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Cranial Electrotherapy Stimulation Review

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ABSTRACT. The use of Cranial Electrotherapy Stimulation (CES) to treat depression and anxiety is reviewed. The data submitted to the Federal Drug Administration (FDA) for approval of medication in the treatment of depression are compared with CES data. Proposed method of action, side-effects, safety factors, and treatment efficacy are discussed. The results suggest there is sufficient data to show that CES technology has equal or greater efficacy for the treatment of depression compared to antidepressant medications, with fewer side effects. A prospective re-search study should be undertaken to directly compare CES with antidepressant medications and to compare the different CES technologies with each other.

EVIDENCE FOR CES EFFICACY

"The 160-plus research studies of CES revealed significant changes associated with relaxation responses, such as lowered readings on electromyograms (Forster et al., 1963; Gibson & O'Hair, 1987; Heffernan, 1995; Overcash & Siebenthall, 1989; Voris, 1995), various improvements seen in electroencephalograms (Weiss, 1973; Cox & Heath, 1975; Heffernan, 1996, 1997; Hozumi, Hori, Okawa, Hishikawa, & Sato, 1996; Itil, Gannon, Akpinar, & Hsu, 1971; Schroeder & Barr, 2001; McKenzie, Rosenthal, & Driessner, 1971; Singh, Chhina, Anand, 1971), reduced anxiety (Klawansky et al., 1995; Bianco, 1994; Gibson & O'Hair, 1987; Heffernan, 1995; Krupitsky et al., 1991, Overcash, 1999; Philip, Demotes-Mainard, Bourgeois, & Vincent, 1991; Ryan & Souheaver, 1977; Schmitt, Capo, & Boyd, 1986; Smith & Shiromoto, 1992; Voris & Good, 1996; Winick, 1999), increased peripheral temperature (an indicator of vasodilatation; Heffernan, 1995; Brotman, 1989), reductions in gastric acid output (Kotter, Henschel, Hogan, & Kalbfleisch, 1975), and reductions in blood pressure, pulse, respiration, and heart rate (Heffernan, 1995; Taylor, 1991).

CES research also found significant reductions in clinical depression (Cox & Heath, l975; Bianco, 1994; Philip et al. 1991; Rosenthal, 1972; Feighner, Brown, & Olivier, 1973; McKenzie et al., 1971; Matteson & Ivancevich 1986; Rosenthal & Wulfsohn, 1970a, 1970b; Shealy et al., 1989; Smith & O'Neill, 1975; Smith, 1999). The effectiveness of CES for treating anxiety has been reconfirmed through meta-analyses conducted by Klawansky et al. (1995) and O'Connor, Bianco, and Nicholson (1991). Gender does not influence the outcome of CES treatment (Kirsch & Smith, 2004) and in a survey of 500 patients with anxiety, the age ranged from 3 to 89 (Kirsch & Smith, 2004).

Longitudinal data from 17 studies of CES conducted follow-up investigations from one week to two years after treatment (Kirsch, 2002). These studies encompassed various populations including depressed patients unresponsive to medications. Sixteen of the studies reported that at least some of the subjects had continued improvement after a single CES treatment, or a series of CES treatments. The other follow-up report only commented on safety (Forster et al., 1963). None of the 17 studies mentioned any enduring adverse effects."

CES RESEARCH IN DEPRESSION

"There are 26 published studies of patients with depression and measured physiological and/or psychological changes after CES treatment. Twenty-one of the 26 (81%) studies reported efficacious results in the treatment of depression. The five CES studies which reported negative or indeterminate results were conducted in the 1 970s with CES devices that are no longer commercially available. Three studies showed both actual treatment and sham treated groups to improve significantly, most likely because both groups were also taking medications (Levitt, James, & Flavell, 1975; Marshall & Izard, 1974; Passini, Watson, & Herder, 1976). One study reported no significant change on anxiety or depression scales, but subjective insomnia improved ($P < .05$) during active treatment (Moore, Mellor, Standage, & Strong, 1975). Only one early CES study published over 30 years ago conducted on a population of insomniacs with an average duration of symptoms of nearly 20 years did not show any significant change at all in any parameters (Frankel, Buchbinder, & Snyder, 1973)."

COMPARISON DATA OF ANTIDEPRESSANTS AND CES EFFICACY

TABLE 1. Mean improvement (weighted for N) in medication and placebo conditions, and proportion of placebo/medication response.

Medication	Trials	N	Medication Effect	Placebo Effect	Placebo/Medication
Fluoxetine	5	1,132	8.30	7.34	0.89
Paroxetine	12	1,289	9.88	6.67	0.68
Sertraline	3	779	9.96	7.93	0.80
Venlafaxine	6	1,148	11.54	8.38	0.73
Nefazodone	8	1,428	10.71	8.87	0.83
Citalopram	4	1,168	9.69	7.71	0.80
			Mean placebo contribution to effect size		**79%**
			Mean medication treatment contribution beyond placebo		**21%**

TABLE 2. Mean improvement in CES and placebo conditions, and proportion of the placebo/CES response for each study.

Medication	Scale	N	CES Effect	Placebo Effect	Placebo/CES
Bianco (1994)	HDS	29	19.45	2.89	0.15
Krupitsky (1991)	ZUNG	20	25.90	-5.90	0.19
Smith (1975)	POMS	72	7.80	6.00	0.77
Smith (1994)	POMS	21	5.05	2.73	0.54
Matteson (1986)	POMS	54	4.16	1.00	0.24
Rosenthal (1972b)	ZUNG	22	8.10	2.70	0.33
Rosenthal (1970b)	ZUNG	12	21.10	9.00	0.43
Lichtbroun (2001)	POMS	60	32.00	10.00	0.31
			Mean placebo contribution to effect size		**37%**
			Mean medication treatment contribution beyond placebo		**63%**

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