

[Integr Physiol Behav Sci.](#) 1999 Jan-Mar;34(1):43-53

A study of the effects of cranial electrical stimulation on attention and concentration.

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There have been several anecdotal accounts that cranial electrical stimulation (CES) enhances attention and the ability to learn new tasks in a normal population, but only one published investigation confirms that CES improves attention using the Alpha Stim CES (Madden and Kirsch, 1987). The purpose of this study was to corroborate the findings of Madden and Kirsch, using more precise measures of attention, such as a Continuous Performance Test (CPT). A pretest and posttest CPT was given to two groups using the LISS CES device. The control group consisted of twenty-one subjects who received the placebo treatment. The experimental group of thirty-one subjects received twenty minutes of CES. Four measures of the CPT show significant gains in attention: Number of Hits, $p = .010$ Hit RT ISI Change, $p = .016$, Risk Taking, $p = .055$; and Attentiveness, $p = .054$. Based on subjects who demonstrated improvement by one standard deviation on two different measures of the CPT, thirty-one percent of the experimental group improved versus four percent of the control group. The use of CES as a method of increasing attention is a promising area that requires further investigation.

PMID: 10381164 [PubMed - indexed for MEDLINE]

[IEEE Trans Biomed Eng.](#) 1996 Sep;43(9):939-43.

Potential and current density distributions of cranial electrotherapy stimulation (CES) in a four-concentric-spheres model.

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Cranial electrotherapy stimulation (CES) has been successfully used for treatment of many psychiatric diseases. Its noninvasive nature is its major advantage over other forms of treatments such as drugs. It is postulated that the low electric current of CES causes the release of neurotransmitters. However, the current pathways have not been extensively investigated. In the following paper, analytical and numerical methods are used to determine the distribution of potential and current density in a four zone concentric spheres model of the human head when excited by two electrodes diametrically opposite to each other. Because of the azimuthal symmetry, which is assumed in this study, a two-dimensional (2-D) finite difference approximation is derived in the spherical grid. The current density distribution is projected around the center of the model, where the thalamus is modeled as a concentric sphere. All dimensions and electrical properties of the model are adapted from clinical data. Results of this simulation indicate that, in contrast to previous beliefs, a small fraction of the CES current does reach the thalamic area and may facilitate the release of neurotransmitters.

PMID: 9214809 [PubMed - indexed for MEDLINE]

[Expert Rev Neurother.](#) 2007 Dec;7(12):1785-9.

Neurostimulation in primary headache syndromes.

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Neurostimulation therapy involves the use of peripheral or central nerve electrical stimulation approaches for the treatment of medically intractable headache. Currently, for peripheral stimulation the main approach is that of occipital nerve stimulation, while for central stimulation deep-brain approaches with the target of the region of the posterior hypothalamic gray matter have been explored. Target conditions include migraine and the trigeminal autonomic cephalalgias: cluster headache, paroxysmal hemicrania and short-lasting unilateral neuralgiform headache attacks with conjunctival injection and tearing/cranial autonomic features (SUNCT/SUNA), as well as hemicrania continua. The initial results are encouraging and given the very significant disability of medically intractable primary headaches, this is a very promising area for patients and physicians alike.

PMID: 18052770 [PubMed - indexed for MEDLINE]

[Biol Psychiatry.](#) 1990 Oct 15;28(8):650-6.

Transcutaneous electrical stimulation with Limoge current potentiates morphine analgesia and attenuates opiate abstinence syndrome.

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Transcutaneous electrostimulation is a somewhat controversial technique used in the management of the opiate withdrawal syndrome. We report an animal study of a particular transcutaneous electrostimulation called transcutaneous cranial electrostimulation, based on a technique used for many years on heroin addicts for the rapid severance of their addiction, which has been validated in a clinical setting by a double-blind trial. This technique involves the application of an intermittent high-frequency current (Limoge's current). Our experimental data show that this transcutaneous cranial electrostimulation increases morphine analgesia by threefold on the tail flick latency measure and produces a 48% attenuation of the abstinence syndrome observed after abrupt cessation of morphine administration. These results were obtained using a double-blind paradigm.

PMID: 2173629 [PubMed - indexed for MEDLINE]

[Alcohol Clin Exp Res.](#) 1986 Mar-Apr;10(2):158-60.

Cranial electrotherapy stimulation as a treatment for anxiety in chemically dependent persons.

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Cranial electrotherapy stimulation (CES) is reported to be an effective treatment for anxiety, a major presenting symptom among chemically dependent patients. In this study, 40 inpatient alcohol and/or polydrug users were given CES or sham CES in a double blind design. An additional 20 patients served as normal hospital routine controls. Dependent measures of anxiety were the Profile of Mood States, the Institute for Personality and Ability Testing Anxiety Scale, and the State/Trait Anxiety Index. CES-treated patients showed significantly greater improvement on all anxiety measures than did either control group. There were no differences in response between older and younger patients, or between the primarily drug or alcohol abusers. No placebo effect was found on any of our measures. It is concluded that CES is a clinically significant addition to the treatment regimen for this patient population.

PMID: 3521373 [PubMed - indexed for MEDLINE]

[Ter Arkh.](#) 1992;64(1):24-7.

[Cranial electrostimulation--a new nondrug method of treating the initial stage of hypertension]

[Article in Russian]

[Podzolkov VI](#), [Mel'nikova TS](#), [Suvorova IA](#), [Churganova LIu](#), [Starovoïtova SP](#).

The authors relate the data on the hypotensive effect and procedure of cranial electric stimulation (CES). The method was applied to the treatment of 66 patients aged 20-40 years suffering from stage I essential hypertension (EH) (WHO classification). To provide clinical and physiological evidence for CES, the EEG and ECG were recorded. In addition, computer was employed to average out and to design the histograms of the R-R intervals as was echocardiography to examine central hemodynamics. Before the treatment of SAP (179.2 +/- 4.3 mm Hg), DAP (104.2 +/- 2.6 mm Hg) the patients manifested cephalgia, cardialgia, pronounced vegetative dysfunction. The EEG showed phenomena of irritation in the upper stem structures of the brain. The histograms of R-R intervals distribution demonstrated the signs of a decrease of the tonic influence of the parasympathetic nervous system. The hyperkinetic type of hemodynamics was revealed. After CES the patients manifested an improvement of subjective symptomatology: headache attacks ceased in 85% of the patients, heart pains in 76%; AP got stabilized within normal, which correlated with normalization of central hemodynamics. The histograms of R-R intervals distribution demonstrated an increase of the modal value, a decline of the mode, and a rise of the variation range, attesting to the changes in vegetative regulation of heart activity, with a reduction of sympathetic regulation and a simultaneous increment of parasympathetic effects. The authors hold that CES is an effective and prospective method of the treatment of the initial stage of EH.

PMID: 1523556 [PubMed - indexed for MEDLINE]