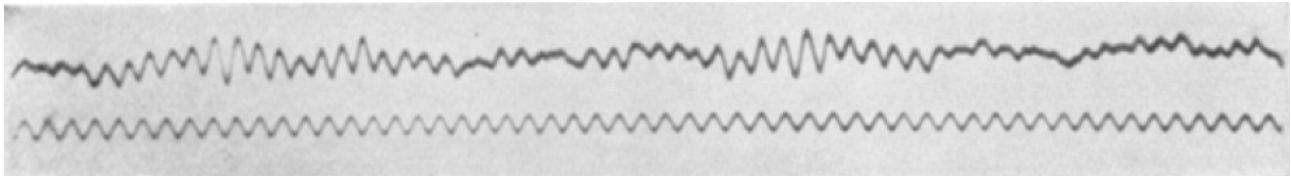
EEG and hypnotherapy

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

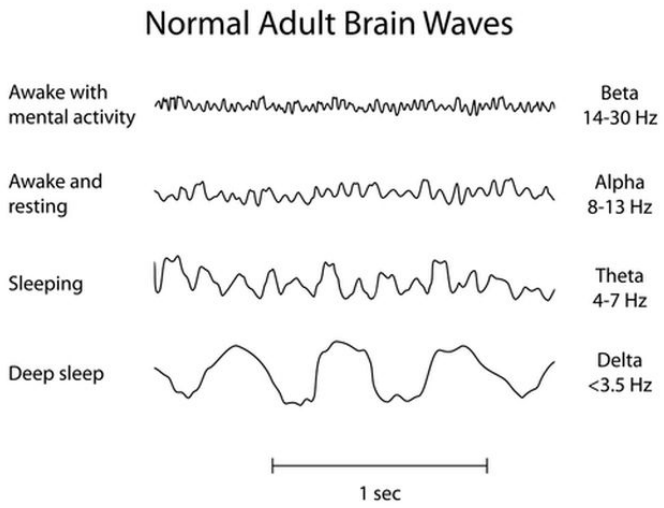
Theta (4-8Hz) – indicating deep meditative states, daydreaming and automatic tasks

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

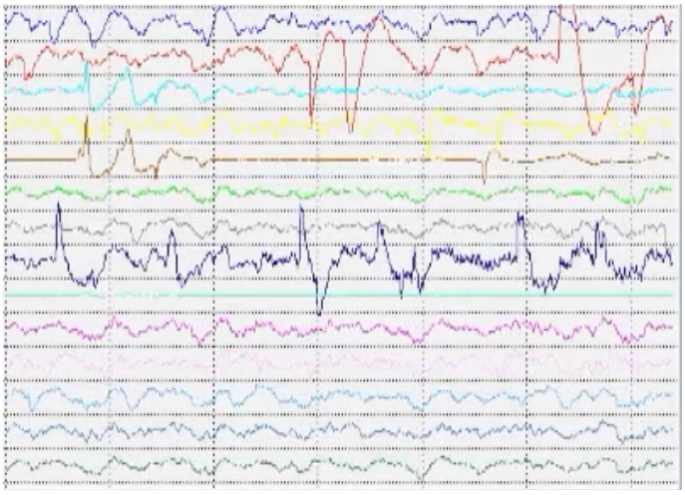
Beta (15-30Hz) – indicating wakefulness, alertness, mental engagement and conscious processing of information, can be associated with anxiety

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

EEG and Solution-focused Hypnotherapy

We are going to look at an EEG trace of a typical person with no known neurological conditions. We will use a range of language patterns and monitor any changes in EEG.

We will do this in two ways:

1. 3D brain mapping
2. Pure EEG

The 3D brain map provides us with four images of the brain referencing alpha, beta, theta and delta brainwaves. We will see where the changes happen.

Commonly asked questions on hypnotherapy

1. How is this different to meditation?
2. Does this really work?
3. Will you make me cluck like a chicken?

How can we answer these questions?

EEG?

Let's see what happens…

Answers:

How is this different to meditation?

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Does this really work?

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Will you make me cluck like a chicken?

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Anatomy and Functional Areas of the Brain

Functional Areas of the Cerebral Cortex

1 **Visual Area:**
Sight
Image recognition
Image perception

2 **Association Area**
Short-term memory
Equilibrium
Emotion

3 **Motor Function Area**
Initiation of voluntary muscles

4 **Broca's Area**
Muscles of speech

5 **Auditory Area**
Hearing

6 **Emotional Area**
Pain
Hunger
"Fight or flight" response

7 **Sensory Association Area**

8 **Olfactory Area**
Smelling

9 **Sensory Area**
Sensation from muscles and skin

10 **Somatosensory Association Area**
Evaluation of weight, texture, temperature, etc. for object recognition

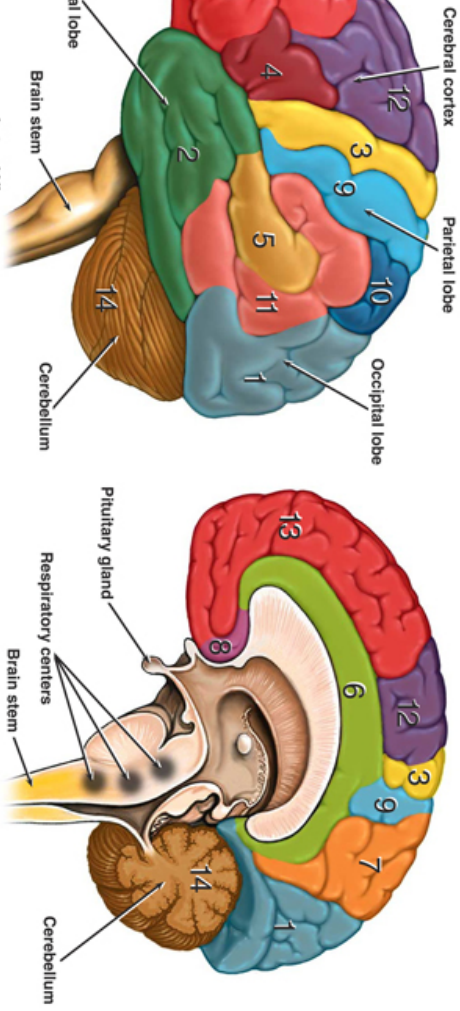
11 **Wernicke's Area**
Written and spoken language comprehension

12 **Motor Function Area**
Eye movement and orientation

13 **Higher Mental Functions**
Concentration
Planning
Judgment
Emotional expression
Creativity
Inhibition

Functional Areas of the Cerebellum

14 **Motor Functions**
Coordination of movement
Balance and equilibrium
Posture



Emotiv Epoc - what is it?

Non-invasive, easily applied headset with 14 electrodes to measure brain activity.

Take a look! www.emotiv.com

Where do the sensors go? Which areas of the brain are being measured?