establishing the efficacy of CES for treating mental disorders (Kirsch, 2002). In addition, the Alpha-Stim SCS has been cleared by the FDA for treating depression, anxiety, and insomnia. Below is a small sampling of studies where physical and mental disorders were successfully treated using CES.

Business executives Matteson and Ivancevich, (1986), **drug abusers** (Braverman, Smith, Smayda, & Blum, 1990), **alcoholics** (Krupitsky, Burakov, Karandashova, Katsnelson, Lebedev, Grinenko, & Borodkin, 1991), **subjects with migraine headaches** (Broatman, 1989), **outpatients with clinical levels of anxiety** (Overcash,1999), **the violent mentally retarded** (Childs, 2005) and **hospitalized patients** (Passini, Frank, Watson, & Herder, 1976) with a variety of mental health diagnoses, have all been treated successfully with CES.

In most studies reviewed in this article, mental health assessments were used for dependent variables. However, two of the studies employed biological measurements: EEG P-300 brainwaves; the MAO-B (an enzyme that slows break down of dopamine) and the neurotransmitter (Gama-aminobutric acid or GABA). One additional study used biofeedback instrumentations.

As noted by Matteson and Ivancevich (1986), corporate middle management supervisors frequently report significant levels of stress. These mid-management supervisors, who were also pursuing MBA degrees at the University of Houston, formed the treatment group of a CES study. The CES was found to produce reductions in state anxiety, trait anxiety, depression, anger, fatigue, confused thinking, hostility, and a sense of dejection. In juxtaposition, the subjects reported increased energy, fewer health complaints, less sleep problems, less stress, and greater reductions in tension.

Outpatients (N=197) reporting high levels of anxiety were subjects in Overcash's (1999) research. While most did not have histories of treatment for their anxiety (58%), about 26% had been refractive to anti-anxiety medications. All subjects completed pre-post self-assessments. Subjects were divided into three treatment groups using different pre- post-treatment biological measures:

Group 1: electromyogram (EMG)
Group 2: electrodermal response (EDR)

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Group 3: peripheral digit (middle finger) temperature (hand-thermal biofeedback)

Pre- post-treatment assessments found significant reductions in subject stress levels in biological, as well as, psychological measures. At follow-up, 73% of the subjects were "well satisfied" with their treatment outcomes. In another study (Brotman,1989), significant reductions in migraine headache symptoms were observed when a combination of CES and Quieting Reflex Training was utilized.

CES was also effective with inpatient volunteers. In this early study by Passini et al. (1976), subjects (N=60) with a wide range of mental health disorders responded well to CES treatment. Their disorders included alcohol and drug dependence, manic-depressive episodes, organic brain disorders, and anxiety neurosis. The volunteer subjects were treated for anxiety and depression with the goal of increasing coping skills and energy. The subjects, while still on psychotropic and other medications, experienced significant reductions in depression and anxiety. No side-effects were reported by the researchers.

One biological marker for high-risk drug abuse is the presence of low P-300 waves on the EEG. Braverman et al. (1990) used CES to treat substance abusers and found significant increases in P-300 amplitudes secondary to treatment. Specifically, there were positive changes in the Alpha, Beta, Delta, and Theta bandwidths. These results suggested CES produced positive global changes in the patients' cortical functioning and thus may have greater applicability than just depression, anxiety, and insomnia. There were no corresponding amplitude increases in the control group.

At the biochemical level, low concentrations of MAO-B (enzyme) and GABA (neurotransmitter) have been reported in alcoholic populations. The GABA is the main neurotransmitter that supports a person's ability to inhibit hostile emotions and actions. MAO-B works with neurotransmitters to strengthen a person's inhibitory response. Low levels of GABA and MAO-B weaken the inhibitory response and can lead to increased anxiety and depression, which can increase the likelihood of relapse. Krupitsky et al. (1991) found CES increased GABA and MAO-B levels in substance abusers. This increase in patient's blood levels provides patients with greater ability to control their anger and aggressive behaviors. The GABA and MAO-B levels in the control group did not increase.

While many studies looked at CES as a treatment for various mental disorders, only three (Childs, 2005; Childs, 1995; Mellen & Mitchell, 2008) have demonstrated its utility in reducing violent behavior, an issue of particular concern in the criminal justice field. In other areas, such as using CES to reduce correctional officer stress, no studies have been published.

METHOD

Research Question

Would the application of CES reduce depression and anxiety in a county sheriff's jail security and patrol officers?

Subjects

The subjects were 21 volunteer officers from the sheriff's staff. These included jail security, patrol officers, investigators and administrators. Eleven officers were males, and 10 were females. Subjects were randomly assigned to either the treatment or control groups and were blind to group assignments.

Apparatus

The CES unit utilized in the present study was the Alpha-Stim SCS produced by Electromedical Products International, Mineral Wells, Texas. The unit is hand held (10 cm height; width is 7.5 cm; 2.3 cm depth) and uses a standard 9 volt battery to generate the appropriate current level. It is about the size of an early I-Pod and comes with two ear clips, one for each ear lobe that deliver the electrical current. In non-research settings, the range of electrical current is determined by the subject using a side-dial. The therapeutic range is from 100 to 500 uA (micro-amps). One hundred uA is the lowest therapeutic level and is approximately 80% as effective as the maximum 500 uA. Two timing settings are built into the Alpha-Stim, 20 minutes and 1 hour; however, it can be used for any time period.

While using the Alpha-Stim, the officers went about their daily office tasks. However, driving a car or heavy equipment is not recommended while using the Alpha-Stim. While it is not intended to replace pharmacological interventions, it can be highly effective, substantially less expensive and will generally produce fewer and less severe side-effects than many medications.

As Giordano (2006) reported, the "microcurrent waveform activates

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particular groups of nerve cells that are located at the brainstem These groups of nerve cells produce the chemicals serotonin and acetylcholine which can affect the chemical activity of nerve cells at nearby and more distant sites in the nervous system" (see Figure 1). These actions modulate the brain and encourage the production of Alpha waves which help an individual focus and remain relaxed, an excellent mental state for handling stress. As the picture below demonstrates, the Alpha-Stim modulates brain activity by increasing serotonergic activity (5-HT). This increase enhances the Alpha (8-13 Hz) bandwidth necessary for a relaxed and focused mental state. In juxtaposition, it also inhibits cholinergic and noradrenergic systems which are involved in the production of agitation and aggression (see Figure 1). It appears, at this time, that the Alpha-Stim SCS may be producing a more global modulation effect on the brain than the more targeted effects of pharmacological treatments.

Dependent Variables

The BDI, BAI, and BSI were used as dependent variables. The BAI and BDI are both single dimensional assessment instruments.

The BSI is composed of a depression and an anxiety scale as well as measures of seven additional clinical scales. It also has three global scales. The BSI clinical scales are:

Somatization: measures stress from physical ills.

Obsessive/Compulsive: measures thoughts and/or actions that are unremitting and unwanted.

Interpersonal Sensitivity: measures feelings of inadequacy and self-deprecation.

Depression: measures symptoms of clinical depression such as dysphoria, and a lack of motivation.

Anxiety: measures symptoms such as nervousness, tension, apprehension, and panic.

Hostility: measures anger and other related negative feelings.

Phobic Anxiety: measures irrational fears and avoidant behaviors.

Paranoid Ideation: measures suspiciousness, delusions, hostility, and thought projection.

Psychoticism: measures withdrawal, interpersonal alienation, psychosis, and thought dysfunctions.

The three BSI global scales are:

Global Severity Index (GSI): it is the most sensitive indicatory of stress and like the other global scales, draws data from a number of the clinical scales.

Positive Symptom Total (PST): this scale gives the total number of symptoms endorsed by the test taker.

Positive Symptom Distress Index (PSDI): this scale provides information on a patient's tendency to minimize or exaggerate stress by the subject.

Administration of Treatment

Subjects in both the treatment and control groups completed 20 sessions using the Alpha-Stim SCS, and each session lasted 20 minutes. The Alpha-Stim units were loaned to the experimenters by Electromedical Products International, Inc. The experimental and control group units were factory pre-set at the lowest therapeutic level (10 uA) preventing manipulation by subjects. The control group received a non-therapeutic level of current. The time of day for treatment was set by individual subjects and all sessions were completed while the officers were on-duty. All treatment and control group members received a $20 Wal-Mart gift certificate upon completion of 20 sessions and post-treatment assessments.

Only one subject was removed from the study. After the third session, the subject reported increased levels of agitation secondary to treatment. The literature was reviewed, covering approximately 5,000 subjects, and one similar incident has been reported.

Pre-assessments were administered 2 days before treatments began. Because officers completed their treatments on different days, post-assessments were taken the week following each subject's final treatment session.

Hypotheses

Two tiers of hypotheses were tested. The first tier of four hypotheses compared the treatment group with the sham control group:

1. The treatment group, compared to the sham control group, will have lower BSI anxiety scores.
2. The treatment group, compared to the sham control group, will have lower BSI depression scores.
3. The treatment group, compared to the sham control group, will have lower BAI anxiety scores.
4. The treatment group, compared to the sham control group, will have lower depression scores.

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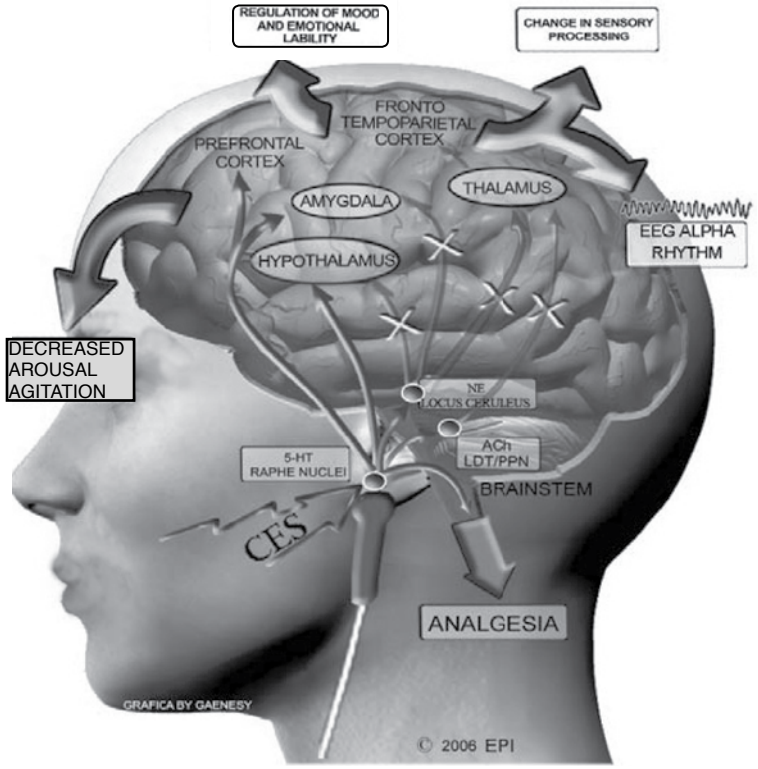

FIGURE 1: Pathways Activated and Inhibited by CES*

The above arrows indicate electro-current pathways in cortical and sub-cortical areas. CES not only activates areas of the cortex that calm a person down, but the "Xs" above present cortical and sub-cortical areas in which CES inhibits the thalamo-cortical activity which contributes to arousal and agitation (cholinergic and noradrenergic systems). *Electromedical Products International granted permission for the use of this picture.

TABLE 1: Comparisons of Mean Differences and Standard Deviations For Focal Group Versus Sham/Control Group Across BSI Sub-Scales

BSI Sub-Scales	M Focal	SD	M Sham/Control	SD	t-value (df=19
SOM	.258 **	(.219)	.197 ‡	(.293)	0.51 n.s.
OC	.640 *	(.973)	.223 *	(.301)	1.54 n.s.
IS	.432 n.s.	(.929)	.075 n.s.	(.290)	1.15 na
DEP	.516 *	(.638)	-.138 n.s.	(.369)	2.77**
ANX	.439 n.s.	(.834)	.103 n.s.	(.601)	1.01 n.s.
HOS	.654 ‡	(1.050)	.268 n.s.	(.620)	0.99 n.s.
PHO	.164 n.s.	(.644)	.240 n.s.	(.440)	0.30 n.s.
PAR	.442 n.s.	(.906)	.320 **	(.215)	0.41 n.s.
PSY	.363 ‡	(.564)	.060 n.s.	(.280)	1.50 n.s.
GSI	.423 *	(.576)	.197‡	(.281)	1.10 n.s.
PST	9.366 *	(11.587)	2.800 n.s.	(6.620)	1.53 n.s.
PSDI	.372 *	(.496)	.026 n.s.	(.383)	1.71 n.s.
BECK A/I	4.636 ‡	(8.200)	4.800*	(6.560)	0.06 n.s.
BECK D/I	5.360 **	(5.32)	-.100 n.s.	(4.200)	2.49*

‡ p < 05 (1-tailed); *p<.05 (2-tailed); **p<.01

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RESULTS

As seen in Table 1, results of the two depression scales, BSI and BDI, confirmed Hypotheses 2 and 4. Hypotheses 1 and 3, regarding anxiety, were not supported. In Table 2, the results of the trend analysis (Sign test) are provided. The p <.01, demonstrated a strong trend toward reductions in all symptoms but two, BSI Phobia and BAI.

TABLE 2: Sign Test—Comparisons of Mean Scores for Focal Group Versus Sham/Control Group Across BSI Sub-Scales

BSI Sub-Scales	M Focal	M Sham/Control	M Differences	Direction of Differences
SOM	.258	.197	.060	Down
OC	.640	.223	.417	Down
IS	.432	.075	.357	Down
DEP	.425	-.138	.563	Down
ANX.	.561	.103	.458	Down
HOS	.655	.268	.387	Down
PHOB	.164	.240	.076	Up
PAR	.442	.320	.122	Down
PSY	.273	.060	.213	Down
GSI	.317	.197	.120	Down
PSI	9.360	2.800	6.560	Down
PSDI	.372	.026	.346	Down
Beck (BAI)	4.360	4.800	.440	Up
Beck (BDI)	5.360	-.100	5.460	Down

Number of differences down = 12; Number of differences up = 2;
Number of ties = 0;
Sign test: p < .01

DISCUSSION

Statistically significant results were found on both measures of depression (BDI, p<.05 and BSI, p<.01), and a Sign test demonstrated a very strong trend (p.<01) toward a reduction in other BSI symptoms. In the broadest sense, these results may support the theory that the Alpha-Stim SCS has a global modulating effect on brain dysfunctions. Officers struggle with many emotional issues and these results suggest CES may produce benefits, as noted below.

With reduced depression, officers could have more energy for productive activities, as opposed to spending energy worrying and/or feeling lethargic. Such a change could improve their effectiveness at work and at home.

Reductions in other scales could have ramifications for officers' quality of life both on the job and at home. The lower Somatization scores may reflect CES's ability to provide officers' an improvement in their general sense of physical well being.

Reductions in Psychoticism would increase cortical control. Cortical control means officers would be better able to use logic-based thinking processes to control their emotions when dealing with highly intense jail situations.

Changes in the Obsessive/Compulsive scores may reflect reductions in excessive checking and double checking, as well as a feeling of being blocked by obsessive thinking patters. Such changes could lead to improved decision making.

With lower scores on Hostility, one could anticipate improved ability to handle the inherent challenges in their jobs and reduce the risk of officers over reacting.

Reductions in Interpersonal Sensitivity scores means officers experienced reduced feelings of alienation translating into a better workplace environment for the officer and his/her colleagues.

While officers must be vigilant, higher scores on Paranoia suggests a level of personal concern that goes beyond vigilance. Reducing

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these scores would help officers maintain the healthier levels of watchfulness. All three global stress indexes indicated reductions in stress for the officers.

Overall, the results were positive regarding depression scores and Sign test results. Results may have been stronger had the level of treatment not been permanently set at 10 uA. Also, the small N made achieving a statistically significant difference difficult. Finally, while the officers in this study had problems secondary to stress, their issues did not achieve clinical levels. The ability of CES to bring about change seems to increase as the severity of a patient's psychological dysfunction increases.

Results suggest a follow-up study using a larger sample could produce even stronger evidence for the utility of CES as an inexpensive and effective treatment for reducing stress in law enforcement officers. The Sign test revealed a reduction in BSI measured anxiety, but not with the BAI.

REFERENCES

Beck, A. (1990). *Beck Anxiety Inventory*. San Antonio, TX: The Psychological Corporation.

Beck, A. (1996). *Beck Depression Inventory*. San Antonio, TX: The Psychological Corporation.

Braverman, E. Smith, R., Smayda, R., & Blum, K. (1990). Modification of P-300 amplitude and other electrophysiological parameters of drug abuse by cranial electrical stimulation. *Current Therapeutic Research. 48*, 586-596.

Brotman, P. (1989). Low-intensity transcranial electro-stimulation improves the efficacy of thermal biofeedback and quieting reflex training in the treatment of classical migraine headache. *American Journal of Electromedicine, 6,* 120-123.

Childs, A. (1995). Droperidol and CES in Organic Agitation, Clinical Newsletter, Austin Rehabilitation Hospital.

Childs, A. (2005). Cranial Electrotherapy Stimulation reduces aggression in a violent retarded population: a preliminary report. *The Journal of Neuropsychiatry and Clinical neurosciences, 17*, 548-551.

Derogatis, L. (1993), *Brief Symptom Inventory,* Minneapolis, MN: National Computer Systems.

Finn, P. (2000), Issues and practices: Addressing correctional officer stress: Programs and strategies, Washington, DC: U.S. Department of Justice, National Institute of Justice.

Giordano, J. (2006), How Alpha-Stim Cranial Electrotherapy Stimulation (CES) works. From brochure published by Electromedical Products international, Inc., Mineral Wells, Texas.

Griffin, S., & Bernard, T. (2003). Angry aggression among police officers. *Police Quarterly, 6*, 3-21.

Kirsch, D. (2002). *The science behind cranial electrotherapy stimulation*. Edmonton, Alberta: Canada, Medical Scope Publishing Co.

Krupitsky, E., Burakov, A., Karandashova, G., Katsnelson, J., Lebedev, V., Grinenko, A., & Borodkin, J. (1991). The administration of transcranial electric treatment for affective disturbances therapy in alcoholic patients. *Drug and Alcohol Dependence, 27*, 1-6.

Matteson, M., & Ivancevich, J., (1986). An exploratory investigation of CES as an employee stress management technique. *Journal of Health and Human Resource Administration*, *9*, 93-109.

Mellen, R., & Mitchell, S. (2008). Cranial Electrotherapy Stimulation: A case study. *The Correctional Psychologist, 40,* 4-8.

Overcash, S. (1999). A retrospective study to determine the efficacy of Cranial Electrotherapy Stimulation (CES) on patients suffering from anxiety disorders. *American Journal of Electromedicine. 16*, 49-51

Passini, F., Frank, G., Watson, C., & Herder, J. (1976). The effects of cerebral electric therapy (electrosleep) on anxiety, depression, and hostility in psychiatric patients. *Journal of Nervous and Mental Disease. 163*, 263-266.

Scott, Y. (2004). Stress among rural and small-town patrol officers: A survey of Pennsylvania municipal agencies. *Police Quarterly*, *7*, 237-261.

Van Barcum P. (2008). Critical Incident Stress Management Team, Ulster County Sheriff's Office, Ulster County, New York.

Zhao, J. (2002). Predicting five dimensions of police officer stress: Looking more deeply into organizational settings for sources of police stress. *Police Quarterly*, *5*, 43-62.

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ASSOCIATION UPDATES

CONGRATULATIONS DR. EDWIN I. MEGARGEE

In your former role as President of our Association, and for over 40 years as a teacher and researcher, your seminal contributions to psychology and criminal justice have benefited forensic psychologists, other mental health and correctional workers, students and research colleagues around the world.

In honor of your lifetime of contributions to our field, and on behalf of the members and Directors of the International Association for Correctional and Forensic Psychology (IACFP), we are extremely proud to confirm the beginning of what we expect will be a long series of lectures in your name.

The series is titled: *The Dr. Edwin I. Megargee Honorary Lecture Series,* and is scheduled to take place each year at the International Community Corrections Association's (ICCA's) Annual Research Conference.

The first lecture, *The Use of Risk and Needs Assessment in Evidence-Based Sentencing*, was the featured event at the ICCA luncheon banquet, October 20, 2008, at the Millennium Hotel in St. Louis, MO. The speaker was the Honorable Michael Wolff, a sitting Justice and former Chief Justice of the Missouri Supreme Court.

DOCTOR ROBERT R. SMITH PRESENTS

Doctor Robert R. Smith, *The Correctional Psychologist (TCP)* Executive Editor, presented the keynote address for the Alabama Department of Corrections Executive Leadership Conference, November 12-14, 2008, in Huntsville, Alabama. Smith's keynote was titled: *Integrity and the Importance of Valuing Every Human Being.* He also conducted two workshops at the conference, one on Rational Cognitive Therapy, a therapy that he and his colleague, Dr. Victor S. Lombardo, *TCP* Associate Editor, co-founded, and another workshop on behavior modification