



EFFECTS ON BRAINWAVES

Two 2019 case studies



Preliminary research on brainwaves (2019)

In 2019, we performed preliminary experiments on the effects of Somarka/Analemma Water on human brainwave activity. **Brainwaves** are the synchronized electrical pulses emitted by masses of neurons communicating with each other. Different types of mental activity will induce different types of brainwaves.

Brainwave activity is measured by quantitative electroencephalogram (qEEG), which is most commonly divided into four frequency bands: delta (0-4 Hz), theta (4-8 Hz), alpha (8-12 Hz) and beta (12-30 Hz).

The lower frequency bands, delta and theta, are active in more restful states, while high frequency bands, alpha and beta, show increased activity in cognitively engaging states (for details, see [Table 1](#)).

Table 1. Six types of brainwaves, their frequency bands (measured in Hz) and the type of mental activity or state they are most commonly associated with.

Brainwave type	Frequency band (in Hz)	Mental activity
Delta	1-4	Stability, sleep
Theta	4-8	Stability, light sleep
Alpha	8-12	Relaxation, meditation
Beta 1	12-15	Concentrated but relaxed. This frequency band is important for balance in the autonomic nervous system.
Beta 2	15-22	Cognitive activity
Beta 3	22-32	Cognitive activity

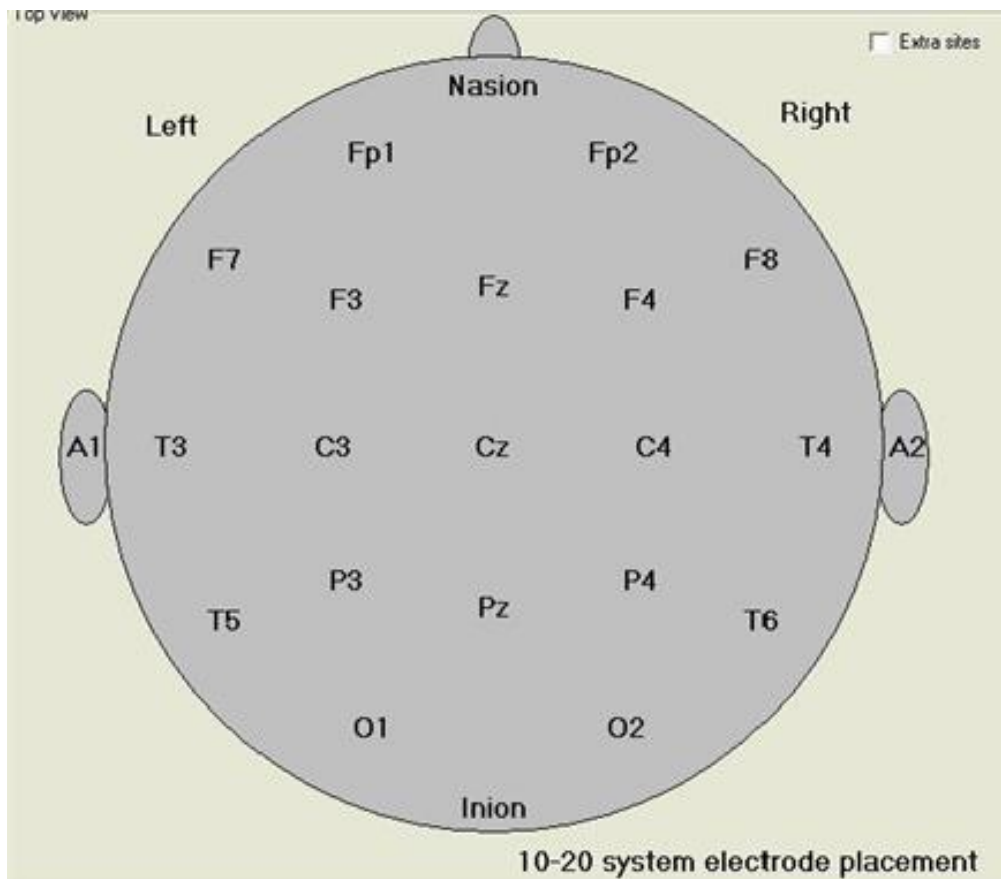
HOW IS QEEG DATA EVALUATED?

The qEEG data provides two types of information.

1) The spectra

The spectra reflect power distribution over different frequency bands: i.e. how many circuits are firing with a certain frequency at a certain location. In our experiments, spectra were measured in 19 locations scattered throughout the brain (**Figure 1**).

Figure 1. Schematic representation of 19 different brain locations in which qEEG measurements were performed.



HOW IS QEEG DATA EVALUATED?

2) The coherences

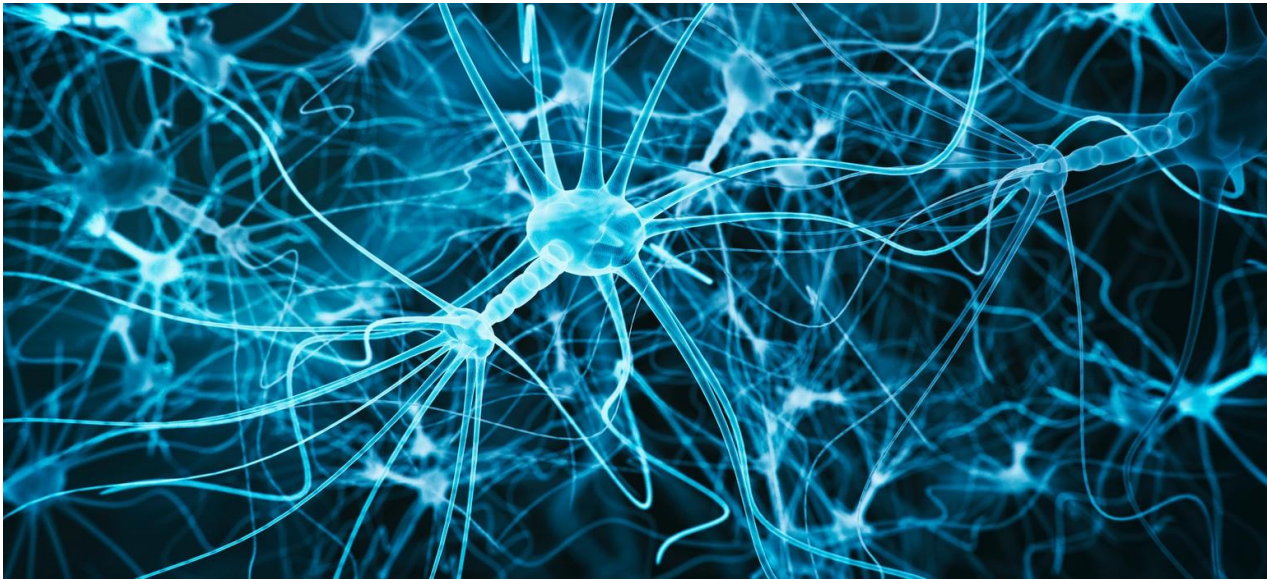
When we measure a parameter called **coherence**, we receive information on the efficiency of communication between different brain locations at a specific type of brainwave frequency.

In our experiments, coherences were measured in 7 different frequency bands (delta, theta, alpha, beta1, beta 2-1, beta 2-2 and beta 3) in four different conditions: eyes closed, eyes open, while reading and while watching a movie. Coherences were measured between 19 different brain locations. Each of these measurements gave us information about the **extent of communication and connection between different brain areas**.

These types of experiments produce a large amount of data. For simplicity, we express each measured aspect as a numbered value ranging from 0 to 5, based on the visual amount of difference observed between the **baseline value** (prior to drinking water) and **test value** (after drinking water).

For instance, in **Case Study I**, this was done for all spectra and coherences in all 4 conditions and all frequency bands, resulting in 32 data points. Finally, a cumulative value was obtained from the 32 data points, indicating the total amount of change between the two time points.

For details on how to interpret the brain maps produced by a qEEG measurement, please see the individual case study reports below.



CASE STUDY 1 - BRAIN CONNECTIVITY

An important information about brain function is the efficiency of communication between different brain areas. One way to quantify this is by measuring the **coherence** (spectral correlation of two qEEG signals) between two different brain locations.

To assess the immediate effect of Somarka/Analemma Water on the level of communication between different brain areas, we conducted **a case study on a pair of identical twins** who consumed either Somarka/Analemma Water or Regular Water in a double-blind setup.

Immediately after water intake, we measured their **spectral** qEEG signals in 19 different brain areas to assess power distribution. Additionally, we measured the **coherences** between different brain areas in all frequency bands.

This experiment showed **a positive, stabilizing effect of Somarka/Analemma Water on brain spectra and coherence in the delta range.** Positive effects were observed both immediately after consumption and after a week of continued consumption.

EXPERIMENTAL DESIGN

OBJECTIVE

To determine whether Somarka/Analemma Water consumption affects **power distribution and communication between brain areas** in adult humans.

PARTICIPANTS

Two adult human subjects, female, identical twins, aged 19.

STUDY DESIGN

The experiment was performed as a **double-blind placebo-controlled study**. The two participants (identical twins) were randomly assigned to consume either Regular Water (Placebo) or Somarka/Analemma Water, with neither the participants nor the investigators aware of the exact distribution.

The qEEG measurements were performed on 4 different days, as follows:

Day 1 - baseline measurement (before consuming water), both twins

Day 1 - test measurement (10 minutes after consumption of the assigned water), both twins

- after Day 1, both twins continued to consume only the type of water they had initially been assigned with, up until Day 8

Day 2 - test measurement, both twins

Day 8 - test measurement, both twins

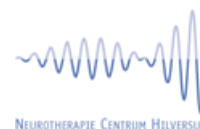
Day 10 - baseline measurement (before consuming Somarka/Analemma Water), only the twin who previously consumed Regular Water*

Day 10 - test measurement (10 minutes after consuming Somarka/Analemma Water), only the twin who previously consumed Regular Water*

**The subject did not know that they were about to consume Somarka/ Analemma Water, nor that the water they had consumed previously was Regular Water*

INSTITUTIONS

Neurotherapie Centrum Hilversum (Hilversum, The Netherlands)



RESEARCH REPORT

AUGUST 2023

FOR DETAILS, SEE **APPENDIX D**

EXPERIMENTAL DESIGN

QEEG MEASUREMENTS

Measurements were taken in the following four conditions:

- ♦ eyes closed (EC)
- ♦ eyes open (EO)
- ♦ while reading (EOR)
- ♦ while watching a movie (EOM)

Spectral information was obtained for 19 different brain locations.

In total, 32 aspects were measured:

- ♦ brainwave **spectra** in all 19 locations (in EC, EO, EOR and EOM), and
- ♦ **coherences** between different brain locations at seven different frequency bands (from delta to beta 3), measured in EC, EO, EOR and EOM.

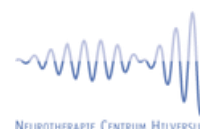
All data was interpreted by means of Z-scores, i.e. deviations from the expected values derived from an international database of healthy individuals (Thatcher database).

The measurement period was 5 minutes each, with at least 1 minute of 'clean' EEG remaining after artifact removal; the averages used are therefore based on more than 7,500 observations each time.

For simplicity, each measured aspect was expressed as a numbered value ranging from 0 to 5, based on the visual amount of difference observed between the **baseline value** (prior to drinking water, measured at Day 1) and **test value** (after drinking water, measured on Days 1, 2, and 8). The test measurement performed on Day 10 was compared to the baseline measurement taken earlier that same day (mimicking the scenario on Day 1).

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RESULTS

Several results were obtained in this experiment.

Firstly, the cumulative change in spectra and coherence was calculated by adding up the amount of change observed in all 32 measured aspects (**Table 2**). Data obtained on Day 1 indicate **immediate effects**, and data obtained on Days 2 and 8 indicate **persisting effects**.

This analysis does not indicate whether the change is positive or negative. However, it is useful to assess whether the change occurs in the same category (frequency band) and whether it persists over time.

Based on this analysis, we can see that **the cumulative change is more pronounced in the twin consuming Somarka/Analemma Water** (change values are 59, 57 and 59). The most obvious contribution to this cumulative change was made by **a strong positive change observed in the low-frequency delta range**, which will be discussed in more detail later on.

In the twin consuming Regular Water, the cumulative change was less pronounced (25 and 26 on Days 1 and 2). On Day 8, we observed some additional change (value 48) in the twin consuming Regular Water. However, this was mostly contributed by **a negative change in predominantly high-frequency bands (data not shown in this report)**. It is unlikely that this was caused by drinking Regular Water. Mostly likely, it was caused by external and/or internal circumstances and stressors which are known to influence brainwave activity.

On Day 10, the twin who previously consumed only Regular Water was now given Somarka/Analemma Water, and the cumulative change was calculated in the same way. **This twin also experienced more cumulative change after consuming Somarka/Analemma Water compared to Regular Water** (value 37 vs, values 25/26 obtained on Days 1 and 2). Again, similar to the first twin who consumed Somarka/Analemma Water, **a positive change was observed in the delta range**, while no change was observed in that range in the previous week.

RESULTS

Table 2. Changes in brainwave activity of two identical twins consuming either Añalemma Water or Regular Water. Changes in 32 qEEG aspects (spectra and coherence) were measured for 19 different brain locations in 4 different conditions (see text for details). The values were assigned based on visual difference observed between baseline value (before consuming water) and test value (after water consumption). The total amount of change without assigned positive or negative meaning is presented at the bottom.

HOW TO READ THIS TABLE?

The table represents the total amount of change measured after water intake, either Regular or Añalemma. The intensity of yellow color represents the amount of change - more color means more change. This points us to the areas (brainwaves) where coherence was most strongly affected by drinking water. It doesn't tell us the nature of that change. By analyzing these individual areas in more detail, we can find out whether the change was positive or negative (see [Figures 2 and 3](#)).

		Añalemma Water (AW)			Regular Water			AW
		Day 1	Day 2	Day 8	Day 1	Day 2	Day 8	Day 10
Spectra	EC	4	2	4	2	1	1	1
	EO	5	3	3	1	1	2	2
	EOR	3	2	3	2	1	2	2
	EOM	3	2	3	2	2	1	1
Coherences (Delta)	EC	5	2	2	0	1	1	3
	EO	5	5	5	0	0	0	4
	EOR	5	5	5	0	0	0	3
	EOM	5	5	5	2	1	0	1
Coherences (Theta)	EC	4	1	2	1	1	1	0
	EO	2	2	3	1	1	2	2
	EOR	1	2	2	1	1	2	1
	EOM	2	1	1	0	1	2	2
Coherences (Alpha)	EC	1	1	1	1	1	1	1
	EO	1	4	3	2	1	3	1
	EOR	0	1	1	0	0	1	0
	EOM	1	3	1	0	0	2	0
Coherences (Beta 1)	EC	0	1	1	1	2	1	1
	EO	0	3	3	1	2	2	1
	EOR	1	0	1	0	1	2	0
	EOM	0	1	1	1	2	1	2
Coherences (Beta 2-1)	EC	1	2	0	1	1	2	1
	EO	1	1	1	0	0	2	0
	EOR	2	0	0	0	0	2	0
	EOM	1	2	0	1	1	1	0
Coherences (Beta 2-2)	EC	0	1	0	1	1	2	4
	EO	1	1	0	0	0	2	0
	EOR	1	0	1	0	0	2	0
	EOM	0	0	2	0	0	1	1
Coherences (Beta 3)	EC	0	0	1	0	0	2	1
	EO	2	2	2	2	2	2	1
	EOR	1	1	1	1	0	2	0
	EOM	1	1	1	1	1	1	1
TOTAL		59	57	59	25	26	48	37

RESULTS

Based on the cumulative data presented in **Table 2**, we were able to select the specific areas in which a more pronounced change in spectra and coherence occurred. First, we will take a look at the **spectra**.

Figure 2 shows the spectral measurements obtained in the frequency range going from 2 to 23 Hz. The color of the brain map indicates whether the brainwave activity is below average (blue color), normal (green color), or above average (red). This is determined based on the database values obtained from healthy individuals (the Thatcher database).

In **Figure 2**, the upper panel shows the difference in spectra before (left) and after drinking Somarka/Analemma Water (right). Following the black arrows, you can see the specific areas in which brainwave activity went from "above average" to "normal" in the several minutes between the two measurements. **This indicates that consuming Somarka/Analemma Water normalized (stabilized) the brainwave activity in these areas.**

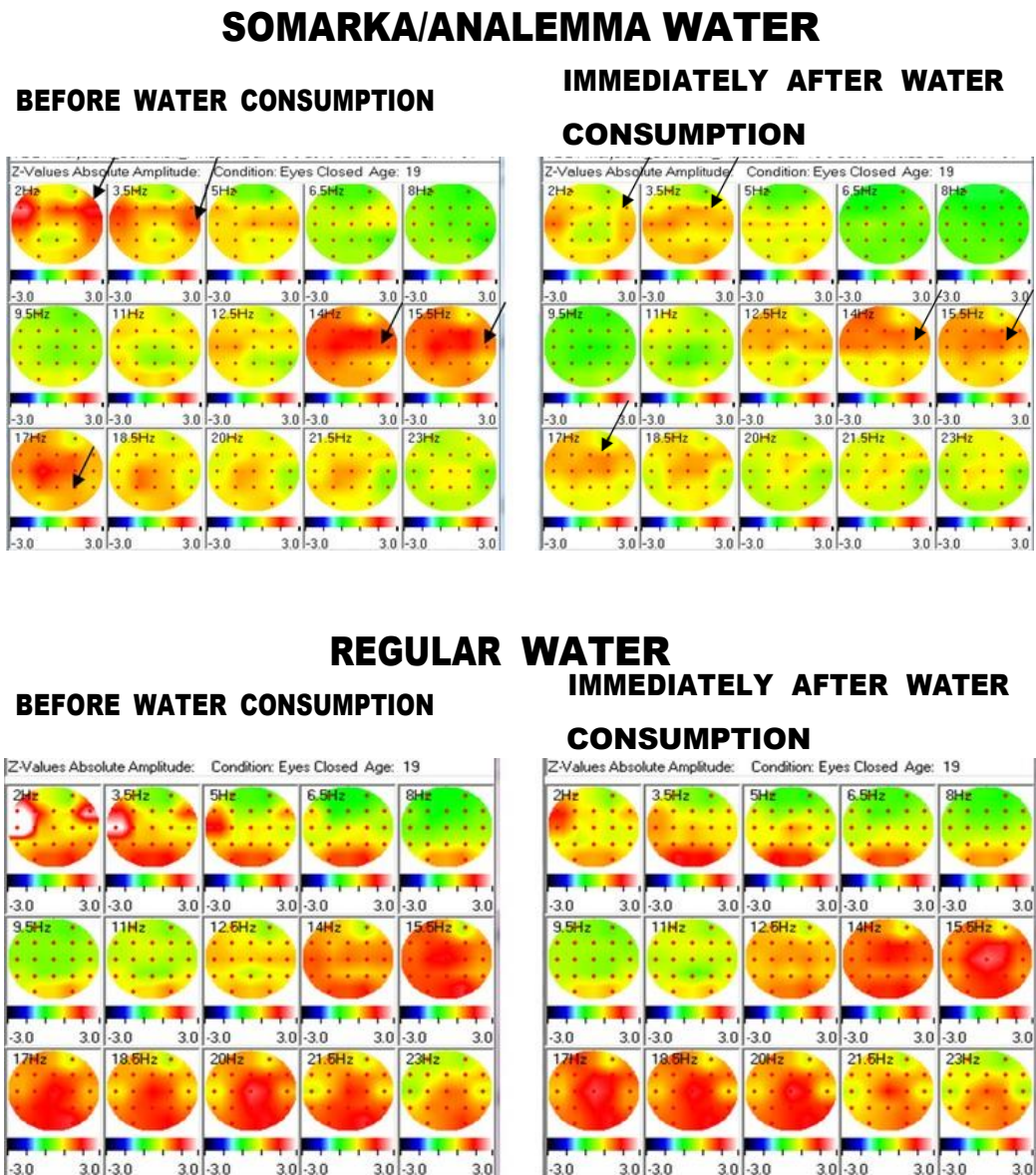
Conversely, no change was observed in these areas in the identical twin who consumed Regular Water (bottom panel).

Finally, we analyzed the difference in **coherences** caused by drinking Somarka/Analemma Water vs. Regular Water, specifically in the delta range where the most positive change was observed. **Figure 3** shows the coherences in the delta range measured in all 19 brain locations. It is immediately apparent that **the twin who consumed Somarka/Analemma Water (top panel) experienced a pronounced positive change in brainwave coherence**, as evident by the change in color - from predominantly blue (below average) to predominantly green (normal). Since this parameter reflects connection between different brain areas, this result demonstrates increased brain connectivity immediately upon drinking Somarka/Analemma Water. This effect was not observed in the twin consuming Regular Water.

These results indicate a strong stabilizing effect of Somarka/Analemma Water in the delta brainwave range. The positive effect is immediate but also seems to persist with continued consumption.

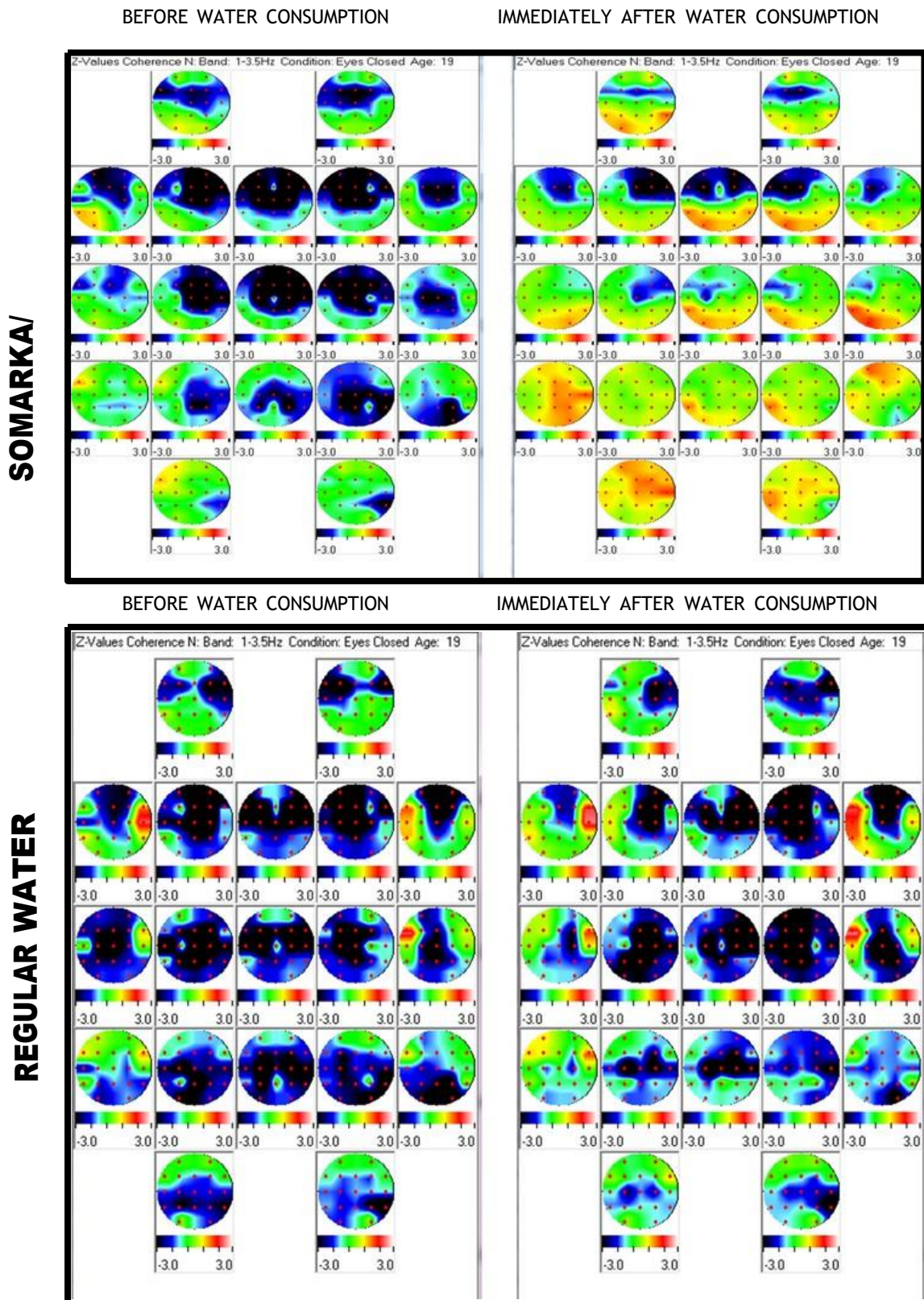
RESULTS

Figure 2. Changes in spectra **before** (left) and **after** (right) consuming either Somarka/Analemma Water (top panel) or Regular Water (bottom panel). The color of the brain map indicates whether the brainwave activity is **below average** (blue color), **normal** (green color), or **above average** (red). The top left corner of each map indicates the frequency at which brainwave activity was measured (in Hz). Black arrows indicate brainwave frequencies at which activity went from above average to normal immediately after drinking Somarka/Analemma Water. These measurements were obtained on Day 1 of the experiment.



RESULTS

Figure 3. The coherence in the delta band measured **before** (left) and **after** (right) consuming either Somarka/Analemma Water (top panel) or Regular Water (bottom panel). The color of the brain map indicates whether the brainwave activity is **below average** (blue color), **normal** (green color), or **above average** (red). The coherence values are shown for all 19 brain locations (individual maps). These measurements were obtained on Day 1 of the experiment.





CASE STUDY 2 - EFFECTS ON WAKEFULNESS

To better understand the effect of coherent water on brainwave activity, a longitudinal experiment was performed on a woman diagnosed with a severe neurological condition. This condition is marked by **increased delta brainwave activity**.

Biomarkers are measurable biological characteristics often used for diagnosis or tracking disease progression. One type of biomarker which can be used to assess the progression of certain neurological conditions is the change in brainwave activity measured by the EEG.

In healthy humans, delta brainwaves are most active in states of **deep sleep**. In the neurological condition this woman was diagnosed with, the progression of disease is usually correlated with **abnormally increased** delta brainwave activity. Here, 51 days of Somarka/Analemma Water consumption caused **a gradual stabilization of delta brainwaves** into the normal range.

In the second part of the study, short-term exposure to mobile phone radiation was used to negatively affect brainwave activity and was immediately followed by consumption of Somarka/Analemma Water with a repeated measurement of the same aspects. This experiment showed an **immediate positive effect** of Somarka/Analemma Water consumption on delta brainwave activity.

EXPERIMENTAL DESIGN

OBJECTIVE

This study aimed to determine the effects of prolonged Somarka/Analemma Water consumption on delta brainwave activity of a patient diagnosed with a severe neurological condition.

PARTICIPANTS

One adult human subject, female, aged 68, previously diagnosed with a severe neurological condition.

STUDY DESIGN

Three types of experiments were performed in this study:

1) Long-term effects

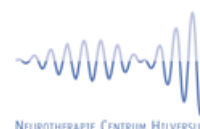
The patient was instructed to continually consume Somarka/Analemma Water over a period of 51 days (6 weeks). The qEEG measurements were taken at baseline (prior to experiment) and at Day 1, 2, 9, 37 and 51 of the experiment.

2) Short-term effects

On Day 1 of the study, the patient was instructed to drink a glass of Somarka/Analemma Water. To assess the immediate effects of Somarka/Analemma Water consumption, qEEG measurements were performed within the next 10 minutes.

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EXPERIMENTAL DESIGN

3) Short-term effects in combination with EMFs

Recent studies indicate that exposure to electromagnetic fields (EMFs) generated by mobile phone radiation affect all common frequency bands (delta, theta, alpha, beta and others).

To assess the effects of Somarka/Analemma Water consumption on brainwave activity following exposure to cellphone radiation, the participant was instructed to make a 2 minute cellphone call, followed by a qEEG measurement. Then, the participant drank a glass of Somarka/Analemma Water which was followed by another qEEG measurement.

All measurements were obtained in the Eyes Closed condition. Frequency maps were obtained for delta (1 - 3.5 Hz) and theta (4 - 7.5 Hz) bands.

RESULTS

Over a period of 51 days, **the patient's delta levels exhibited a gradual decrease from "above average" values into the average range**, as evident by the increasing levels of green color in the delta band brain map (**Figure 4**). This was uncommon for a patient with this specific neurological condition, indicating a strong positive effect of Somarka/Analemma Water on brainwave activity.

Since delta brainwaves are most active in deep sleep states, a decrease in delta brainwave activity could be correlated with less drowsiness. Correspondingly, **the participant herself reported increased vitality and less tiredness**.

Furthermore, frequency maps obtained **immediately after consumption of Somarka/Analemma Water clearly demonstrate a decrease in delta levels** (**Figure 5**).

The stabilizing effect was also observed after exposure to **cellphone radiation** (**Figure 6**).

These results further indicate that Somarka/Analemma Water has a **stabilizing effect on delta brainwaves**, and that it could **possibly mitigate the short-term destabilizing effects of EMFs**.

RESULTS: LONG-TERM EFFECTS

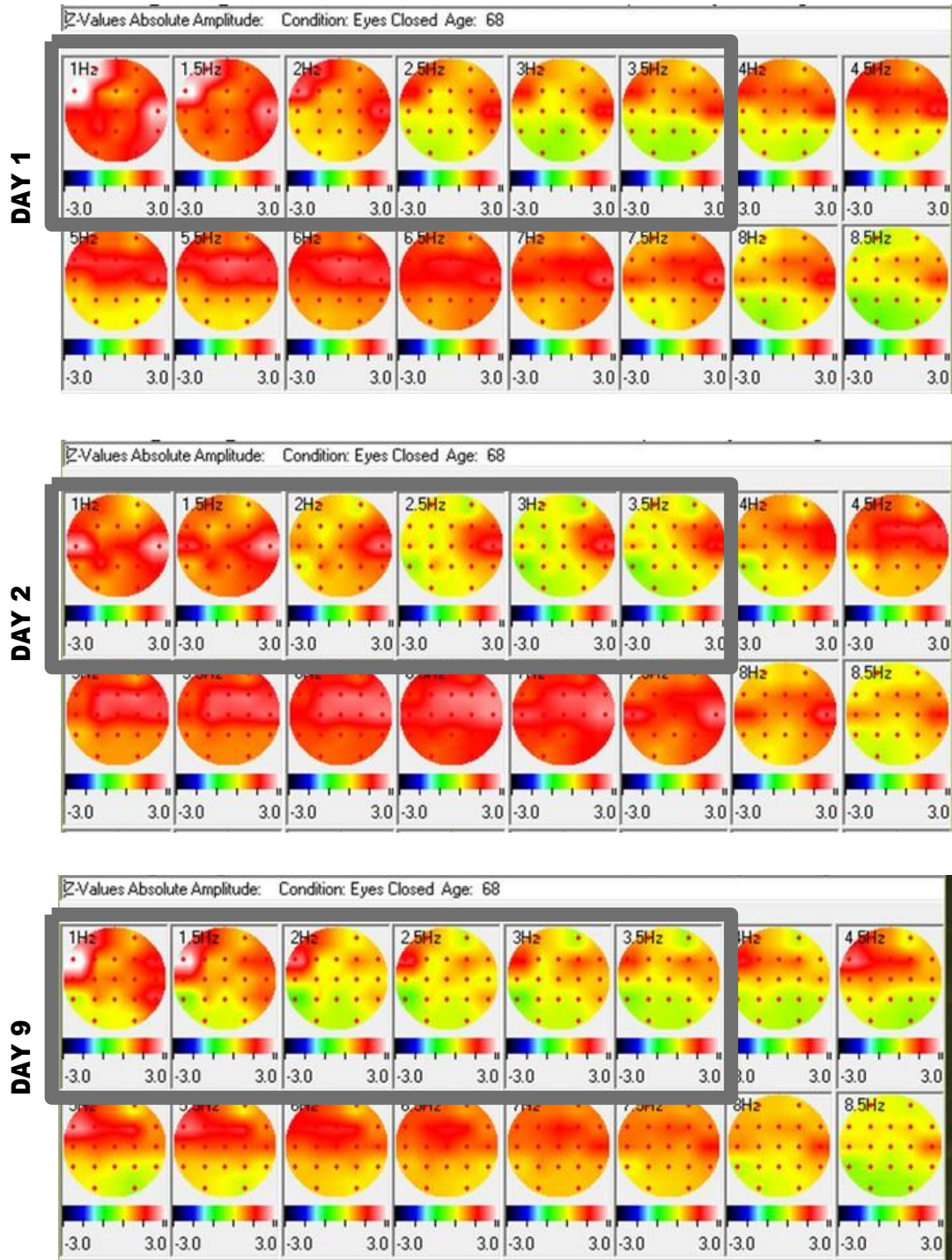


Figure 3.1 - continued on next page.

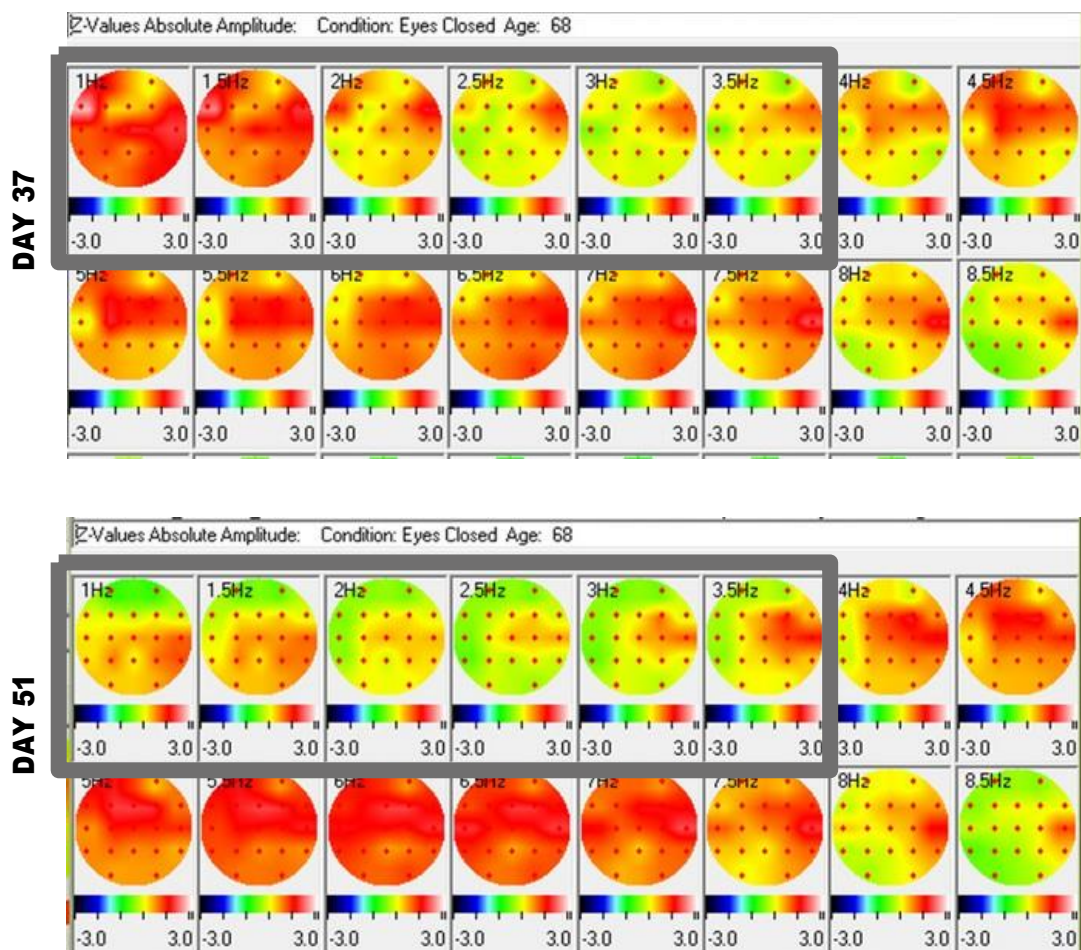
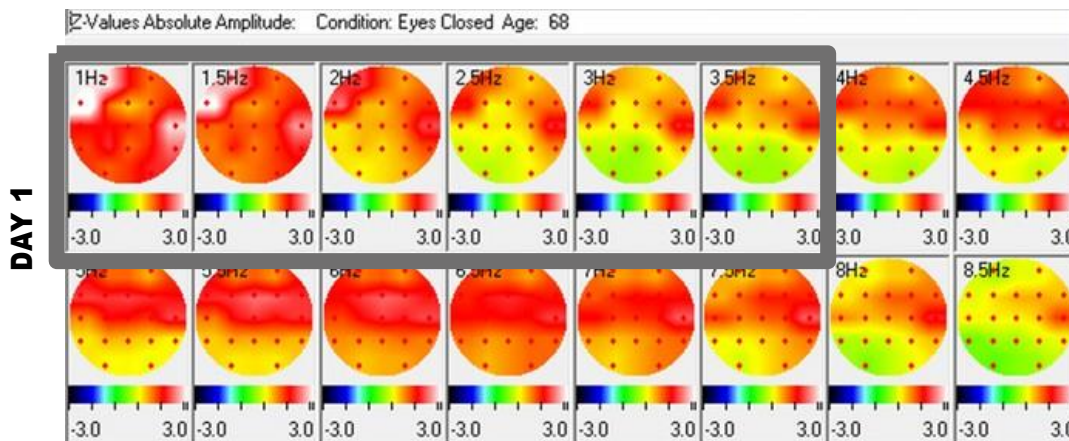


Figure 4. Frequency maps for delta (1 - 3.5 Hz) and theta (4 - 7.5 Hz) bands measured in a patient diagnosed with a neurological condition marked by increased delta activity. Measurements were obtained over the course of 6 weeks, during which the patient consumed Somarka/Analemma Water. The day of each measurement is indicated on the left. The delta band range is marked with a grey box. Red color indicates **above average** brainwave activity, while green color indicates **normal** (average) brainwave activity. Long-term consumption of Somarka/Analemma Water caused a gradual stabilization of delta brainwaves in this individual, despite the neurological condition marked by above average delta activity.

RESULTS: SHORT-TERM EFFECTS

Before Somarka/ Analemma Water consumption



Immediately after Somarka/ Analemma Water consumption

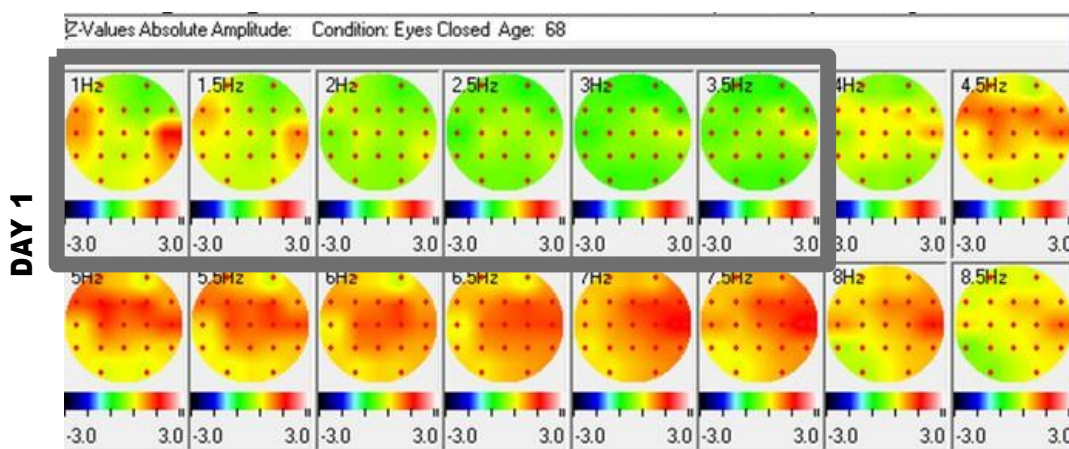
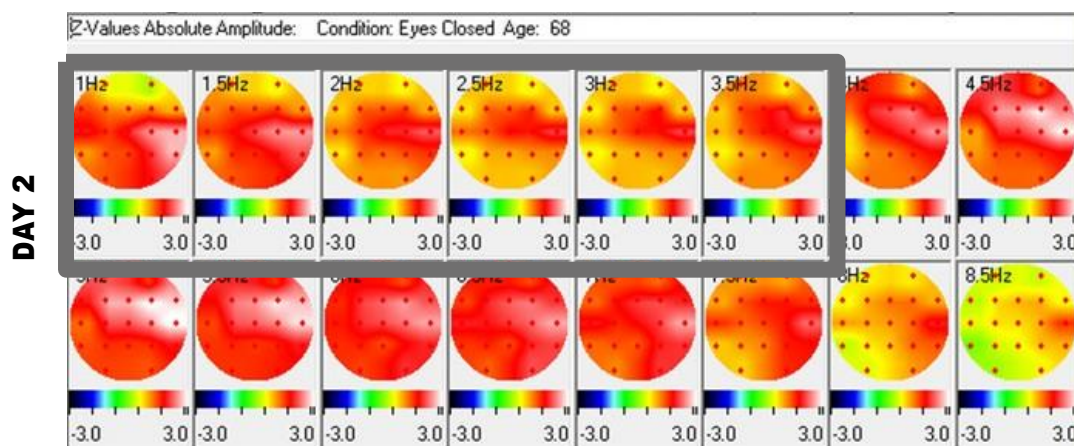


Figure 5. Frequency maps for delta (1 - 3.5 Hz) and theta (4 - 7.5 Hz) bands measured in a patient diagnosed with a neurological condition marked by increased delta activity. Measurements were obtained on Day 1 of a continuous experiment (see the text for details). Here, the measurements were obtained in regular conditions (top panel) and then immediately after consumption of Somarka/ Analemma Water (bottom panel). The delta band range is marked with a grey box. Red color indicates **above average** brainwave levels, while green color indicates **normal** (average) brainwave activity. As evident by the change from predominantly orange-red tones in the top panel toward green tones in the bottom panel, Somarka/ Analemma Water consumption caused stabilization in delta brainwave activity.

RESULTS: SHORT-TERM EFFECTS IN COMBINATION WITH EMF EXPOSURE

After 2 minute exposure to cellphone radiation



Immediately after Somarka/ Analemma Water consumption

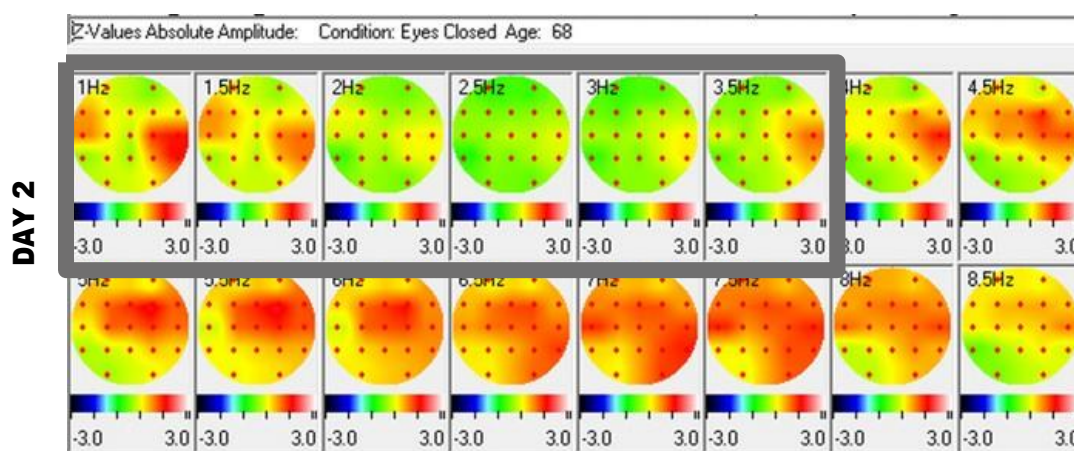


Figure 6. Frequency maps for delta (1 - 3.5 Hz) and theta (4 - 7.5 Hz) bands measured in a patient diagnosed with a neurological condition marked by increased delta activity. Measurements were obtained on Day 2 of a continuous experiment (see the text for details). The patient was exposed to cellphone radiation (2 min phone call) and consumed Somarka/ Analemma Water immediately after. Measurements were taken after the phone call (top panel) and after consumption of Somarka/ Analemma Water (bottom panel). The delta band range is marked with a grey box. Red color indicates **above average** brainwave levels, while green color indicates **normal** (average) brainwave levels. As evident by the change from predominantly red tones in the top panel toward green tones in the bottom panel, Somarka/ Analemma Water consumption caused stabilization in delta brainwave activity.

APPENDIX D

Case Study II - Effect on wakefulness

D1. qEEG MEASUREMENTS DURING EMF EXPOSURE EXPERIMENTS

The measurements consisted of 3 full consecutive qEEG measurements conducted with 10 minute intervals:

1. qEEG base measurement
2. qEEG measurement after 2 minute cell phone call
3. qEEG measurement 10 minutes after drinking the designated water

All data are interpreted with reference to Z-scores, i.e. deviations from the expected value for healthy individuals of a certain age group; the reference values used are from the internationally accepted Thatcher database for qEEG.

For each condition 5 minute measurements were taken at a sampling rate of 256 samples per second. 20% of the data were used after artefact removal, thus rendering 1 minute averages per condition (based on about 15.000 samples per location).

D2. DATA EVALUATION

In order to simplify the overall evaluation of so many data originating from qEEG measurements, a value between 0 and 5 was allocated to the following 32 aspects, indicating how much they differed (upon visual inspection) from the qEEG with which they were being compared :

Spectra (EC, EO,EOR,EOM) (max total value 20)

Frequency bands x Coherence (EC, EO,EOR,EOM) (max total value 140)

Delta (1-3.5Hz) x Coherence (EC, EO,EOR,EOM)

Theta (4-7.5 Hz) x Coherence (EC, EO,EOR,EOM)

Alpha (8-12 Hz) x Coherence (EC, EO,EOR,EOM)

Beta 1 (12-15 Hz) x Coherence (EC, EO,EOR,EOM)

Beta2 I (15- 17.5 Hz) x Coherence (EC, EO,EOR,EOM)

Beta2 II (18-25 Hz) x Coherence (EC, EO,EOR,EOM)

Beta 3 (25.5-30 Hz) x Coherence (EC, EO,EOR,EOM)

Each aspect was evaluated for the four different conditions (eyes closed EC, eyes open EO, reading EOR, and watching a movie EOM). Evaluation was not conducted in the sense of positive or negative tendency, as change in itself was considered to be the important aspect. The reason was that on the long run positive tendencies are usually precursed by disintegrating dysfunctional circuits before more functional circuits are formed, so "chaos" may temporarily seem to occur.

Therefore, when total values are presented in a graph, these values are derived from adding the allocated change values (between 0 and 5).

APPENDIX D

D3. EFFECTS ON DELTA BRAINWAVES

To further assess the effect of Somarka/ Analemma Water on delta brainwaves, additional spectral graphs were obtained for a specific centrally located brain location (Pz), which is not very susceptible to artefacts. The results are shown in **Figures D1** and **D2**. Similar tendencies have also been found for other brain locations (not shown).

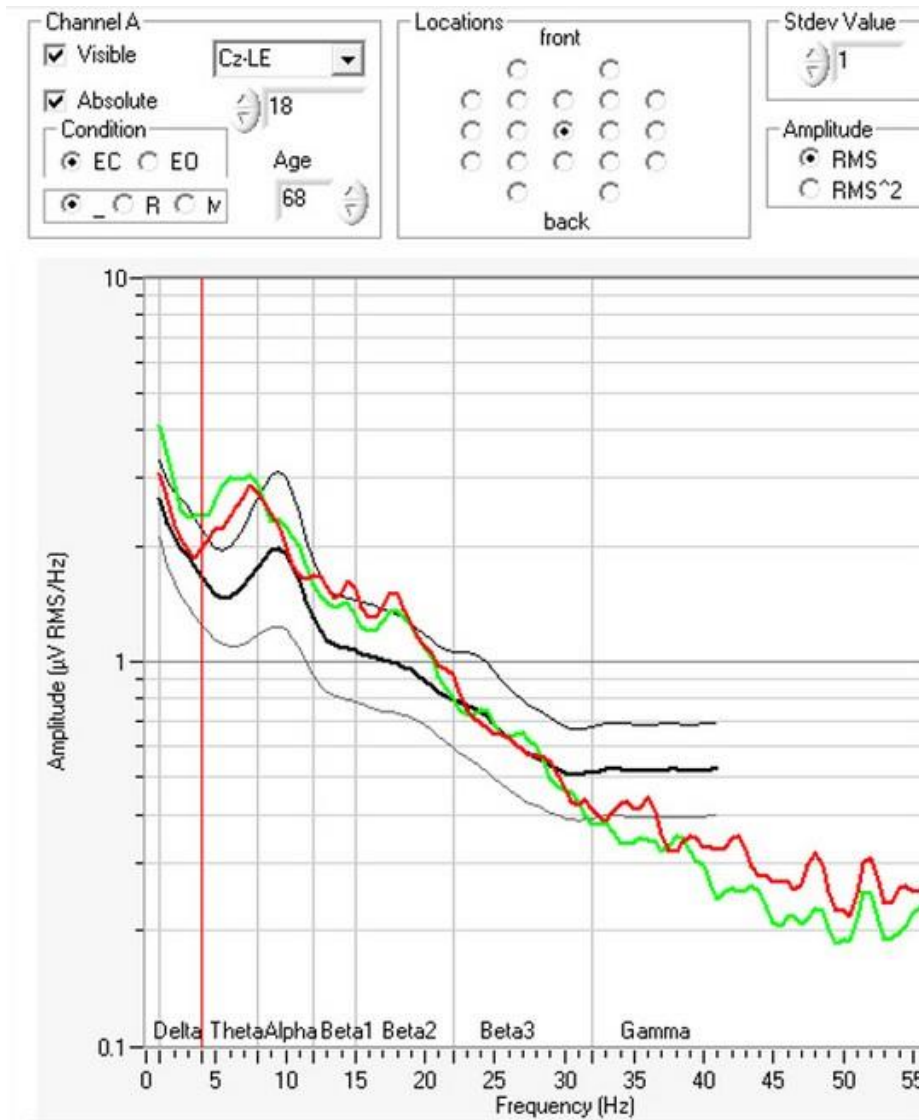


Figure D1. EC Spectrum of location Pz : baseline measurement (green line) and measurement obtained immediately after consuming Somarka/ Analemma Water (red line). Black lines depict the reference value for healthy individuals (+- 1 std dev.)

APPENDIX D

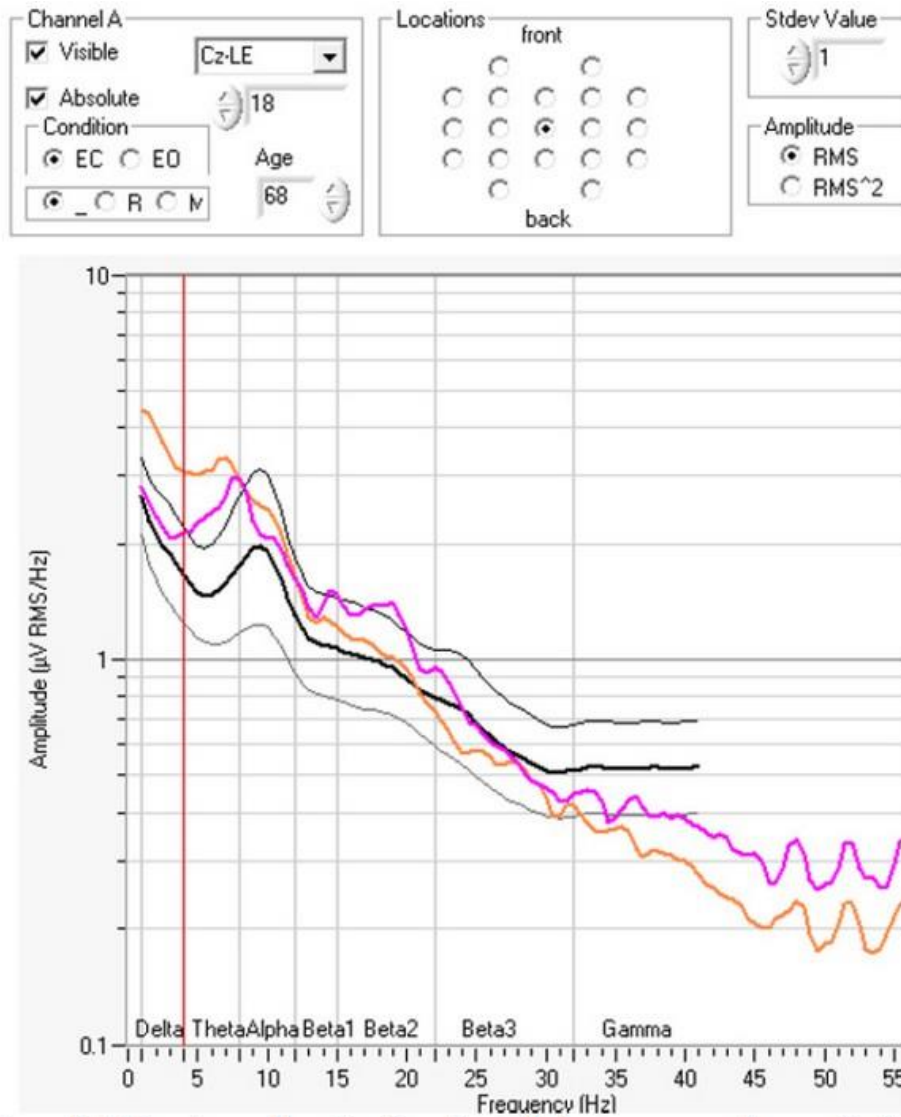


Figure D2. EC Spectrum of location Pz: measurement after cell phone exposure (orange line) and measurement obtained immediately after consuming Somarka/ Analemma Water (pink line).. Black lines depict the reference value for healthy individuals (+- 1 std dev.).

APPENDIX D

D4. REFERENCES

Lustenberger C, Murbach M, Dürr R, Schmid MR, Kuster N, Achermann P, Huber R (2013) Stimulation of the brain with radiofrequency electromagnetic field pulses affects sleep-dependent performance improvement. *Brain Stimul* 6(5): 805-11.

Perentos N, Croft RJ, McKenzie RJ, Cosic I (2013) The alpha band of the resting electroencephalogram under pulsed and continuous radio frequency exposures. *IEEE Trans Biomed Eng* 60: 1702–1720.