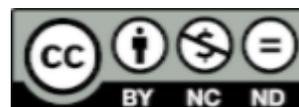


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Hypnotic Brainwaves

There has long been a question of whether hypnotic trance is a distinct brain state, or just a different way of paying attention. I want to show you the brainwaves of one of my clients in hypnosis. Examining these brainwaves does more than answer this question.

I've offered brainwave training for a decade, and professional hypnotherapy for two years. I attach most of my hypnosis clients to an EEG amplifier and record their brainwaves. The picture one gets from the electroencephalograph is complex. No two people are the same, and there is no uniform progression of brainwaves through hypnosis. But some things that are generally evident, and some clients present a textbook picture. This article describes one such client.

Hyper-Vigilance

I offer a free, 1-hour session to anyone who walks into a volunteer free-clinic in Stone Ridge, New York. I provide a combined session of neurofeedback and hypnosis. I give my client a quick description of neurofeedback, attach them to the leads of my EEG amplifier, and begin my induction.



Mary signed up for a session of neurofeedback. Now in her 50's, the child of parents traumatized by war, Mary inherited a version of this trauma through their dysfunction. Her personality is emotionally stable and even-keeled, but she confessed to always being in a fearful, hypervigilant state. This was consistent with her confident, subtly tense posture and erratic eye movements.

I attached a single EEG circuit between Mary's left parietal area and a site above her right ear. I asked her to describe a place she enjoyed, and she provided a description of a woodland environment. I elicited enough detail to recreate something like this in the guided visualization that was to follow.

The neurofeedback protocol, called Alpha-theta Training, presents either of the two ambient sounds depending on whether one's brainwave pattern has increased its amount of slow theta waves, or faster alpha waves. If there is an increase in the amplitude of slow theta, as when you are calm and your mind empty, then you hear rain. If there is an increase in the amplitude of faster alpha, as when you are focused and attentive, then you hear frogs.

She listened to these sounds, and to my voice, through a pair of headphones with her eyes closed. The purpose of the feedback is to draw your attention to when you shift attention and, by doing this, heighten the contrast and encourage you to oscillate between them. As I spoke, behind my voice, she heard the sounds of frogs and rain.

I guided Mary through progressive muscle relaxation, and then asked her to visualize a set of ten steps. The steps served to both deepen her trance, and served as an introduction to active visualization. The amplitude of her brainwaves over the course of the session is shown in the figure below. The colored lines show the amplitudes of the different brainwave bands.



Time runs across the horizontal axis from left to right. The session begins at the left where the background teal color first appears. The 50-minute session ends at the right edge.

The solid teal-colored shape shows the amplitude of the delta waves. This is a measure of Mary's relaxed state, and it varies rapidly up to a point shortly after the start of the induction.

The fuchsia-colored line measures alpha amplitude; alpha is between 8 and 12 Hertz. Hertz, or Hz, is cycles per second. Alpha reflects your engagement with verbal thinking. This starts at a level below all others.

The frequencies above alpha -- called Sensory Motor Rhythm (SMR) and beta -- are yellow and blue. These frequencies signal attention to detail of short duration. With higher amplitudes they indicate vigilance grading into anxiety.

I should note with regard to all of these frequency associations that these are not universal markers. A great variety of personality, awareness, and presentation is carried on these few frequencies.

The Hypnotic State

Soon after the start of the hypnotic induction, Mary's state changes dramatically. Her delta waves calm down, the amplitude of her anxious frequencies drops by half, and alpha -- her non-vigilant, verbal state marker -- doubles and continues to rise.

I guided her on a journey through a woods to a lake. I asked her to walk into the lake, and walked with her until we were far under the water, still warm, comfortable, and breathing easily. Then I asked her to conjure a presence that represented her fearful, anxious self. I asked her to interact with this presence, and to allow it to speak through her. I asked her for details of its appearance and mood, and I asked her to understand its role in supporting her.

In this case Mary did not speak even though I asked her to. Speech requires a

contribution from the beta frequencies which support the muscle movements and reflexes. She could hear me perfectly well, but was in a state of light paralysis. For her to be able to speak, her beta levels would have needed to be higher. However, excessive beta-related anxiety was her main complaint, and I did not want to interfere with obtaining the relief she had come for. Instead, I asked her to answer my questions silently, to herself.

I then asked her to turn her attention to the conjuring of a strong, fearless, healing presence; to bring that presence into focus, to give it a form, a face, and a name. I asked her to recognize this presence, for it to recognize her, and to establish a personal connection with it.

Finally, in a kind of phantasmagorical [parts therapy](#), I asked her fearful and fearless selves to join with each other, and with her, in establishing a triad of support and understanding. I asked for tokens from each, anchoring these presences in idea, image, and sensation. This was the point on the chart where the alpha levels were the highest, and delta the smoothest.

I took 4 minutes to lead her back out of the lake, out of the woods, and up the ten steps to reawakening. At this point she opened her eyes and began readjusting herself. These movements generated high muscle voltages that overwhelmed the brainwaves during the final 90 seconds, on the far right of the chart.

The Heat Map

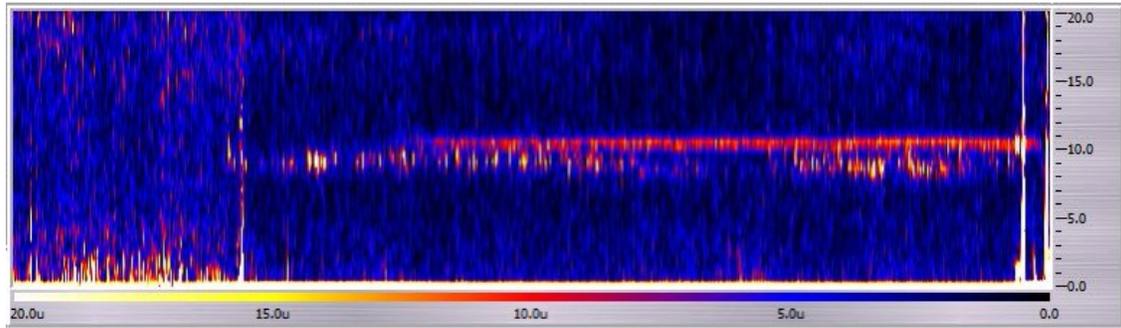
If you've followed me this far, then you know there are different brainwaves, with different frequencies, and they can be stronger or weaker. Let's take the next step.

In reality there are no brainwaves, that's just a name that we give to something we construct. What appears as a brainwave is a mathematical concept visualized computationally. What is really there?

The brain is an holistic organ that coordinates its parts using resonance. Resonance is most easily pictured as the interaction of frequencies, which we call waves, but there are not really any waves. Rather, there are various echos that reverberate through the networks of our brain. The reality is that the brain is neither just a collection of parts, nor the collective motion of them. It's both.

To see more detail we can recast the brainwave graph as a heat map. A heat map is like a topographic map in that it shows both details and the larger pattern. It shows both the mountains and the ranges. A heat map has less prejudice, and is more realistic in representing the duality of the operation.

The following figure is a heat map of Mary's session and it is derived from the same information as the brainwave graph in the first figure.



The width and height of heat map are time and frequency. Time moves from the start of the session on the left, to the end of the session on the right. The width of the graph tracks the 50 minute session, the same time span as the active area of the first figure.

The vertical axis is frequency, which runs from zero to 20 Hertz. Where the first graph showed the energy in bands of frequency, the heat maps show energy at each frequency.

The measure of energy is given by the color, and that is the scale shown along the bottom of the graph. The highest energy is shown in white, grading to yellow, then red, indigo, blue, and finally black, which represents no energy.

What We Can See

Most people don't display as dramatic a shift in their EEG as Mary. The changes in her EEG also coordinated well with the shifts in her mental state.

The first fifth of the heat map, which appears on the left side, is Mary's normal state. It shows little focus in the alpha frequency of linguistic thought. Her attention is mostly tuned to hyperstability in the low range, and vigilance in the high range. This suggests Mary narrowly filters her mental structures, focusing on basic feelings while being alert for issues of threat.

This state ends with a white burst of energies at low frequency, and a dramatic

shift. It is as though this burst “broke through” to a new state of awareness.

A new pattern then emerges showing a narrow band of high energy at 9 Hz. After another 10 minutes, this gives way to a smoother, narrower band at 10 Hz that appears to drain power from frequencies above it, causing the higher frequencies to go dark. At the same time the low frequencies, the home to breadth, relaxation, and metaphor, persist at fraction of their original energy.

Seeing Consciousness

You are seeing the emergence of new awareness, a state defined in the space of frequencies. This new awareness has two adjacent and distinct horizontal alpha bands with much lower power in the delta and beta regions. I know the meaning of alpha-band structures, but I can't distinguish between these two, nor can anyone to my knowledge. I expect further exploration of Mary's subjective state would provide more explanation.

I believe Mary's new awareness differs from her initial state of awareness with regard to her general use of words and her formation of thoughts. I see Mary's emergent state of mind as open, receptive, and more verbally aware. It differs from her normal state in being less associative, and in being stripped of vigilance, and missing certain aspects of fine detail.

My answer to the question of hypnosis being either a state of consciousness or direction of attention is that it is both: the two are aspects of each other. Consciousness rides on attention. What you attend to shapes your consciousness.

The connections I'm making between the frequencies and subjective states are new. The connection between the brainwaves and subjective states is unexplored. Mary is the first person to present such a clear shift in consciousness alongside a clear electrical picture. She may be my Rosetta stone.

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