

Jacobson JI (1994) Pineal-hypothalamic tract mediation of picotesla magnetic fields in the treatment of neurological disorders.

Panminerva Med Dec;36(4):201-205. Institute of Theoretical Physics and Advanced Studies for Biophysical Research, Jupiter, FL 334377-1418, USA.

The objective of this study is analysis of the clinical efficacy of picotesla magnetic fields in the treatment of epilepsy, Parkinson's disease and multiple sclerosis. The method utilized involved the exogenous application of physiologic, very weak magnetic fields to the brain by Sandyk, Anninos, Derpapas and Tsagas. The magnetic device produced a magnetic field ranging from about $5 \times 10(-8)$ to about $2.5 \times 10(-7)$ Gauss (G) at frequencies of 2-7 Hz. The wave form was sinusoidal and the device was positioned about the posterior portion of the corpus callosum most specifically to influence the pineal gland. Direct correlation of melatonin production with magnetic field stimulation was found. In most cases, the neurological conditions showed amelioration or palliation over an extended period of time. It seemed that resonance was established between the magnetic field and melatonin which could be explained with Jacobson Resonance. These studies begin to point to the explanation of the mechanism of interaction between non-ionizing EM radiation and biological systems. Also, evaluation of the pineal gland as a magneto-sensitive gland may help us understand fundamental conditions in magneto-receptors of biological systems in terms of their piezoelectric nature.

Publication Types: Review Review, tutorial PMID: 7603740, UI: 95327372

Int J Neurosci 1999 Mar;97(1-2):139-45

Yawning and stretching induced by transcranial application of AC pulsed electromagnetic fields in Parkinson's disease.

Sandyk R

Department of Neuroscience at the Institute for Biomedical Engineering and Rehabilitation Services of Touro College, Dix Hills, NY 11746, USA.

Yawning is considered a brainstem regulated behavior which is associated with changes in arousal and activity levels. Yawning and stretching are dopamine (DA) mediated behaviors and pharmacological studies indicate that these behaviors are associated with increased DA release coupled with stimulation of postsynaptic DA-D2 receptors. Despite their relation to the dopaminergic system, yawning and stretching are poorly documented in untreated or treated patients with Parkinson's disease (PD). A 49 year old fully medicated female patient with juvenile onset PD is presented in whom recurrent episodes of yawning and stretching developed during transcranial administration of AC pulsed electromagnetic fields (EM Fs) of picotesla flux density. These episodes have not been observed previously in this or other patients during treatment with levodopa or DA receptor agonists or in unmedicated PD patients during treatment with AC pulsed EMFs. It is suggested that yawning and stretching behavior resulted in this patient from a synergistic interaction between EMFs and DA derived from levodopa supplementation with EMFs possibly facilitating the

release of DA and simultaneously activating postsynaptic DA-D2 receptors in the nigrostriatal dopaminergic pathways. In addition, it is postulated that the release of ACTH/MSH peptides from peptidergic neurons in the brain upon stimulation of the DA-D2 receptors reinforced the yawning and stretching behavior.

PMID: 10681123, UI: 20143358

Int J Neurosci 1999 Aug;99(1-4):139-49

AC pulsed electromagnetic fields-induced sexual arousal and penile erections in Parkinson's disease.

Sandyk R

Department of Neuroscience at the Institute for Biomedical Engineering and Rehabilitation Services, Touro College, Bay Shore, NY 11706, USA.

Sexual dysfunction is common in patients with Parkinson's disease (PD) since brain dopaminergic mechanisms are involved in the regulation of sexual behavior. Activation of dopamine D2 receptor sites, with resultant release of oxytocin from the paraventricular nucleus (PVN) of the hypothalamus, induces sexual arousal and erectile responses in experimental animals and humans. In Parkinsonian patients subcutaneous administration of apomorphine, a dopamine D2 receptor agonist, induces sexual arousal and penile erections. It has been suggested that the therapeutic efficacy of transcranial administration of AC pulsed electromagnetic fields (EMFs) in the picotesla flux density in PD involves the activation of dopamine D2 receptor sites which are the principal site of action of dopaminergic pharmacotherapy in PD. Here, I report 2 elderly male PD patients who experienced sexual dysfunction which was recalcitrant to treatment with anti Parkinsonian agents including selegiline, levodopa and tolcapone. However, brief transcranial administrations of AC pulsed EMFs in the picotesla flux density induced in these patients sexual arousal and spontaneous nocturnal erections. These findings support the notion that central activation of dopamine D2 receptor sites is associated with the therapeutic efficacy of AC pulsed EMFs in PD. In addition, since the right hemisphere is dominant for sexual activity, partly because of a dopaminergic bias of this hemisphere, these findings suggest that right hemispheric activation in response to administration of AC pulsed EMFs was associated in these patient with improved sexual functions.

PMID: 10495212, UI: 99423432

Int J Neurosci 1999 Apr;97(3-4):225-33

Treatment with AC pulsed electromagnetic fields improves olfactory function in Parkinson's disease.

Sandyk R

Department of Neuroscience at the Institute for Biomedical Engineering and Rehabilitation Services of Touro College, Dix Hills, NY 11746, USA.

Olfactory dysfunction is a common symptom of Parkinson's disease (PD). It may manifest in the early stages of the disease and infrequently may even antedate the onset of motor symptoms. The cause of olfactory dysfunction in PD remains unknown. Pathological changes characteristic of PD (i.e., Lewy bodies) have been demonstrated in the olfactory bulb which contains a large population of dopaminergic neurons involved in olfactory information processing. Since dopaminergic drugs do not affect olfactory threshold in PD patients, it has been suggested that olfactory dysfunction in these patients is not dependent on dopamine deficiency. I present two fully medicated Parkinsonian patients with long standing history of olfactory dysfunction in whom recovery of smell occurred during therapeutic transcranial application of AC pulsed electromagnetic fields (EMFs) in the picotesla flux density. In both patients improvement of smell during administration of EMFs occurred in conjunction with recurrent episodes of yawning. The temporal association between recovery of smell and yawning behavior is remarkable since yawning is mediated by activation of a subpopulation of striatal and limbic postsynaptic dopamine D2 receptors induced by increased synaptic dopamine release. A high density of dopamine D2 receptors is present in the olfactory bulb and tract. Degeneration of olfactory dopaminergic neurons may lead to upregulation (i.e., supersensitivity) of postsynaptic dopamine D2 receptors. Presumably, small amounts of dopamine released into the synapses of the olfactory bulb during magnetic stimulation may cause activation of these supersensitive receptors resulting in enhanced sense of smell. Interestingly, in both patients enhancement of smell perception occurred only during administration of EMFs of 7 Hz frequency implying that the release of dopamine and activation of dopamine D2 receptors in the olfactory bulb was partly frequency dependent. In fact, weak magnetic fields have been found to cause interaction with biological systems only within narrow frequency ranges (i.e., frequency windows) and the existence of such frequency ranges has been explained on the basis of the cyclotron resonance model.
PMID: 10372649, UI: 99299864

Int J Neurosci 1998 Sep;95(3-4):255-69

Reversal of the bicycle drawing direction in Parkinson's disease by AC pulsed electromagnetic fields.

Sandyk R

Department of Neuroscience, Touro College, Dix Hills, NY 11746, USA.

The Draw-a-Bicycle Test is employed in neuropsychological testing of cognitive skills since the bicycle design is widely known and also because of its complex structure. The Draw-a-Bicycle Test has been administered routinely to patients with Parkinson's disease (PD) and other neurodegenerative disorders to evaluate the effect of transcranial applications of AC pulsed electromagnetic fields (EMFs) in the picotesla flux density on visuoconstructional skills. A seminal observation is reported in 5 medicated PD patients who demonstrated reversal of spontaneous drawing direction of the bicycle after they received a series of transcranial treatments with AC pulsed EMFs. In 3 patients reversal of the bicycle drawing direction was observed shortly after the administration of pulsed EMFs while in 2 patients these changes were observed within a time lag ranging from several weeks to months. All patients also demonstrated a dramatic clinical response to the administration of EMFs. These findings are intriguing because changes in drawing direction do not occur spontaneously in normal individuals as a result of relateralization of cognitive functions. This report suggests that administration of AC pulsed EMFs may induce in some PD patients changes in hemispheric dominance during processing of a visuoconstructional task and that these changes may be predictive of a particularly favourable response to AC pulsed EMFs therapy.

PMID: 9777443, UI: 98450618

Int J Neurosci 1998 May;94(1-2):41-54

Transcranial AC pulsed applications of weak electromagnetic fields reduces freezing and falling in progressive supranuclear palsy: a case report.

Sandyk R

Department of Neuroscience, Institute for Biomedical Engineering and Rehabilitation Services, Touro College, Dix Hills, NY 11746, USA.

Freezing is a common and disabling symptom in patients with Parkinsonism. It affects most commonly the gait in the form of start hesitation and sudden immobility often resulting in falling. A higher incidence of freezing occurs in patients with progressive supranuclear palsy (PSP) which is characterized clinically by a constellation of symptoms including supranuclear ophthalmoplegia, postural instability, axial rigidity, dysarthria, Parkinsonism, and pseudobulbar palsy. Pharmacologic therapy of PSP is currently disappointing and the disease progresses relentlessly to a fatal outcome within the first decade after onset. This report concerns a 67 year old woman with a diagnosis of PSP in whom freezing and frequent falling were the most disabling symptoms of the disease at the time of presentation. Both symptoms, which were rated 4 on the Unified Parkinson Rating Scale (UPRS) which grades Parkinsonian symptoms and

signs from 0 to 4, with 0 being normal and 4 being severe symptoms, were resistant to treatment with dopaminergic drugs such as levodopa, amantadine, selegiline and pergolide mesylate as well as with the potent and highly selective noradrenergic reuptake inhibitor nortriptyline. Weekly transcranial applications of AC pulsed electromagnetic fields (EMFs) of picotesla flux density was associated with approximately 50% reduction in the frequency of freezing and about 80-90% reduction in frequency of falling after a 6 months follow-up period. At this point freezing was rated 2 while falling received a score of 1 on the UPRS. In addition, this treatment was associated with an improvement in Parkinsonian and pseudobulbar symptoms with the difference between the pre-and post EMF treatment across 13 measures being highly significant ($p < .005$; Sign test). These results suggest that transcranial administration AC pulsed EMFs in the picotesla flux density is efficacious in the treatment of PSP.

PMID: 9622798, UI: 98286001

Int J Neurosci 1998 Feb;93(1-2):43-54

Reversal of a body image disorder (macrosomatognosia) in Parkinson's disease by treatment with AC pulsed electromagnetic fields.

Sandyk R

Department of Neuroscience, Institute for Biomedical Engineering and Rehabilitation Services of Touro College, Dix Hills, NY 11746, USA.

Macrosomatognosia refers to a disorder of the body image in which the patient perceives a part or parts of his body as disproportionately large.

Macrosomatognosia has been associated with lesions in the parietal lobe, particularly the right parietal lobe, which integrates perceptual-sensorimotor functions concerned with the body image. It has been observed most commonly in patients with paroxysmal cerebral disorders such as epilepsy and migraine. The Draw-a-Person-Test has been employed in neuropsychological testing to identify disorders of the body image. Three fully medicated elderly Parkinsonian patients who exhibited, on the Draw-a-Person Test, macrosomatognosia involving the upper limbs are presented. In these patients spontaneous drawing of the figure of a man demonstrated disproportionately large arms. Furthermore, it was observed that the arm affected by tremor or, in the case of bilateral tremor, the arm showing the most severe tremor showed the greatest abnormality. This association implies that dopaminergic mechanisms influence neuronal systems in the nondominant right parietal lobe which construct the body image. After receiving a course of treatments with AC pulsed electromagnetic fields (EMFs) in the picotesla flux density applied transcranially, these patients' drawings showed reversal of the macrosomatognosia. These findings demonstrate that transcranial applications of AC pulsed EMFs affect the neuronal systems involved in the construction of the human body image and additionally reverse disorders of the body image in Parkinsonism which are related to right parietal lobe dysfunction.

PMID: 9604168, UI: 98267527

Int J Neurosci 1997 Nov;92(1-2):63-72

Speech impairment in Parkinson's disease is improved by transcranial application of electromagnetic fields.

Sandyk R

Department of Neuroscience, Touro College, Dix Hills, NY 11746, USA.

A 52 year old fully medicated physician with juvenile onset Parkinsonism experienced 4 years ago severe "on-off" fluctuations in motor disability and debilitating speech impairment with severe stuttering which occurred predominantly during "on-off" periods. His speech impairment improved 20%-30% when sertraline (75 mg/day), a serotonin reuptake inhibitor, was added to his dopaminergic medications which included levodopa, amantadine, selegiline and pergolide mesylate. A more dramatic and consistent improvement in his speech occurred over the past 4 years during which time the patient received, on a fairly regular basis, weekly transcranial treatments with AC pulsed electromagnetic fields (EMFs) of picotesla flux density. Recurrence of speech impairment was observed on several occasions when regular treatments with EMFs were temporarily discontinued. These findings demonstrate that AC pulsed applications of picotesla flux density EMFs may offer a nonpharmacologic approach to the management of speech disturbances in Parkinsonism. Furthermore, this case implicates cerebral serotonergic deficiency in the pathogenesis of Parkinsonian speech impairment which affects more than 50% of patients. It is believed that pulsed applications of EMFs improved this patient's speech impairment through the facilitation of serotonergic transmission which may have occurred in part through a synergistic interaction with sertraline.

PMID: 9522256, UI: 98182725

Int J Neurosci 1997 Oct;91(3-4):189-97

Treatment with AC pulsed electromagnetic fields improves the response to levodopa in Parkinson's disease.

Sandyk R

Department of Neuroscience, Touro College, Dix Hills, NY 11746, USA.

A 52 year old fully medicated Parkinsonian patient with severe disability (stage 4 on the Hoehn & Yahr disability scale) became asymptomatic 10 weeks after he received twice weekly transcranial treatments with AC pulsed electromagnetic fields (EMFs) of picotesla flux density. Prior to treatment with EMFs, his medication (Sinemet CR) was about 50% effective and he experienced end-of-dose deterioration and diurnal-related decline in the drug's efficacy. For instance, while his morning medication was 90% effective, his afternoon medication was only 50% effective and his evening dose was only 30% effective. Ten weeks after introduction of treatment with EMFs, there was 40% improvement in his response to standard Sinemet medication with minimal change in its efficacy during the course of the day or evening. These findings demonstrate that intermittent, AC pulsed applications of picotesla flux density EMFs improve Parkinsonian symptoms in part by enhancing the patient's response to levodopa. This effect may be

related to an increase in the capacity of striatal DA neurons to synthesize, store and release DA derived from exogenously supplied levodopa as well as to increased serotonin (5-HT) transmission which has been shown to enhance the response of PD patients to levodopa. Since decline in the response to levodopa is a phenomenon associated with progression of the disease, this case suggests that intermittent applications of AC pulsed EMFs of picotesla flux density reverse the course of chronic progressive PD.
PMID: 9394226, UI: 98056065

Int J Neurosci 1997 Sep;91(1-2):57-68

Reversal of cognitive impairment in an elderly parkinsonian patient by transcranial application of picotesla electromagnetic fields.

Sandyk R

Department of Neuroscience, Touro College, Dix Hills, NY 11746, USA.

A 74 year old retired building inspector with a 15 year history of Parkinson's disease (PD) presented with severe resting tremor in the right hand, generalized bradykinesia, difficulties with the initiation of gait with freezing, mental depression and generalized cognitive impairment despite being fully medicated. Testing of constructional abilities employing various drawing tasks demonstrated drawing impairment compatible with severe left hemispheric dysfunction. After receiving two successive transcranial applications, each of 20 minutes duration, with AC pulsed electromagnetic fields (EMFs) of 7.5 picotesla flux density and frequencies of 5Hz and 7Hz respectively, his tremor remitted and there was dramatic improvement in his drawing performance. Additional striking improvements in his drawing performance occurred over the following two days after he continued to receive daily treatments with EMFs. The patient's drawings were subjected to a Reliability Test in which 10 raters reported 100% correct assessment of pre- and post drawings with all possible comparisons (mean $2 = 5.0$; $p < .05$). This case demonstrates in PD rapid reversal of drawing impairment related to left hemispheric dysfunction by brief transcranial applications of AC pulsed picotesla flux density EMFs and suggests that cognitive deficits associated with Parkinsonism, which usually are progressive and unaffected by dopamine replacement therapy, may be partly reversed by administration of these EMFs. Treatment with picotesla EMFs reflects a "cutting edge" approach to the management of cognitive impairment in Parkinsonism.
PMID: 9394215, UI: 98056054