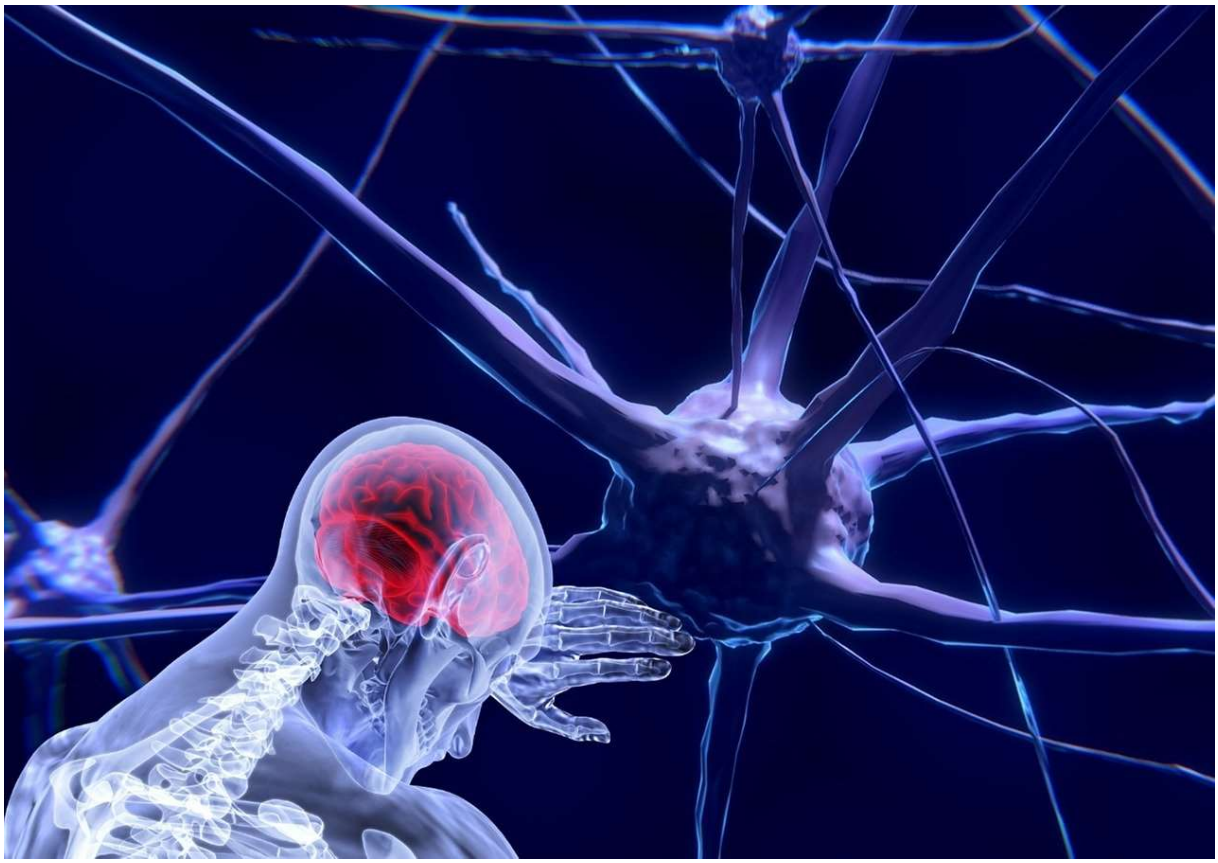

Scientific background on NES technology

History of Neuroelectric Stimulation (NES)

The first NES device, the Somniatron, was developed in the Soviet Union in the early 20th century and delivered 1-4 mA AC current at 100 Hzthrough two electrodes attached to the eyelids (Robinovitch, 1914). The Somniatron has been used to induce analgesia and sleep in patients with insomnia. In 1973, the first NES device without formal regulation, the Electrosone 50, was marketed in the United States to induce relaxation and sleep (Kirsch et al., 2014). The electrosone delivered alternating current with a variable pulse frequency (up to 4,000 Hz) and an intensity of 2 mA up to 8 mA. The device was portable and battery operated, and electrodes were placed on the eyelids and behind the ears. At the same time, Scottish doctor Meg Patterson was developing the addiction treatment. While in China, she learned about the use of electroacupuncture to treat pain and discovered that it also had a positive effect on cravings and withdrawal symptoms. She then tested the procedure on many patients with different disorders and developed it further. She found that the common symptoms of withdrawal are virtually absent or greatly reduced by neurostimulation, making withdrawal much easier. As a result, patients were highly motivated and more receptive to psychotherapy and lifestyle changes. She also found that psychological symptoms such as anxiety, depression and fatigue were quickly and significantly reduced by the NES, so that the patients themselves feel fit and well again very quickly, which further increased their motivation. So she developed therapy with different frequencies for different conditions. Three years after the release of the Electrosone, the US Food and Drug Administration (FDA) began regulating medical devices. In 1978, the Neurotone 101 became the first FDA-cleared NES device to provide intensity of up to 1.5 mA at 50-100 Hz (Guleyupoglu et al., 2013). The

device was marketed to treatanxiety, depression and insomnia. In the years that followed, several NES devices were developed and marketed in the USA.

If you look at the development of the published medical studies, you can see that the Neuroelectric stimulation is in the process of developing from an alternative method to an approved medical procedure. In the USA alone, around about 500 medical studies on neuroelectrical stimulation have been published in the last 5 years (2022, National Library of Medicine).

How Neuroelectric Stimulation Works

Neuro-electrical stimulation, NES for short, is unfortunately not very well known in Germany. Only a few therapy providers and a few private practices use this method, whereas it has already become established in America, for example. It is used very successfully to support
Treatments such as burnout, depression, addictions, anxiety, stress, sleep problems, listlessness and much more. Furthermore, to improve cognitive performance, improve short and long-term memory and increase well-being.
In burnout therapy, the positive effects speak for themselves. Studies show that prolonged and continuous use maintains or even increases the positive effects. Affected people who want to overcome their stress problem thus have strong support in overcoming their problem with the NES.

The way the NES devices work when you are mentally exhausted is simple. Neuro-Electrical-Stimulation (NES), acts as an effective form of electro-acupuncture, targeting biochemical aspects of the brain. The production of important neurotransmitters such as serotonin, dopamine, endorphin, dynorphyn or GABA is stimulated. Prolonged stress in particular can disrupt these hormonal systems, leading to the familiar feelings of exhaustion and restlessness.

In addition to physical relaxation, regular applications provide a positive overall feeling. Electrostimulation is particularly important for increasing general wellbeing and promoting relaxation, sleep and stress reduction, as well as muscular relaxation. The NES process ensures a lasting and fundamental change in behaviour, gently guiding you towards your goal. This technique has been used in stress management for over fifty years. Due to years of overwork, certain neurotransmitters are no longer produced in sufficient quantities (dopamine, serotonin, endorphins, etc.), the lack of which is responsible for the symptoms of exhaustion, but also for “discomfort, sleep problems”, etc.

Neurotransmission and the importance of Transmitters

The nervous system enables communication between the body's organs, allowing each individual part to work in concert with the others within the overall system. It allows the body to receive information about its environment and is essential for survival as it
Information is processed and transported between the different parts of the body. In order for the body to be able to react to a stimulus, it must be passed on in several ways in order to trigger a reaction in the target organ. Transmission occurs from one neuron to the neighboring

Neuron, via the junctions of neurons - so-called synapses. This transmission takes place via the neurotransmitters. Neurotransmitters (from the Latin transmittere = to bring) are messenger substances that play an important role in the transmission of a stimulus from one neuron (nerve cell) to another neuron. Within a synapse, they are usually released from the presynaptic membrane via exocytosis into the synaptic cleft, where they diffuse to the postsynaptic membrane. Neurotransmitters are therefore responsible for transmitting stimuli from one cell to another.

Neurotransmitter as part of the Synapse

Synapses are where the transmission of impulses takes place – here electrical stimuli (action potentials) are transmitted from neurons to the downstream muscle, nerve and gland cells. This is where neurotransmitters play an important role.

Uses

Neuroelectric stimulation to improve sleep quality

A recent study evaluated the effects of NES on sleep quality in 40 healthy women in a randomised, double-blind, sham-controlled (inactive) trial (Wagenseil et al., 2018). Using the NES device with bilateral earlobe electrodes, active NES (0.5 Hz, 100 µA, for 60 minutes) was compared with a placebo control (device connected but not active). Measures included polysomnography (PSG) and electroencephalography (EEG). NES induced a frequency-lowering effect in the alpha band of the EEG signal, similar to what we will describe in the NES Effects on Brain Electrical Activity section.

A study on the quality of sleep in athletes before competitions (Wen-Dien Chang 2022) came to similar conclusions, the result of which was that the NES intervention reduced negative emotions, reaction times improve the imbalances of the parasympathetic and sympathetic improved nervous activity and slowed the deterioration in sleep efficiency. Neuroelectric Stimulation for Acute Stress Reduction Three studies were identified that examined the effects of NES on anxiety and stress in the nonclinical state. The first study included 33 healthy participants undergoing routine dental procedures who were randomized to receive either active (0.5 Hz, 200 µA) or sham NES with bilateral earlobe electrodes assigned (Winick, 1999).

In a double-blind design, participants received active or sham NES during a dental procedure and reported anxiety symptoms using a visual analogue scale (VAS). The results showed that active NES after treatment (but not during treatment).
caused significantly lower anxiety ratings compared to appearances.

Neuroelectric stimulation to reduce anxiety disorders

A large and very well-conducted study shows convincing results for the effectiveness of NES in anxiety disorders (Barclay and Barclay, 2014). In this study, a group of 115 participants with a diagnosed anxiety disorder received either a sham or active (100 µA, 0.5 Hz) NES device with bilateral ear loops for 5 weeks (60 min/day). ppchen electrodes. In sham disease, manufacturer-supplied inactive devices were used and no assessment of vestibular or cutaneous sensation was reported. By week 5, results showed a ~32% reduction in anxiety symptoms as measured by the Hamilton Rating Scale for Anxiety (HAM-A-17).

Neuroelectrical stimulation to reduce clinical depression

From our point of view, a high-quality publication is worth mentioning. In the study, a group of 16 participants with depression received either sham or active NES using the stimulator device with two electrodes placed over the bilateral temples (2 mA, 5-15,000 Hz) for ;r 10 days (20 min/day), in a randomized, double-blind, placebo-controlled design (McClure et al., 2015). The sham group received active stimulation until the participant reported a tingling sensation on the scalp, and then the device was turned off for the remainder of the session; The results showed a significant reduction in depressive symptoms in the active NES group, but none in the sham NES group at the end of the second week, as measured by the BDI.

Schumann resonances and their effect on human bioregulation

The physicist Professor Winfried Otto Schumann discovered the “pulse” of the earth. Later research observed that brain rhythms can overlap and synchronise with the Schumann frequencies.

The Pulse of the Earth

The Schumann resonances (or frequencies) are quasi-continuous electromagnetic waves. They exist in the cavity (or space) between the earth's surface and the ionosphere. In 1952, the physicist Professor Winfried Otto Schumann of the Technical University of Munich was concerned with the question of whether the earth itself has a frequency – a pulse - owns. He suspected that a sphere creates an electrical voltage in another sphere. Since the negatively charged earth exists within the positively charged ionosphere, there must be a tension between the two that gives the earth a certain frequency.

Today, Schumann resonances are recorded at many research stations around the world. Specialized receivers and antennas are required to detect and record Schumann Resonances. Although 7.83 is considered the fundamental Schumann resonance, other frequencies occur between 6 and 50 cycles per second. Specifically, these are 7.8, 14, 20, 26, 33, 39, and 45 Hertz, with a daily variation of about +/- 0.5 Hertz (Hz). These frequencies act as background frequencies that affect the biological circuitry of much of life on Earth.
The amount of resonance varies as the ionosphere becomes more or less dense, largely depending on the amount of solar radiation hitting it. Another influence is that the world's three lightning hotspots - Asia, Africa and South America - also follow a day/night cycle and are also seasonal. So the peaks in radio signal strength at the Schumann resonance follow an ever-changing but somewhat predictable schedule.

Brain effect

Schumann himself was interested in the biological effects of sferics. Research has uncovered links between Schumann resonances and life on earth. Their research ranges from the effects on yeast cells and bacteria to plants, animals and humans. Herbert Künig, Schumann's successor at the University of Munich, discovered and demonstrated a clear link between Schumann resonances and brain rhythms. He compared human EEG recordings with natural electromagnetic fields in the environment and found that the so-called alpha waves during brain activity were in the same frequency range as the first two modes of the Schumann resonance. He speculated that this may not be a coincidence, but an adaptation of humans to the electromagnetic environment over a long evolutionary period.

Rhythmic synchronisation

König and his colleagues described the striking similarities in power spectral density profiles and patterns between the Earth-ionosphere resonance and human brain activity, which also share common features for both the electric and magnetic field components. Since then, other scientists have observed and repeated the phenomenon that brain rhythms can overlap and become synchronous with the ultra-low frequency electromagnetic activity occurring in this resonant cavity.