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Original Article

First Responder Research Shows that Electrical Brain Stimulation Helps Control Anxiety, Insomnia, and Depression

Kathy Platoni[1], Rick Oakley[2], Steven G Haltiwanger[3*], Tracey B Kirsch[3], Jeff Marksberry[3] and Larry R Price[3,4]

[1]Private practice in Centerfield, Ohio and Dayton SWAT, City of Dayton

[2]Ohio Police Department, Dayton, Ohio, USA

[3]Electromedical Products International Inc., Texas, USA

[4]Department of Psychometrics and Statistics, Southwest Texas State University, San Marcos, Texas, USA

*Corresponding author: Steven G Haltiwanger, Electromedical Products International Inc., Texas, USA, Tel: 940-328-0788; E-mail: steve@epii.com

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Abstract

This study was designed to investigate the effectiveness of Alpha-Stim® cranial electrotherapy stimulation (CES) in a group of 86 first responders for the treatment of anxiety, insomnia, depression, and pain. The study included a nonrandomized pretest-posttest design with participants choosing to participate or not (i.e., self-selecting into participation). The independent (treatment) variable in this study was exposure to active cranial electrotherapy stimulation. Participants were instructed to use the Alpha-Stim at a comfortable current intensity level adjustable from 100-600 microamperes for 20-60 min daily. The frequency of the waveform was set by the manufacturer to be constant at 0.5 Hz. At pretest (baseline) and posttest, data on outcome measures included perceived level of discomfort specific to the following indications (a) anxiety, (b) insomnia, (c) depression, and (d) pain.

The instrument used by participants for reporting their perceived level of anxiety, insomnia, depression, and pain was a downloadable smartphone app. This app used an 11-point scale expressed as values of 0-10. A value of zero (0) signified an absence of the condition and a value of ten (10) signified a very high level of discomfort of the condition as perceived by participants. The statistical analyses of the results revealed highly significant (p values<.001) for anxiety, depression, insomnia, and pain. The effect size Cohen's d values were large for all outcome measures indicating a high level of practical change from baseline to posttest, which supports the capability of Alpha-Stim CES technology in reducing anxiety, insomnia, depression and pain symptoms and the ability to monitor progress on the Alpha-Stim app.

Keywords: Cranial electrotherapy stimulation; Alpha-Stim®; Anxiety; Depression; Insomnia; Pain; First responders

Introduction

Responding to crises is an everyday occurrence for some people in our society who we call first responders. First responders will inevitably encounter traumatic events, which are also known as critical incidents many times during their career [1].

Traumatic events can be defined as an experience where a person perceives a threat of death or serious injury to self or others with emotional responses of fear, sadness, anger, disgust, and horror. The autonomic nervous system kicks in raising both heart rate and blood pressure [2].

Exposure to traumatic events will produce psychological and biological reactions both at the time and delayed reactions following exposure. Any strong emotional response, when it persists, can lead to irritability, hyper vigilance, feeling overwhelmed, becoming emotionally over reactive, avoidant, isolating, fatigued, depressed and having disrupted sleep [3].

When under stress some individuals cannot turn off their brains and go to sleep. The mind rewinds a day's events, recalls past events and at times thoughts just seem to race through the head rapidly switching from one idea/image to another. A person awakens feeling unrested and tired and may progress to a chronic sense of fatigue.

Coping with tragic memories, that can haunt, is another burden that first responders also face. Symptoms of insomnia, anxiety, and depression are common for first responders who may become emotionally upset about events countered on the job.

Routine work stresses combined with critical incident exposure create a cumulative pattern of both psychological and physical distress [4]. Long work hours associated with chronic sleep and fatigue can all combine to physically and emotionally exhaust first responders.

How are first responders affected by trauma?

First responders are at high risk for physical illnesses such as cardiovascular disease and chronic pain. They also have an increased risk of stress-related psychological problems. Some avoid working yet others work longer hours to keep themselves distracted. Studies of first responders have found that increased use of sick leave, increasing negativity, detachment and withdrawal from coworkers are common responses to chronic stress [5]. Also, irritability, headaches, fatigue, anxiety, depression, insomnia, suicidal thoughts, substance abuse, and increased risk-taking may also occur [6].

When anxiety dominates a first responder's life, it makes them fearful that they are not normal, so they often conceal it from others and themselves. They wind up suffering in silence. They know they have a job to do and many think they are weak if they ask for help. So, they just hide and deny their emotions and try to deal with it alone. Unfortunately, they just cannot lock up their emotions and just duct tape themselves together. If a person does not deal with overwhelming emotional problems, they come out in other ways. Their mind is at war with itself, and they struggle and become tired of not being able to function in life fully. Sometimes fear chokes them, and they become scared because they do not want to hurt themselves or others.

The occupations of first responders expose them to many traumatic events (incidents) throughout a career. Exposure to a cumulative set of traumatic experiences will result in physical, psychological and behavioral repercussions in a significant percentage of first responders. When ineffectively addressed these responses result in a decline in workplace efficacy and human toil. Strategically it makes sense to have plans and methods in place to address these issues.

Recognition of the physical and psychological problems that first responders inevitably face has resulted in institutional programs being implemented around the country to help provide preparative, supportive and treatment measures. Preparedness training includes resiliency programs, exercise programs, coping skills training, and the practice of mindfulness. Mindfulness involves being in the moment, becoming nonreactive and developing nonjudgmental awareness [7]. Preparedness training can also include education about mental health making first responders' aware of resources available. One of the most effective supportive measures is participation in a peer support group [5].

When mental health issues begin to create distress

the current treatment approach typically consists of mental health counseling and psychiatric drugs. Although drugs can help some percentage of first responders, side effects of weight gain, sexual dysfunction, and sedation can be intolerable for some individuals. Also, medications do not work for everyone and can take 6 to 8 weeks to be effective.

Why are first responders hesitant to seek help?

Many first responders will experience feelings of shame, fear of disapproval by peers and fear of having their career impacted negatively. It is common for first responders to repress their feelings and pretend to be fine hiding the fact that they are not fine. Some fear that they are letting their comrades down by not being strong enough [8].

First responders often have misconceptions about counseling. They do not want to appear weak, they do not want to go to a counselor who they think could not possibly understand how they feel, and they do not want to see a counselor and have somebody tell them how they should feel. Surveys of first responders also identify that many first responders avoid mental health counseling because of fear of retribution, stigmatization, and being labeled [9].

New technology adds to preventative measures

A 38-year-old technology is making its way from the military into the hands and onto the ears of first responders. Alpha-Stim® is a cranial electrotherapy stimulator (CES) cleared by the FDA for treatment of anxiety, insomnia, and depression [10]. It works by simply clipping two electrodes to the earlobes and wearing for 20-60 minutes. The technology is safe with minimal side effects usually limited to temporary dizziness and skin irritation.

Electromedical Products International (EPI), the manufacturer of Alpha-Stim cranial electrotherapy stimulators, is located in Mineral Wells, Texas Since EPI was started in 1981 over 100 clinical research and mechanistic Alpha-Stim studies have been conducted by independent researchers, many of them double-blind, and most done at American universities. These studies have studies demonstrated the effectiveness of this technology in anxiety, insomnia, and depression. Post-market surveillance has demonstrated that this CES therapy is often as effective as antianxiety, antidepressant medications without the side effects of drugs [11]. Alpha-Stim CES is safe and proven to work in real-world experiences in groups ranging from active military, veterans, teachers, firefighters and correctional officers both in the USA and the UK [11-12].

In 2008, Ronald Mellen published a study where he examined the ability of Alpha-Stim CES as a treatment to reduce stress-related symptoms of anxiety, insomnia, and depression in security and patrol officers at a rural sheriff's jail. The analysis of the study was that "… 11 of the 14 scales had significant main-effects when pretest and posttest results from the experimental group were compared [13]." One way to look at Alpha-Stim CES is to consider it as Rebalancing the nervous system.Since,the nervous system can also get out of balance with repeated stress.

When stress is chronic or repeated the body will activate its sympathetic branch of the autonomic nervous system. A person will go into a fight or flight mode with the heart rate and blood pressure rising. Well, this is okay if after the dangerous situation is over, there is time to calm down, but when the troubles just keep coming the nervous system will reset into a chronic stress mode. When the stress is prolonged, it begins to damage both physical and mental health. When chronic stress is a problem, Alpha-Stim CES has been proven in over 100 studies to be a valuable tool in rebalancing/readjusting [14].

Users of Alpha-Stim CES report that the reduction in anxiety makes them feel like they have control again. It gives them a piece of their life back. Many people will not believe it until they just give it a try. The goal of use is to help gain control of anxiety, insomnia, and depression.

Unfortunately, many officers are first responders unarmed and underequipped when it comes to dealing with anxiety insomnia and depression. Burnout from untreated stress is a common reason why many first responders quit, which is why having effective techniques to treat the symptoms of burnout like anxiety, insomnia, depression, and pain are crucial.

Methods

In 2018, a six-week study was completed at 4 locations. Seventy-six law enforcement first responders from

the Mineral Wells, Texas Police Department, Palo Pinto County Sheriff's Department, and Dayton, Ohio Police Department as well as ten members of the Mineral Wells, Texas Fire Department participated. A nurse practitioner gave participants a health screening after receiving approval to conduct the study and signing informed consent. A licensed clinical psychologist conducted training with participants on how to properly use the Alpha-Stim CES device. The instructions were to attach the Alpha-Stim electrode ear clips soaked in a conducting nontoxic mineral solution to the ear lobes. Participants were instructed to adjust the current intensity level to a comfortable level from 100- 600 micro amps microamperes for 20-60 minutes daily. The frequency of the waveform was set by the manufacturer to be constant at 0.5 Hz for the entire course of the study. The manufacturer of Alpha-Stim, Electromedical Products International Inc., donated the devices that participants were allowed to keep for participating in the study. All personal data was coded to ensure confidentiality.

The instrument used by participants for reporting their perceived level of anxiety, insomnia, depression, and pain was a smartphone app. This app used an 11-point scale expressed as values of 0-10. A value of zero (0) signified an absence of the condition and a value of ten (10) signified a very high level of discomfort of the condition as perceived by participants.

Prior to first use pretest (baseline) measures were recorded as self-reported levels of discomfort specific to levels of' anxiety, insomnia, depression, and pain. During the six-week study, the participants used the mobile smartphone app, to monitor themselves at least five days per week. Participants were permitted to use the device any time of day and for any indication. At the end of six weeks, they were asked to complete a survey of perceived effectiveness.

Results

Analysis of the results was done by measuring the differences between the pretest and posttest mean of the participants. For anxiety the pretest mean was 4.18 and the posttest was 1.93 producing a reduction in anxiety of 54% with a p-value<.001 (two-tailed), and effect size Cohen *d*=1.21 (large). Similar results were seen in insomnia with a pretest mean of 5.70 and posttest mean of 3.80 for a reduction of 33% with a p-value<.001 (two-tailed), and effect size *d*=1.18 (large), depression measures were a pretest mean of 3.95 and posttest mean of 2.83 for a reduction of 28% with a p-value<.001 (two-tailed), and effect size *d*=.81 (large) and the pain pretest mean was 4.62 and posttest mean of 2.58 for a reduction of 44% with a p-value<.001 (two-tailed), and effect size *d*=.72 (large). These 86 police officers, sheriff's officers, and firefighters experienced a very significant decrease in anxiety, insomnia, depression, and pain by using Alpha-Stim® CES.

Table 1 provides the results of dependent t-tests for the five outcome measures for first responders. The results

Table 1: Differences for Measures between Pretest and Posttest - First Responders.

	Baseline		Posttest			
Measure	**M**	**SD**	**M**	**SD**	**t (df)**	**d**
Insomnia (N=25)	5.7	2.25	3.8	3.05	17.53 (24)***	1.18
Pain (N=15)	4.62	1.72	2.58	2.08	5.37 (14)***	0.72
Anxiety (N=66)	4.18	2.27	1.93	1.94	35.71 (72)***	1.21
Depression (N=22)	3.95	1.7	2.83	1.42	10.30 (21)***	0.81

Note. *** p<.001. d=Cohen's d effect size based on the standardized difference between pretest and posttest means.Values are in standard deviations and are interpreted as .01-.20=small; .30-.59=medium; .60-1.49=large; >1.50=very large.

in Table 1 illustrate the statistical significance and practical effect (Cohen's *d*) of CES on the reduction of insomnia, pain, anxiety depression and stress. Notably, effect size values were greater than two standard deviations for all outcome measures indicating a high level of practical change from baseline to posttest beyond only a statistical one.

Discussion

The statistical analyses revealed highly significant (p values<.001) for anxiety, depression, insomnia, and pain. The effect size Cohen's d values were large for all outcome measures indicating a high level of practical change from baseline to posttest, which supports the capability of Alpha-Stim CES technology in reducing anxiety, insomnia, depression and pain symptoms and the ability to monitor progress on the Alpha-Stim app. No complaints were made by participants except mild dizziness that resolved during a session when the current was adjusted down to a lower intensity. This study supported the hypothesis that the use of a smartphone application could be useful in helping individuals track their response to Alpha-Stim CES and in tracking their progress over time.

Limitations

Despite the excellent results several observations were made as to study design that limited the conclusions of the study. The study was not blinded, and no control group was included. This study used a self-selected group of participants who all used the active device. Time of year may be an unforeseen factor in that stress and symptoms of anxiety and depression may vary based on demands of the job and time of year. The study may have taken place during a period when stress was likely to be decreased/increased, and this factor may have influenced results.

Conclusion

Our study determined that Alpha-Stim CES technology is an effective treatment in reducing symptoms of anxiety, insomnia, depression, and pain in first responders. CES offers a cost-effective alternative approach with few side effects to improve the emotional well-being of first responders and to decrease the presence or intensity of anxiety, insomnia, depression, and PTSD. Therefore, a proactive approach of rebalancing the nervous system with Alpha-Stim CES has the potential of being well accepted as non-threatening as well as therapeutic. Larger future randomized controlled clinical trials are needed to further test the benefit of CES in chronically stressed first responders.

Disclosures

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