

Brainwave Entrainment

A guide on all you need to know



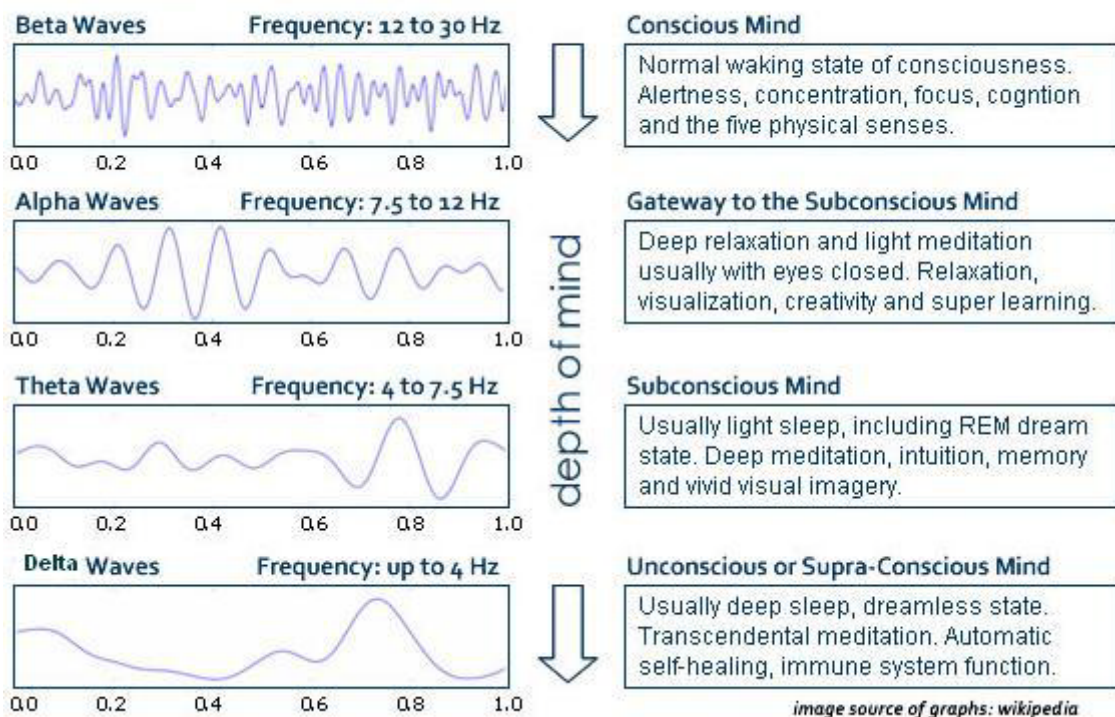
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1. The Science behind Brainwave Entrainment *can be explained quickly and easily.*

To begin, let's start by understanding what "brainwaves" are.

We all experience different states of mind each day: states such as sleep, focus, or creativity, for example. Every state of mind has a unique electrical signature that can be detected in the brain. These signatures are known as "brainwaves." Using specialized equipment, these waves (or *frequencies*) can be measured and recorded, allowing us to map what brainwaves are present during certain key states of mind.

EEG Brain Frequency Chart



"Brainwave Entrainment" is the process of (typically) using audio and/or visual stimulation to actually *change* brainwave patterns. By changing your brainwave patterns, you can actually *recreate* certain states of mind - again, such as sleep, focus or creativity. Usually, this works by listening to a particular brainwave pattern (a specific pulsed frequency, encoded in audio). The brain then follows (entrains) to that pattern, and as a result, changes your state of mind.

Quick example: Brainwave readings (with an EEG machine) have shown that brainwaves of 2Hz occur when an individual is asleep. Scientists can create special audio recordings, which contain an encoded 2Hz frequency. While listening to such audio, the brain naturally follows (entrains) toward that 2Hz frequency, lowering its brainwave patterns. That's "brainwave entrainment." The net result is that when listening to such an audio recording, you (the listener) will naturally and gradually fall asleep.

But it doesn't stop there. By mapping common states of mind - such as intense concentration, creativity, and relaxation - scientists are able to create recordings which replicate any of these states, simply using audio and/or visual stimulation.

In practical terms, that means we can change how we feel - simply by listening to the right "scientific" sounds.

In other areas, scientists have used brainwave entrainment to reduce chronic pain, minimize ADD symptoms, increase IQ levels, and lessen the need for anaesthetic during operations.

2. What Are Brainwaves

Your brain is a fascinating machine.

This three-pound organ contains a staggering 100 billion brain cells. It can process thoughts at thousands of miles per second. It contains left and right hemispheres, each dealing with specific functions. And its cortical networks can rewire themselves, effectively remapping the mind.

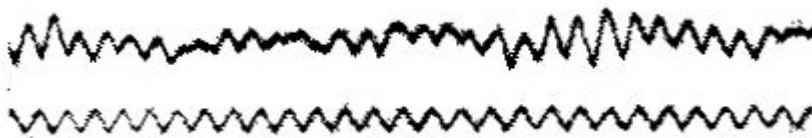
But have you ever thought about how the human brain actually works?

Your brain consists of billions of little nerve cells, known as *neurons*. In order for your brain to work, these neurons have to talk to each other. The neurons communicate using *electricity*.

When millions of neurons are communicating at the same time, this all generates a significant amount of electrical activity - which can be detected using sensitive scientific equipment, such as an EEG (electroencephalograph) machine.

This combined electrical activity in the brain is known as a *brainwave pattern*. It's called a *brainwave* due to its wave-like patterning.

Here's a copy of the very first human EEG (electroencephalograph) reading, taking by Hans Berger back in 1924. The first line is the EEG reading, the second is a 10Hz timing signal:



This is effectively the first brainwave ever recorded. And you can quite clearly see the wave-like pattern of the electrical signals here.

Now, different brainwave patterns have different names, depending on their frequency.

(The frequency is measured in pulses per second.)

So, for example, the "Beta" pattern is typically emitted when we are consciously alert, and is our dominant waking frequency. Think concentration, cognition. On the Hertz scale, this ranges from 13 pulses to 40 pulses per second (Hz).

Beta β

Range: 13-40Hz



Beta is a brainwave state that activates:

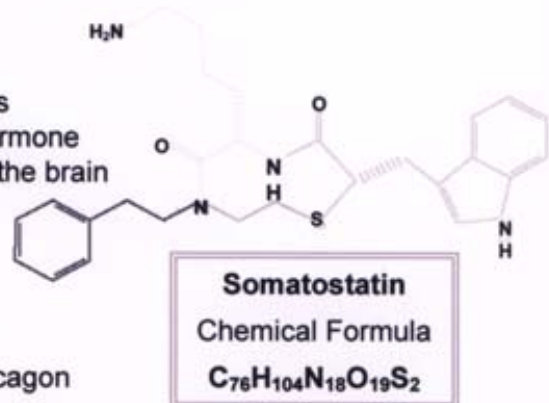
- ◆ Alertness
- ◆ Concentration
- ◆ Cognition
- ◆ Analysis and organization of information
- ◆ High stress levels
 - Higher levels of Beta can quickly deteriorate to anxiety and flight-or-fight reactions

Thermograph of the head in Beta.

Bio chemicals released by the brain in a beta state:

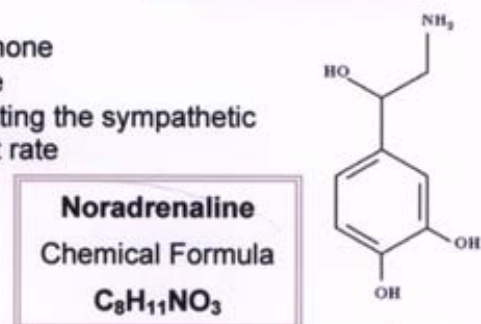
Somatostatin

- ◆ Inhibits the secretion of other hormones
- ◆ Decreases the production of growth hormone
- ◆ Inhibits the function of the right side of the brain
- ◆ High levels may cause emotional instability
- ◆ Decreases the rate of nutrient absorption during digestion
- ◆ Impairment of motor responses
- ◆ Inhibits the secretion of insulin and glucagon



Noradrenaline

- ◆ Decreases the production of growth hormone
- ◆ Increases cholesterol and blood pressure
- ◆ Effects the flight-or-fight response, activating the sympathetic nervous system to directly increase heart rate
- ◆ High levels of noradrenalin cause:
 - Sleeplessness
 - Loss of appetite
 - Anxiety and irritation
 - Depression

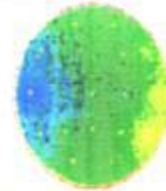


*Note: don not confuse, Beta Endorphins, with beta brainwave states. **Beta Endorphins promote pain control.**

Going deeper, “Alpha” is another brainwave pattern, which usually occurs when we are in a state of physical and mental relaxation, though still aware of the world around us. Think creativity and deep chill. It has a range of 7-13.9Hz.

Alpha α

Range: 7-13.9Hz



Thermograph of the head in Alpha.

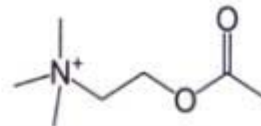
Alpha is a brainwave state that activates:

- ◆ Deep levels of relaxation essential to health and well-being
- ◆ Stress relief
- ◆ Visualization
- ◆ Creativity
- ◆ Concentration
- ◆ Problem solving
- ◆ Creative visualization
- ◆ Intuition
- ◆ Perception
- ◆ Emotional peace
- ◆ Deeper states of consciousness
- ◆ Sleep induction
- ◆ Improved immunity
- ◆ Pulse and breath rate modification
- ◆ The bridge between consciousness and the Schuman Resonance —the resonant frequency of the earth's electromagnetic field

Bio chemicals released by the brain in an alpha state:

Acetylcholine (ACh)

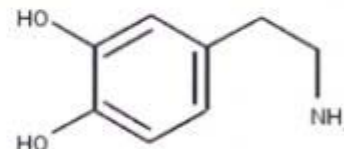
- ◆ A neurotransmitter
- ◆ Growth hormone
- ◆ Decreases cholesterol
- ◆ Decreases blood pressure levels
- ◆ Regulates the secretion of pheromones†
- ◆ Helps relieve anoxemia (insufficient oxygen supply to the blood)
- ◆ A deficiency of acetylcholine is associated with Alzheimer's disease



Acetylcholine
Chemical Formula
 $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{N}^+(\text{CH}_3)$

Dopamine

- ◆ A neurohormone and neurotransmitter
- ◆ Increases heart efficiency
- ◆ Increases renal (kidney) blood flow
- ◆ Improves emotional state of mind
- ◆ Associated with the pleasure centers of the brain and motivation
- ◆ Important in Parkinson's disease
- ◆ Important in psychosis
- ◆ Important in depression



Dopamine
Chemical Formula
 $\text{C}_8\text{H}_{11}\text{NO}_2$

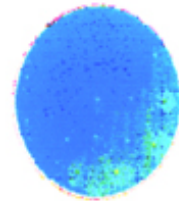
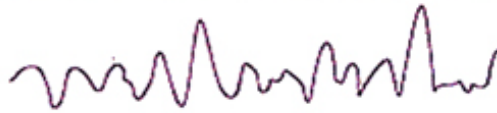
There's also "Theta," which stands at 4-7Hz, and is often associated with daydreaming, or feeling very sleepy. Think meditation, light sleep, memory. It's also strongly associated with creative states.

Theta θ

Range: 4-7.9Hz

Theta is a brainwave state that activates:

- ◆ Deep states of meditation
- ◆ Intuition
- ◆ Enhanced memory
- ◆ Heightened receptivity
- ◆ Enhanced creativity
- ◆ "Ah-ha!" moments or 'suddenly getting it' are a burst of theta waves
- ◆ Dreamlike imagery
- ◆ Inspiration
- ◆ Improved focus
- ◆ Mind expansion beyond the boundaries of the body
- ◆ Behavior modification
- ◆ Potentiation of the treatment for drug and alcohol withdrawal
- ◆ Super-learning, allows faster uptake of information
- ◆ Mind reprogramming
- ◆ Dream recall
- ◆ Self-hypnosis
- ◆ Stress reduction
- ◆ Extrasensory perception



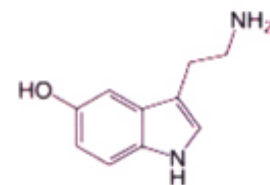
Thermograph of the head in Theta.

Theta is called the 'twilight state' that is felt while drifting off to sleep or just upon waking. Theta is also often called a waking dream state where vivid imagery presents itself to the mind's eye allowing us to be receptive to information beyond our normal conscious awareness.

Bio chemicals released by the brain in a theta state:

Serotonin

- ◆ Regulates blood pressure
- ◆ Regulates the secretion of stomach acid
- ◆ Stimulates smooth muscle function
- ◆ Regulates mood
- ◆ Regulates sleep
- ◆ Helpful in the regulation of vomiting
- ◆ Regulation of sexuality
- ◆ Part of the biochemistry of migraine
- ◆ Part of the biochemistry of bipolar disorder
- ◆ Part of the biochemistry anxiety
- ◆ Is synthesized from the amino acid tryptophan



Serotonin
Chemical Formula
 $N_2OC_{10}H_{12}$

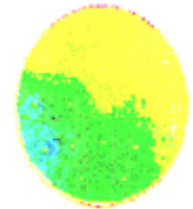
Plus, “Delta” which is the stage between 0.1 and 4Hz, and really represents the lowest amount of activity possible. This typically only occurs during deep sleep, and can also trigger growth and body healing.

Delta Δ

Range: 0.1-4Hz

Delta is a brainwave state that activates:

- ◆ Detached Awareness
- ◆ Healing
- ◆ Deep sleep
- ◆ REM sleep
- ◆ Suspension of active brain function, to allow us to rest completely
- ◆ Healing and regeneration
- ◆ Access to subconscious activity
- ◆ Flow of information from the subconscious mind for clearing and empowerment
- ◆ Release of Human Growth Hormone (HGH)



Thermograph of the head in Delta.

Bio chemicals released by the brain in a delta state:

Human Growth Hormone or Somatotropin

- ◆ Metabolism of proteins
- ◆ Stimulates the growth of cartilage
- ◆ Stimulates bone growth
- ◆ Effects protein, lipid and carbohydrate metabolism
- ◆ Combats the weight loss and general wasting characteristic of HIV and cancer
- ◆ Used by bodybuilders and athletes to increase muscle mass

HGH

Single polypeptide chain of 191 Amino Acids

Chemical Formula



At the opposite end of the spectrum, above Beta, there also exists “Gamma” which is a critical yet mainly supportive frequency. Think inspiration, higher learning, focus. It is believed that Gamma activity acts as a sort of 'operating system,' tying together different areas of the brain.

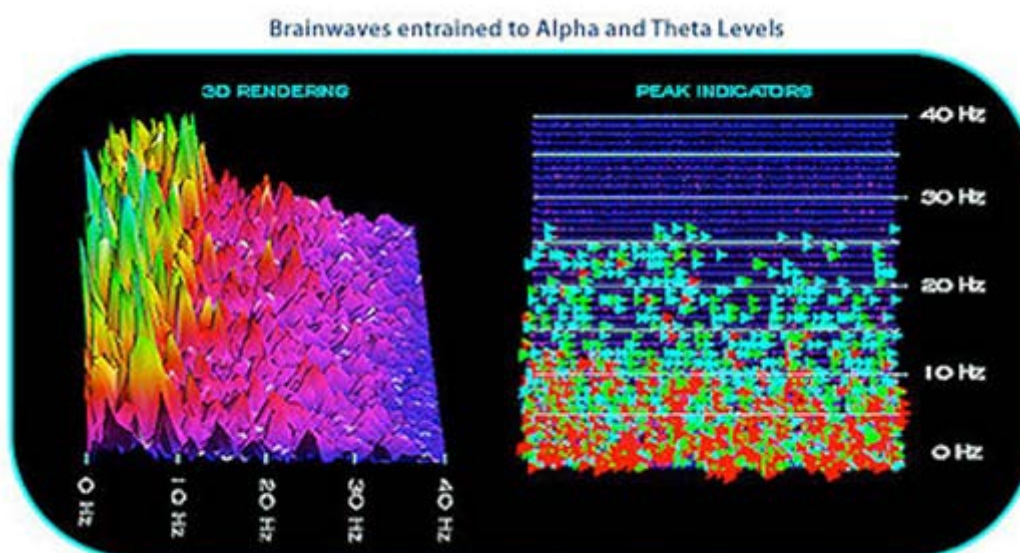
3. Why Are Brainwaves Important

Brainwaves are important, because they are the “signatures” of what is happening inside the brain. Research has shown that specific brainwave patterns mean that you’re in a particular state of being.

If an EEG reading shows you’re emitting a 1Hz signal, there’s no question about it – you will be in a deep, healing sleep. If you’re at 10Hz, you’re going to feel generally calm, detached, and relaxed.

And there are other patterns to be found.

People encountering flashes of inspiration are often in very specific alpha frequencies, periodically sparking up into gamma. People with high focus levels are typically found in upper beta 15 to 20Hz. People in a good mood are found with high serotonin levels, the release of which is triggered by the 10Hz frequency.



So, we can figure out what is happening inside our brain when various states are present – when we fall asleep, when we get focused, when we increase our energy, when we’re happy, when we’re being creative.

But why does this matter?

It’s important because your brainwave frequency isn’t merely the result of being in that state. It works both ways. Your brainwave frequency can actually *determine* your state. So, if you could change your brainwave patterns, you could actually reproduce a particular state of mind. Think about it. **In many ways, you do this already.**

Think of it this way: by setting your alarm clock and waking up, you are effectively controlling your brainwaves, and shifting your brainwave patterns from delta to beta.

But what if there was a very precise way to control your brainwaves, and reproduce the exact frequencies required for the states of mind mentioned above?

There is. It's called "brainwave entrainment" – and it's a branch of science that has been studied now for over 100 years.

4. What Is Brainwave Entrainment

Let's explain the word 'entrainment' with a simple physics experiment.

Try striking a tuning fork, then putting a second tuning fork next to it. The second tuning fork starts vibrating at the exact same frequency as the first.

This is a wonderful phenomenon in the world of science, and it's known as the *Frequency Follow Response (FFR)* - or *entrainment*. It's another way of saying: "Follow the leader!" The same thing happens with the brain. If you expose it to a certain frequency, your brainwaves will *follow* that frequency. This is called *brainwave Entrainment*. In other words, if your brain was exposed to a 10Hz frequency, your brainwave patterns would shift toward that frequency. In turn, that would bring about a state of calm, detached relaxation.

That's what brainwave entrainment is: a method of influencing your brainwave patterns, and ultimately changing your state, on-demand.

5. Brainwave Entrainment with Audio

Using audio to entrain brainwaves was another big discovery.

It started in 1839, when a Prussian scientist known as Heinrich Wilhelm Dove uncovered something that we now call "binaural beats" - although at the time he didn't have the scientific validation to prove his discovery.

H.W. Dove found that by playing two differently pitched sounds into each ears, the difference between the two pitches is realized inside the head – a *perceived pulse or beat*, also known as a binaural beat.

For example, if you played 400Hz into the left ear, and 410Hz into the right ear, the difference of 10Hz is actually 'heard' by the brain.



In other words, H.W. Dove found a way of exposing the brain to a particular frequency.

And, as we already know, when the brain is 'listening' to these low frequencies, it will automatically entrain itself to them – which, in turn, will bring about the relevant state of mind.

So, for 10Hz, that means the listener will begin to enjoy feelings of relaxation.

It wasn't until 1959 that this method actually gained both scientific validation and widespread recognition as a brainwave entrainment technique.

Since then, even further research into audible brainwave entrainment has been performed, and fresh, even more powerful techniques have been uncovered - primarily, *monaural beats* and *isochronic tones*.

Monaural beats have the advantage of not requiring headphones, and use a sine wave pulse to generate a desired frequency. They work in a similar way to binaural beats, yet the beat is audible and not merely perceived.

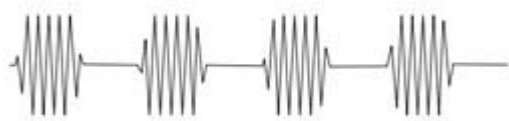
The most powerful discovery however was yet to come.

Binaural beats and monaural beats used indirect methods to create that entrainment beat that diminished their effectiveness. Let's pretend that you wanted to entrain to 10Hz. (Remember that hertz simply means cycles per second.) Wouldn't it make more sense to simply play 10 tiny audio beats/pulses per second, and listen to that?

Previously, the technology wasn't available to make such precise recordings. But in the 1980s, modern digital tools made it possible to create the first entrainment recording using this method.

They were called **isochronic** tones, and they're still the most powerful non-photoc method of entraining your brainwaves today. Isochronic tones use separate pulses of a single tone to recreate a particular frequency, and encouragement entrainment. If you were to visualize the sounds, they would look almost like a regular EEG reading.

If you wanted to represent a 10Hz frequency, you would need to switch a certain tone on and off 10 times per second. Considering the speed and accuracy required for this, it's obvious why science had to wait so long for such a discovery.

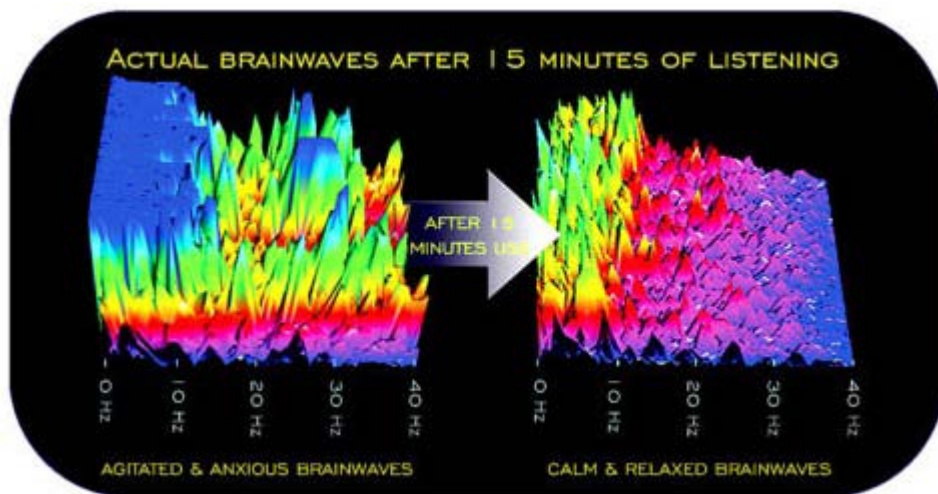


Sample isochronic tone reading: the contrast of the noise and silence helps to produce greater results than with standard binaural or monaural beats

Although binaural beats are still more widely known, it is generally recognized that isochronic tones have a significantly greater effect during entrainment.

Further techniques such as sound modulation, which involve modifying the original audio to embed entrainment into it, have also become popular as digital technology advances. Audio programs which combine various methods, usually produce the best results.

Today, audio is the most popular method of experiencing brainwave entrainment - not only due to its convenience, but also its strength over other entrainment techniques.



Sample EEG reading, following 15 minutes of the [BrainEv](#) program.

6. Brainwave Entrainment History & Significant Studies

Since the official scientific validation of brainwave entrainment back in 1959, research and studies into the science have continued at a feverish pace - and unveiled a number of surprising findings.

In the 1960s, scientists began using it to help alleviate anxieties and reduce pain receptor levels. Anaesthetist M.S. Sadove MD began using photic stimulation to reduce the amount of anaesthetic required for surgery. Later, surgical dentist Bernard Margolis DDS published a report on using brainwave entrainment to induce a trance-like state prior to dental procedures, which resulted in patients requiring less anaesthetic, and experiencing less bleeding, gagging and overall fear.

During this time, artist Brion Gysin also created the "Dreamachine," which used a lightbulb and a cut-out cardboard cylinder, placed on a turntable, to help induce alpha brainwave states using brainwave entrainment.

In the 1970s, scientist Gerald Oster published "Auditory Beats in the Brain" (Scientific American, 1973) which greatly extended the range of research on brainwave entrainment and its use as a powerful cognitive and neurological research tool. It also highlighted his belief that monaural beats were a superior audio entrainment technique.

From this research, the not-for-profit Monroe Institute was also founded in the 1970s, specifically to study meditative practices, binaural beats, and other slightly more ethereal aspects of self-development.

In the 1980s, inventor of the TENS unit, Norman Shealy, studied the effects of 30-minute sessions of brainwave entrainment at 10Hz. His results found a daytime drop in the level of melatonin (the hormone that makes you sleep), and large increases in endorphin, serotonin and norepinephrine (the chemicals that make you happy).

In other words, a 30-minute 10Hz session produced increased alertness and improved mood levels. He also noted that more people experienced better results with entrainment than with hypnosis or other relaxation methods.

During this time, isochronic tones were discovered by Arturo Manns. These are pulses that turn on and off in a precise pattern, to achieve the desired response - and were found to be significantly more effective than other forms of audio entrainment.

The 1990s saw continued research. Highlights include the Metro-Dade Police department study, which concluded that entrainment can reduce both muscle tension and heart rate. Psychological tests also showed the police were more able to handle stressful situations following entrainment.

In 1992, a report from the University of Alberta found that correct entrainment produced a marked decrease in pain. In 1993, a blind study group of learning disabled boys between 8 and 12 found that after forty sessions, the children showed an average IQ increase of 8 points. Another report in 1994 used entrainment to successfully treat children with ADD. In the mid-90s, scientists used it to treat PMS successfully (symptom reduction of 50%+) in over three-quarters of those using entrainment.

Further studies throughout this period have found that brainwave entrainment has brought favorable results for those with chronic fatigue, SAD, hypertension, headaches & migraines, ADD symptoms, and chronic pain.

But it doesn't stop there. The vast majority of individuals using brainwave entrainment utilize it to enhance their life and advance their own personal development.

Popular uses include relaxation, meditation, improved sleep quality, a decreased sleep requirement, "super learning," enhanced creativity, greater mental acuity, and increased focus.

Now and into the Future

In the 21st century, brainwave entrainment continues to grow in popularity, as neuroscientists carry on exploring the brain - including prominent names such as Dr. Thomas Budzynski, David Siever, psychologist Michael Joyce, and Transparent Corp's Dr. Tina Huang.

More and more home users have since discovered the power of brainwave entrainment, which has launched a whole new market of entrainment products designed to specifically assist in key areas.

The advent of high quality audio equipment now means that individuals can listen to the most powerful of audio recordings from the comfort of their own home. Methods of generating binaural, monaural and isochronic recordings have also improved substantially, to the point of being able to track the tiniest of frequency changes with razor-sharp accuracy.

In recent years, other advanced stimuli, such as amplitude modulation, complex phase/timing relationships, asymmetric entrainment, shaped waveforms, have been additionally utilized to bring about desired results.

And uses for brainwave entrainment continue to grow. These days, even game manufacturers are discovering the power of brainwaves, with the launch of toys with EEG-like devices built-in. Using these products, you learn to control your focus and other brainwave frequency patterns, and this helps you progress through the game. Popular products include Star Wars Force Trainer, and the Mindflex game from Mattel. Today, we sit at the cutting edge of science, with the ability to induce precise brainwave responses within minutes – using the most advanced brainwave entrainment audio possible. **And all you need to get started is a pair of headphones, and a few minutes of your time.**

7. Practical Brainwave Entrainment

It's clear that brainwave entrainment is a powerful branch of science that can produce brilliant results with its subjects.

But how can you actually use it practically?

There are a number of brainwave entrainment products currently available to the non-scientist community that you can use to replicate great results from the comfort of your own home.

Different Types of Entrainment

In the audio category, you'll find a series of well-developed audio programs - such as the [Brain Evolution System](#), [Holosync](#), and from our favourite [Unexplainable Store](#) . You also find software tools such as Neuro-Programmer and BWGen.

Using Entrainment Sessions

Practically, how do you sit down and experience brainwave entrainment - whether on a CD, or using a light-and-sound machine?

Every session, whether just audio or audio-visual, will have its own specific listening instructions. Be sure to follow these as closely as possible.

Typically, sessions aimed at relaxation should be undertaken with eyes closed. Sessions aimed to assist with focus and other high-frequency states should be undertaken with eyes open. Headphones will typically enhance a session. Try to wear them if you can, even if you're not listening to stereo binaural recordings. Ensure you use high-quality, regular headphones, without features such as bass enhancement or other audio modification, which may affect audio output.

It usually takes around 15 minutes to start seeing results, and 30 minutes is an ideal length for an entrainment session. The positive results from that session should last at least a few hours.

When sitting a brainwave entrainment session, you should get into a comfortable position and try to relax. Unless you are using your session for enhancing concentration, you should instead allow your mind to clear itself of thoughts, and simply allow the process to happen. People with "busy minds" may find it useful to focus on their breathing, taking long, deep breaths to aid relaxation.

You should avoid "checking" on the results where possible, which may result in the conscious mind interfering too much in the process and losing entrainment value. For some users, it takes a number of sessions before you start to see results. This is because the mind often fails to relax when presented with such unusual sounds.

Brainwave entrainment programs are indispensable, especially audio programs such as the [Brain Evolution System](#) and [Holosync](#), one of our favourites is the [Unexplainable Store](#) offering immediate benefits. These programs have a goal of helping you to gain greater control over your brain, to allow you to tap into a variety of beneficial states, on-demand.

Remember, brainwave entrainment is typically *experiential*, meaning that you know that it's working because you actually *feel it*. You can however verify your brainwave pattern shifts by purchasing an electroencephalograph (EEG) machine. [Pocket Neurobics](#) is one such supplier, with units starting from around R5000.

Health Warnings

Beyond "how to use" such programs, there are also a number of health warnings that should come with all brainwave entrainment programs.

Notably, those with epilepsy should not use brainwave entrainment. There is a small risk of seizure associated with individuals predisposed to epileptic fits.

Certain other individuals are advised to seek advice from their doctor, including those that are pregnant, wear a pacemaker, are photosensitive, have serious mental disorders, or are under the influence of drugs or medication. Individuals aged 18 and under should also seek their doctor's approval prior to use.

Check the relevant warnings that come with each brainwave entrainment program.

8. How to Get Started with Brainwave Entrainment

So, you're interested in the world of brainwave entrainment?

On this page, we list details of a number of highly reputable companies, which help to produce world-leading brainwave entrainment tools.

You can purchase in confidence from these sites. We advise cautious diligence and suitable research when purchasing from other companies.

The Brain Evolution System

www.brainev.com - Recommended!

World-leading program. Powerful 6-month program, designed to help you tap into peak performance states of mind, on-demand. Combines all the most powerful entrainment audio techniques. With online video, support forums, and more.

Holosync from Centerpointe

www.centerpointe.com

Classic multi-level program from Bill Harris. Very wide user base and excellent telephone support. Initial levels are good value, but can get expensive as you advance through the program.

Unexplainable Store

www.unexplainablestore.com – Recommended for beginner and advanced users!

Excellent budget priced, numerous reviews, widest selection of brainwave entrainment, covering an array of interests. Perfect way to get started and measure the effects of entrainment.

Delta Boost

www.deltaboost.com

Delta brainwaves are experienced in deep rejuvenating sleep, or in very deep states of meditation. At the delta level the body replenishes its energy, releases anti-aging hormones like human growth hormone (HGH), relieves stress, and boosts the immune system. The delta state rejuvenates your mind, body, and spirit "resetting" its internal clocks so to speak.

9. Research & Further Reading

What follows is a series of peer-reviewed, controlled studies on brainwave entrainment, categorized by control type.

We provide full credit to our partners [Transparent Corp](#) for the majority of this list. They created possibly the most comprehensive brainwave entrainment reference list of its type online.

We also suggest you read Tina Huang of Transparent Corp's own paper, "A Comprehensive Review of the Psychological Effects of Brainwave Entrainment" by [clicking here](#).

Studies that compared different experimental conditions against each other:

Howard, C. E., Graham, L. E., 2nd and Wycoff, S. J., 1986. "A comparison of methods for reducing stress among dental students." J Dent Educ. 50, 542-544.

Lane, J. D., Kasian, S. J., Owens, J. E. and Marsh, G. R., 1998. "Binaural auditory beats affect vigilance performance and mood." Physiol Behav. 63, 249-252.

Leonard, K. N., Telch, M. J. and Harrington, P. J., 1999. "Dissociation in the laboratory: a comparison of strategies." Behav Res Ther. 37, 49-61.

Morse, D. R. and Chow, E., 1993. "The effect of the Relaxodont brain wave synchronizer on endodontic anxiety: evaluation by galvanic skin resistance, pulse rate, physical reactions, and questionnaire responses." Int J Psychosom. 40, 68-76.

Ossebaard, H. C., 2000. "Stress reduction by technology? An experimental study into the effects of brainmachines on burnout and state anxiety." Appl Psychophysiol Biofeedback. 25, 93-101.

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