

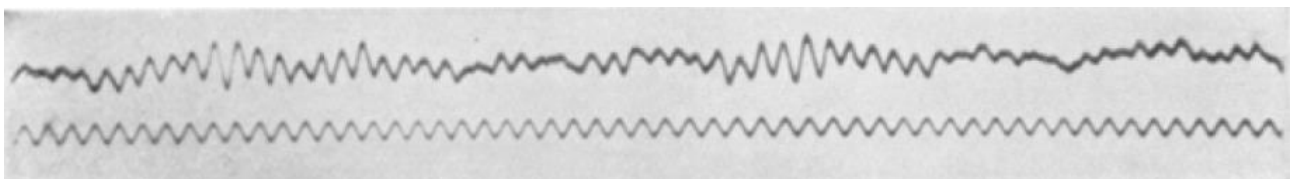
## **EEG and hypnotherapy**

### **What is EEG?**

Electroencephalography or EEG is a method of recording electrical energy in the brain. Electrodes are placed on the scalp and fluctuations in electrical energy are recorded usually on a graph.

In 1875, Richard Caton published his findings on the electrical nature of the brain based on open-brain experiments on animals, but it wasn't until 1890 that Adolf Beck developed an opus of work that demonstrated the existence of brain waves.

Human research followed much later in the 1920s using paddles applied to the brain to detect electrical activity. Hans Berger, a German physiologist, recorded the first ever human EEG in 1924.



*The first human EEG recording obtained by [Hans Berger](#) in 1924. The upper tracing is EEG, and the lower is a 10 Hz timing signal.*

It wasn't until the 1950s that researchers were able to produce more complex EEG measurements and it was William Grey Walter who produced the first electrical maps of the brain at the Burden Neurological Institute in Bristol. Walter was the first to report that alpha waves originate from the occipital lobes.

### **Why use EEG?**

EEG can be used in a clinical setting to diagnose abnormal patterns of electrical activity in the brain (e.g. epilepsy) or in a research setting to understand which parts of the brain are responsible for what sorts of activity – language, movement, memory, visual processing and so on.

The use of EEG in non-clinical research is a growing field, particularly as it has relatively low running costs, is non-invasive (now!) and is tolerated well by most people. It has limited functionality compared with high-level fMRI (particularly for minute brain mapping), and does not map deep into the brain. It has high noise/signal problems which we will see later, but these artifacts are easily spotted and discounted. The benefits of EEG over fMRI are however, significant to most research activity. EEG detects changes in the brain very quickly (microsecond changes can be detected) and the data can be used relatively easily to produce meaningful brain activity maps suitable for most purposes.

We will see how quickly a brain activity map can be produced later in the session.

## Brainwaves

The brainwaves we are most interested in are the Delta Theta Alpha and Beta waves. Brainwaves are measured in Hertz – the number of cycles per second:

Delta (0.5-4Hz) – indicating deep sleep and restfulness

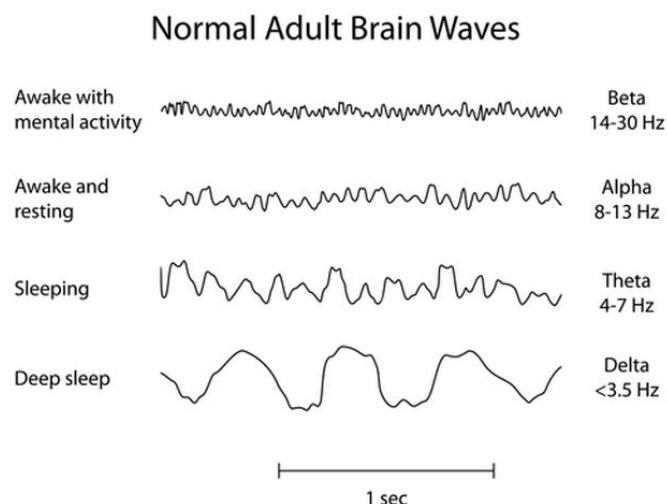
Theta (4-8Hz) – indicating deep meditative states, daydreaming and automatic tasks

Alpha (8-15Hz) – indicating relaxed alertness but restful and relaxing, not anxious

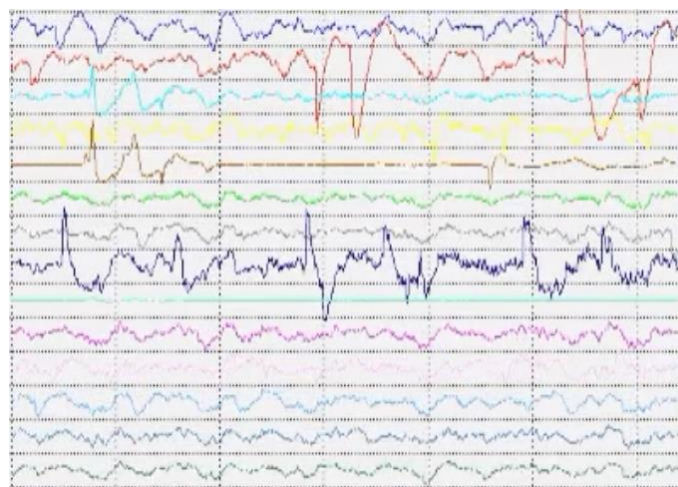
Beta (15-30Hz) – indicating wakefulness, alertness, mental engagement and conscious processing of information, can be associated with anxiety

The normal Electroencephalography (EEG) varies by age. The neonatal EEG is quite different from the adult EEG. The EEG in childhood generally has slower frequency oscillations than the adult EEG.

What do these brainwaves look like?



Typical pure EEG output:



### *Alpha brainwaves*

Alpha Brain Waves are a sign of relaxed activity in your brain. High levels of alpha brainwaves are common among highly creative individuals who have a clear mind or are experiencing relaxation. Interestingly, as a child you will have had significantly greater amounts of alpha brain wave activity than you will as an adult. Environmental stressors, fear, anxiety, tension, and overworking tend to deplete your alpha wave activity.

#### Benefits of alpha brainwave activity:

1. Relaxing thoughts/relaxing body
2. Enhanced problem solving
3. Calming, centred emotions
4. Optimal athletic performance
5. Reductions in fear, tension, stress, nervousness, anxiety
6. Everything seems to 'flow' - life's events pass quickly and challenges are easily overcome
7. Improvement in ability to retain large quantities of information
8. Improved immune system functioning
9. Makes you think positively
10. Natural antidepressant
11. Greater awareness of your 'self'.

### *Beta brainwaves*

Beta brainwaves are the fastest brainwaves, they are usually produced in the left hemisphere of the brain whilst you are working on your mid-morning crossword, Sudoku, taking exams or reading a book. People who think logically tend to have high levels of beta. Adults produce more beta than children and adolescents and this may be reflected in their ability to focus on tasks better.

#### Benefits of beta brainwave activity:

1. You are full of energy, nervousness, excitement or anxiety
2. You can think rapidly and quickly come up with solutions to problems (BUT not necessarily based on a considered review of all the information available to you – knee-jerk reactions for example).
3. You are more socially outgoing
4. You can hold an interesting and stimulating conversation with others
5. You have high levels of motivation
6. You are more goal oriented

### *Theta brainwaves*

Theta brainwaves are fairly slow and associated with the early stages of sleep and with Rapid Eye Movement sleep or dreaming. Theta waves are produced when you experience surges of emotion and have been associated with enhanced creativity. Artists show high levels of theta. Interestingly, people with attention-deficit problems (ADD/ADHD) are not able to shift out of the theta state when they are required to focus which makes school work and holding down a job much harder.

#### Benefits of theta brainwave activity:

1. You feel relaxed and carefree
2. You have stronger and more natural emotions whilst you are producing theta waves
3. Good intuition
4. Advanced problem solving and learning
5. Allows you to "re-programme" your brain with ideas and beliefs that you truly want to believe
6. Long-term improvements to memory
7. Stimulate immune-system functioning

### *Delta brainwaves*

Delta brainwaves are the slowest brainwaves that are produced when you are in the deepest stages of sleep or when you are unconscious. Delta waves do not show the same pattern of synchronicity that other brainwaves show – they can appear anywhere in the brain and not necessarily in both hemispheres at the same time. People with high levels of delta waves tend to show the most empathy for others.

#### Benefits of delta brainwave activity:

1. You release anti-ageing hormones – yep, it truly is beauty sleep!
2. You show increased empathy
3. You release increased growth hormones and the body undergoes its repair cycle
4. Increased melatonin and thus induces sleep
5. Reduced levels of cortisol – stress hormone
6. Can reduce adrenaline levels – people with insomnia release high levels of cortisol and adrenaline and often feel quite rotten with it
7. Associated with spiritual experiences and out-of-body experiences

## Tasks: Experience your brain waves!

1. Alpha - tell your neighbour what's been good about your week, how do you now feel?

a. Feel the love



2. Beta - busy! Pat-a-cake with your neighbour, get faster and faster! How do you now feel?

a. Here are the words:

Pat-a-cake, pat-a-cake

Baker's man

Bake me a cake

As fast as you can.

Roll it and pat it

And mark it with a B

And throw it in the oven

For baby and me.

b. Energised? Excited? Confused? Lost?! Beta is energising and fun but can get out of control and you feel anxious and bewildered.

3. Theta – the hot air balloon task!

You are in a hot air balloon which is losing height rapidly and will soon crash because it is overweight; therefore you have to get rid of seven of the passengers! Who will you choose? The passengers are:

- |                        |                     |
|------------------------|---------------------|
| ▪ Mother Teresa        | ▪ Cristiano Ronaldo |
| ▪ Mao Tse-tung         | ▪ Albert Einstein   |
| ▪ Mahatma Gandhi       | ▪ Leonardo da Vinci |
| ▪ Florence Nightingale | ▪ Abraham Lincoln   |
| ▪ Nelson Mandela       | ▪ Beethoven         |
| ▪ Mikael Gorbachev     | ▪ Vincent Van Gogh  |
| ▪ Charles Darwin       | ▪ Jane Austen       |
| ▪ William Shakespeare  |                     |

a. How does this feel?

4. Delta – after all that hard work, it's time to sit back and take yourself into deep-ish trance for a few minutes, when you are back in the room,

a. how do you now feel?

Think about the different brain states, the energy, the calm, the power, the control.

When your clients come to see you they may be in a predominately beta state.

The IC can help move them into theta where they can begin to analyse their concerns calmly and logically.

Our work is to help our clients identify good beta state and not as good beta (tipping into anxiety and more), help them to learn to use theta to problem solve and find solutions.

## What does the EEG output tell us?

Alpha is a marker of visual attention, shut your eyes and get clear alpha wave 8-12 Hz.

When people go to sleep and when in deep sleep/R.E.M. the brain looks like it is awake.

Get lot of theta when we go into trance = get sleep like state

Possible interpretations:

When our brain is 'idling', is it running at 4-7Hz and thus we see/produce theta? Or, is it running at about 10Hz and we are seeing alpha because we daydream and produce visual images?

During our language pattern, are we producing theta in response to a reduction in other random thoughts?

Our brain activity naturally falls during the day and then rises at night, this could be because brain activity produces calcium and potassium as waste and there is a clean-up during the night.

- During that clean up, pathways developed during the day are underlined and connections renewed.
- During this time we go into deep sleep and R.E.M. sleep, theta increases and impacts on gamma wave production.

*This is why we think that connections are enhanced, pathways underlined and we build new networks of thought.*

During trance, alpha increases, this means we have a reduction in attention and start to daydream.

- As we get a lot of frontal lobe alpha activity it could be that we are shifting our focus from noise to the therapist's voice and the language pattern.
- During trance, theta increases and this means we are underlining the new links we are making between things, not necessarily creating new pathways but interconnecting and building new networks of thought.