

# Dorntherapy: Its Effect on Electroencephalographic Activity in Tinnitus Patients with Craniocervical Dysfunction

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**Abstract:** Dorntherapy was developed in the 1980s by Dieter Dorn, a nonmedical person, to cure his and his family members' vertebral problems. This technique achieves correction of dysfunctions of the vertebrae and joints simply by using natural movements of arms and legs or by applying gentle pressure (thumb) to the spinous process. Various observations suggest that craniocervical dysfunction can lead to tinnitus, thus causing changes in the electroencephalographic patterns. This study demonstrates that the successful application of Dorntherapy induced prominent changes of the electroencephalographic activity. Data analysis revealed a significant increase in the power of the alpha (8–13 Hz) and the alpha<sub>2</sub> (9–11 Hz). Besides electrophysiological effects, changes in the quality of tinnitus and in the intensity of the tinnitus were noted. These results suggest that Dorntherapy must be an integral part of any tinnitus therapy.

**Key Words:** alpha activity; Dorntherapy; tinnitus; quantitative electroencephalography

The craniocervical junction, the upper part of the vertebrae, includes the atlanto-occipital region, the atlanto-axial region, and the C2 and C3 segments [1]. This area, rich in neuronal sensors, is neurophysiologically and mechanically fairly different from the rest of the cervical spine. The afferents are closely connected to the vestibular nuclei [1,2].

Dysfunctions of the craniocervical junction affect the central nuclei via the afferent system, in particular the vestibular nuclei, thus leading to disturbances of the efferent profile [1]. The craniocervical junction is fairly susceptible to acceleration and deceleration [2]. Being the end point of the statomotoric system, the craniocervical junction can also be affected by dysfunctions of other parts of the vertebrae [1–3]. The differences in lengths of legs are very often a sign of torsion of the vertebrae; however, these differences can also cause

torsion of the vertebrae by themselves, thus inducing rotatory dysfunction of the vertebrae and dysfunction of the craniocervical junction. Dysfunctions of the lower part of the vertebrae will significantly affect the mobility of the craniocervical junction, thereby affecting central regulation mechanisms via the afferent systems [3,4]. This can lead to vertigo, dizziness, nausea, tinnitus, diplopia, concentration problems, and headache, to name but a few effects [4–6].

Traditionally, dysfunctions of the vertebrae are treated, for example, by chiropractic therapy, meaning high velocity and minimal impact. Other therapies employed for the correction of dysfunction of the vertebrae are Brügger therapy, craniosacral therapy, strain-counterstrain, and the specific adjustment technique.

However, in the last few years, a new method known as *Dorntherapy* has been fairly successfully employed for treating problems of the vertebrae. This exceptional technique was developed in the 1980s by D. Dorn. It is best described as follows: A therapist uses the natural movements of a patient with a gentle pressure to the spinous process to correct the dysfunction. Dislocation of the vertebrae is corrected via *gentle* pressure against the spinous process while the patient moves an arm or a leg back and forth. These movements induce changes of the muscle tension, thus

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enabling a soft correction of the dislocated vertebra. The basic idea of this concept is the treatment of the complete vertebrae, not the treatment only of the problem zones. Of great additional importance is the correction of possible different lengths of legs [5]. Dorntherapy permits the correction of dysfunctions without any risk of injuring muscles or tendons (or both).

This study employed the technology of quantitative electroencephalography (EEG) to prove that correction of the craniocervical dysfunction by Dorntherapy induces changes in electroencephalographic activity.

## SUBJECTS AND METHODS

### Dorntherapy

Dorntherapy is performed while a patient is standing up or sitting in a chair. Possible dislocations of the vertebrae are localized by moving thumbs gently up and down the spinous process. A diagnosed dislocation of the vertebrae is corrected via a gentle pressure against the spinous process while the patient is moving an arm or leg back and forth. Dysfunctions of the cervical vertebrae are corrected while the patient is slowly shaking the head. Again, a gentle pressure is projected to the spinous process to place the vertebra in its appropriate position. For both approaches, the natural movements of muscles and vertebrae are used; thus, the corrections are not performed against increased tensions.

### Quantitative EEG

The brain waves (EEG signals) were acquired employing a Neurosearch 24 instrument (Lexicor Medical Technology, Inc., Boulder, Co, USA), placing 19 electrodes on the scalp in a standard international (10/20) pattern. Quantitative EEG was undertaken using the Electro-cap (Electro-cap International, Inc., Eaton, OH). Each lead was checked separately. Impedance was judged acceptable when electrode impedance registered below 5 k $\Omega$ . The EEG signals from each electrode were independently amplified by matched differential amplifiers with less than 2  $\mu$ V peak-to-peak noise; input impedance of >70 mega $\Omega$  differential; common mode rejection of >90 dB at 60 Hz; high-pass filter of 2 Hz; and low-pass filter of 32 Hz. Analog-to-digital conversion of the signal was achieved with a 12-bit A/D converter, with sampling interval governed by a 50-kHz crystal oscillator.

All EEG data were visually inspected for artifacts due to movements and to muscular activity before the records were subjected to quantitative analysis and interpretation. Frequency analysis was performed using a

Fast Fourier Transform. The quantitative EEG frequency bands chosen were delta (2–4 Hz), theta (4–7 Hz), alpha (8–13 Hz), and beta (14–21 Hz), with sub-alpha bands of alpha<sub>1</sub> (7–9 Hz), alpha<sub>2</sub> (9–11 Hz), and alpha<sub>3</sub> (11–13 Hz). Statistical calculations were performed using only artifact-screened data.

All EEG data were collected under controlled conditions with the subject reclining comfortably in an arm-chair with eyes closed in a sound-attenuated, electrically shielded room. Unless stated otherwise, the data used for topographical color maps have been manually screened for eye blink movements, and only eye blink-free epochs were used in the preparation of quantitative results, including spectral averages and topographical maps.

EEG was recorded before and after Dorntherapy. After completion of the tests, the EEG data were analyzed to reject artifacts due to eye movements, blinks, and muscle activity. The artifact-free data were subsequently subjected to Fourier power spectral analysis.

Our study included 10 tinnitus patients with craniocervical dysfunctions and additional dysfunctions of other vertebral parts. All 10 patients complained of tinnitus, headache, nausea, and concentration problems and exhibited restricted head and neck movement and segmental vertebral dysfunctions.

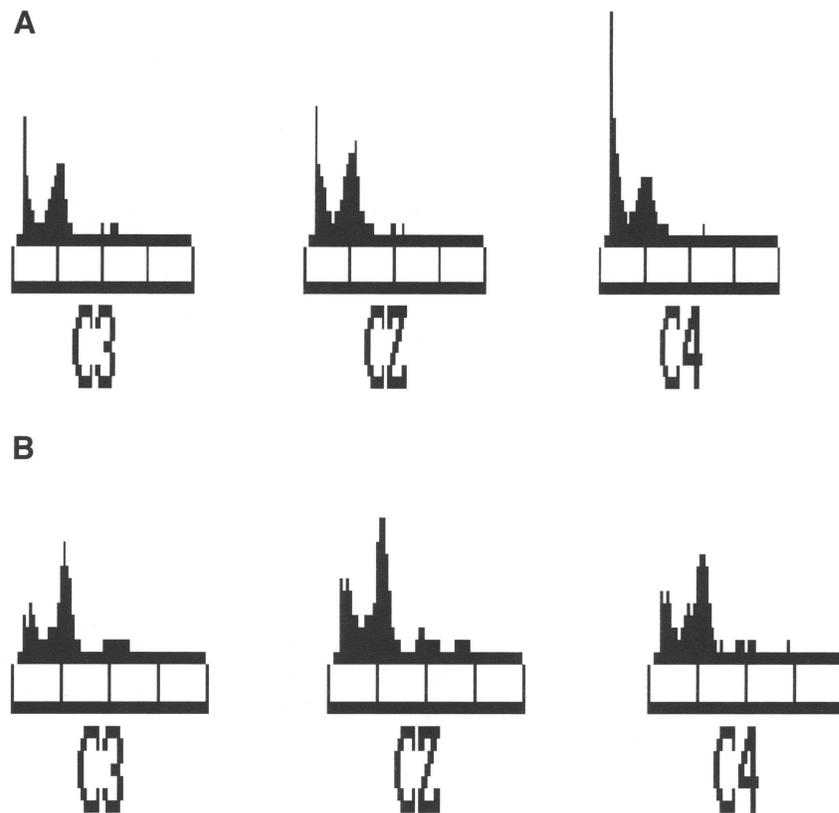
## RESULTS

### Patient 1

A 49-year-old male patient sustained several concussions. In 1986, he fell 36 feet from a ladder, fracturing several ribs and his right wrist and receiving a mild traumatic brain injury. In addition, he experienced a bilateral tinnitus (left-sided tinnitus duration, 6 years; right-sided tinnitus duration, 2 weeks). The onset of the left-sided tinnitus was preceded by a sudden loss of hearing. EEG data were recorded before and after Dorntherapy. The power spectrum data analysis revealed a significant decrease of the power of the delta band. Simultaneously, an increase of the power for the alpha band was noted (Fig. 1). The patient reported a remission of the right-sided tinnitus and a decrease in the tinnitus intensity in the left ear.

### Patient 2

A 42-year-old female patient had experienced a right-sided tinnitus for 6 years. The cause was unknown. EEG data were recorded before and after Dorntherapy. As indicated in Figure 2, a significant increase in the power of the alpha band was noted.



**Figure 1.** Electroencephalographic recordings in patient 1 (A) before and (B) after Dorntherapy.

### All Patients

Statistical analysis of the EEG data of all 10 patients indicated a significant increase ( $p < .05$ ) of the power for the alpha band. A slight increase of the beta power was noted; however, theta power decreased (Fig. 3A).

Subdividing the alpha band into  $\alpha_1$ ,  $\alpha_2$ , and  $\alpha_3$ , the statistical analysis revealed a significant increase ( $p < .01$ ) of the power of the  $\alpha_2$  band (9–11 Hz) (Fig. 3B). A slight increase of power for the  $\alpha_1$  band was noted. No change could be observed for the  $\alpha_3$  band.

### DISCUSSION

Owing to increased noise exposure, a dramatic rise in subjects suffering from tinnitus is expected. Tinnitus is a multifactorial event. A variety of different therapies has been employed, with greater or lesser success. In the last few years, two new therapeutic concepts have been advanced: neurofeedback and tinnitus retraining therapy (TRT). TRT is based on the assumption that nonauditory systems, particularly the limbic system and the autonomic nervous system, play a crucial part in each case of troublesome tinnitus. According to this

model, the annoyance of tinnitus is determined exclusively by the limbic and autonomic nervous system. TRT has two key elements: directive counseling and sound therapy to achieve habituation of the tinnitus. Habituation is the point at which affected patients no longer are aware of the tinnitus except when they focus on it. Even when they focus on their tinnitus, it is no longer annoying or bothersome.

Biofeedback allows the control of physiological processes, such as body temperature or heart frequency. Neurofeedback is a form of biofeedback linked to aspects of the electrical activity of the brain, such as frequency, location, or amplitude of specific EEG activity. Neurofeedback has been employed for treatment of patients experiencing attention deficit–hyperactivity disorder, generalized anxiety disorder, depression, conduct disorder, epilepsy, and posttraumatic stress disorder and for patients with closed-head injury and drug addiction [6–12].

In the past, Weiler et al. [13,14] described significant changes of the EEG pattern of patients experiencing tinnitus. Thus, a logical approach for the treatment of tinnitus is the employment of neurofeedback. Comparison of EEG data before and after neurofeedback revealed significant changes of EEG parameters and items of the Göbel Tinnitus Questionnaire. An increase

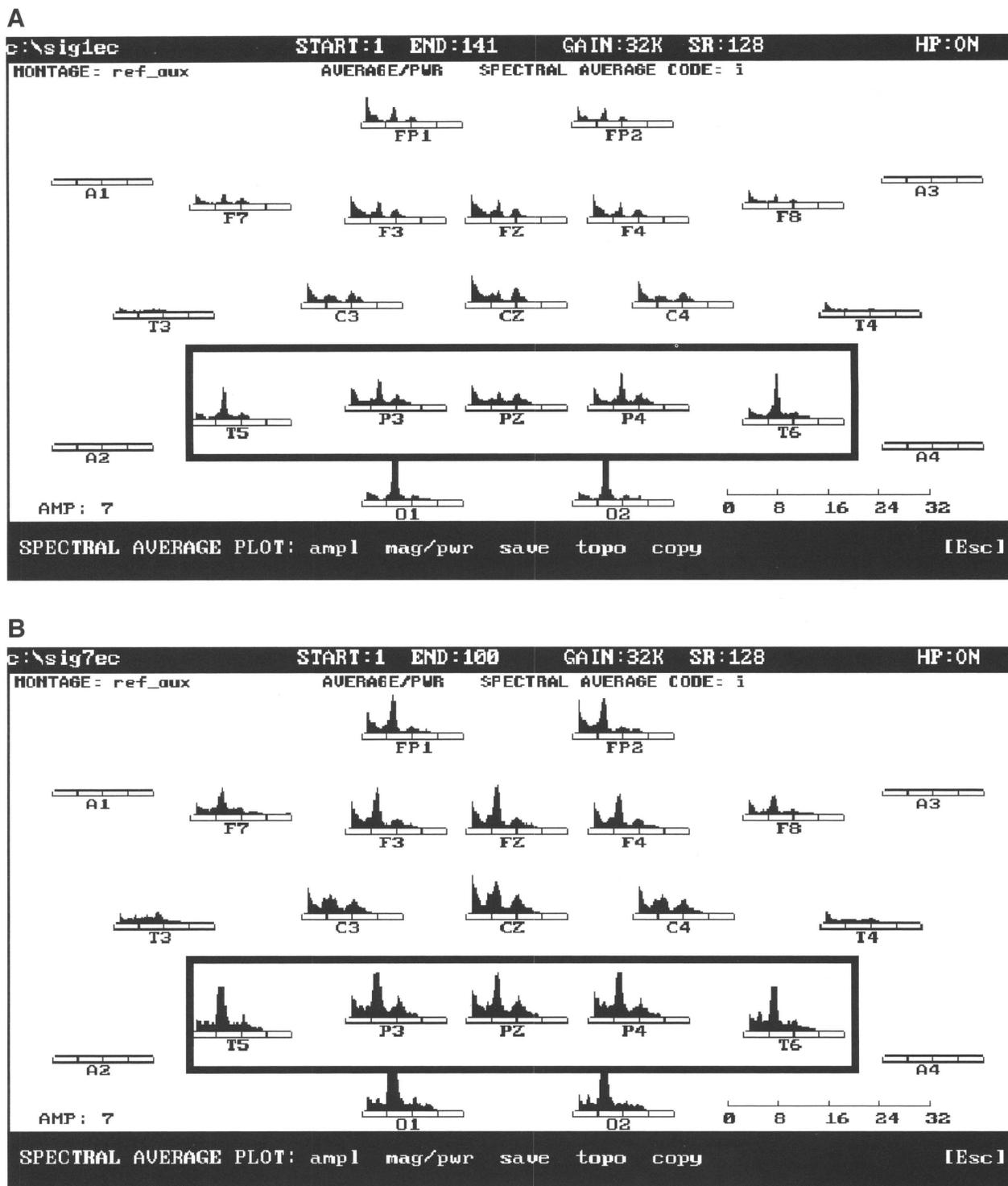
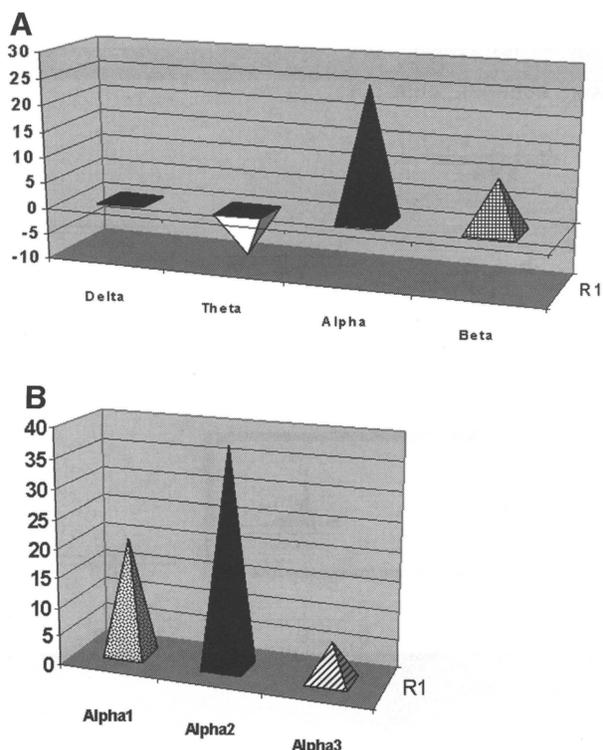


Figure 2. Power spectrum in patient 2 (A) before and (B) after Dorntherapy.

of alpha power and a reduction of beta power were observed. A highly significant change was noted for emotional distress and annoyance from the tinnitus.

Reports by Schneider et al. [15] found a negative

shift in the EEG, in particular the negative DC-EEG potential shift. This report hints at the involvement of the craniocervical system and muscular dysfunction in the pathogenesis of tinnitus (C.F. Claussen, personal



**Figure 3.** Percentage of change in power of (A) delta, theta, alpha, and beta frequency bands and (B) alpha<sub>1</sub>, alpha<sub>2</sub>, and alpha<sub>3</sub> frequency bands after Dorntherapy.

communication, 2001). Similar results were published by Dehler et al. [16]. These reports prompted us to evaluate, with the assistance of quantitative EEG analysis, the role of vertebral dysfunctions in patients suffering from tinnitus. The correction of vertebral dysfunctions in tinnitus patients was achieved by Dorntherapy [5]. Evaluation of the recorded EEG data revealed significant changes within the alpha range and prominently in the alpha<sub>2</sub> band. These changes were accompanied by a decline of tinnitus. Similar results were reported by Schenk et al. [17], who reported a reduction in the subjective perception of tinnitus annoyance when alpha activity was enhanced with neurofeedback.

## SUMMARY

Dysfunctions of the vertebrae produce adverse effects on the EEG pattern and thus interfere with therapies (e.g., psychotherapy and neurofeedback). Our study indicates that Dorntherapy induces significant changes in the EEG pattern. The most prominent changes are associated with the 8- to 13-Hz band and the 9- to 11-Hz band. These findings clearly indicate the necessity for correcting vertebral dysfunctions prior to starting any other therapies.

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