Brainwaves & Brain Entrainment

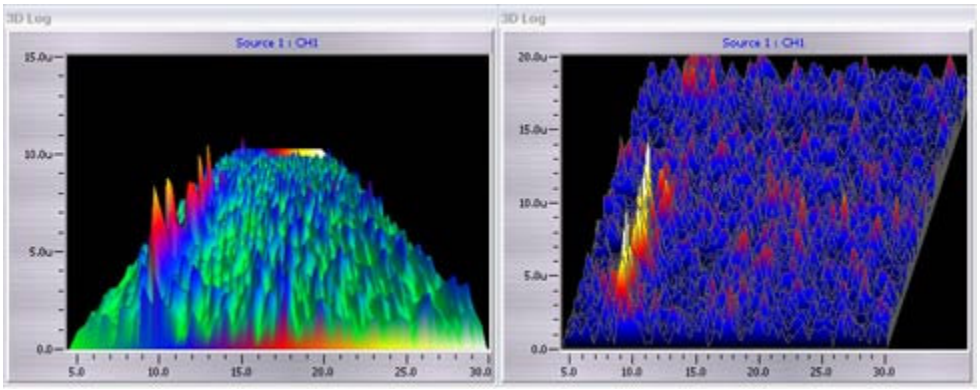
What are Brainwaves?

Your brain is made up of billions of brain cells called neurons, which use electricity to communicate with each other. The combination of millions of neurons sending signals at once produces an enormous amount of electrical activity in the brain, which can be detected using sensitive medical equipment (such as an EEG), measuring electricity levels over areas of the scalp.

The combination of electrical activity of the brain is commonly called a BrainWave pattern, because of its cyclic, "wave-like" nature.

Below is one of the first recordings of brain activity.

Here is a more modern EEG recording:



The Significance of Brainwaves

With the discovery of brainwaves came the discovery that electrical activity in the brain will change depending on what the person is doing. For instance, the brainwaves of a sleeping person are vastly different than the brainwaves of someone wide awake. Over the years, more sensitive equipment has brought us closer to figuring out exactly what brainwaves represent and with that, what they mean about a person's health and state of mind.

You can tell a lot about a person simply by observing their brainwave patterns. For example, anxious people tend to produce an overabundance of high Beta waves while people with ADD/ADHD tend to produce an overabundance of slower Alpha/Theta brainwaves.

Researchers have found that not only are brainwaves representative of of mental state, but they can be stimulated to change a person's mental state, and even help treat a variety of mental disorders. Certain Brainwave patterns can be even be used to access exotic or extraordinary experiences such as "lucid dreaming" or ultra-realistic visualization.

Click here for more information on brainwave patterns.

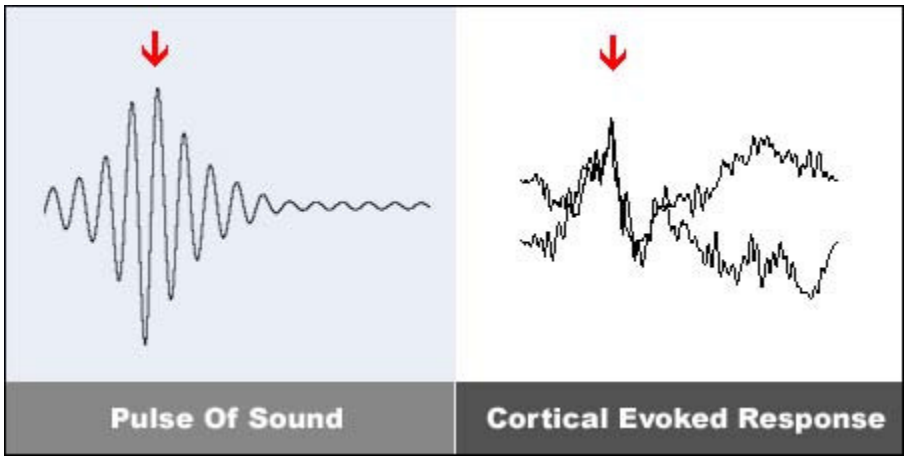
Stimulating brainwaves with sound

BSS stimulates brainwaves in a variety of ways through a complex neural process known as Brainwave Entrainment (or BWE).

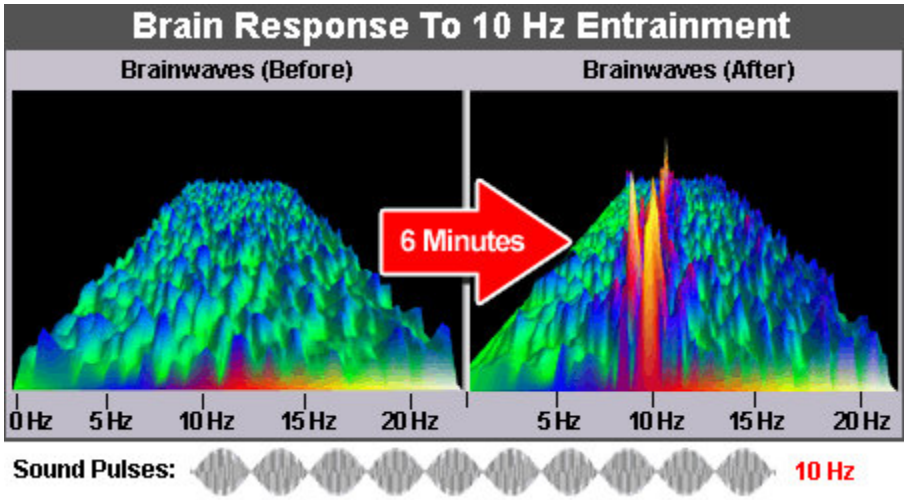
What is Brainwave Entrainment?

Brainwave Entrainment refers to the brain's electrical response to rhythmic sensory stimulation, such as pulses of sound or light.

When the brain is given a stimulus, through the ears, eyes or other senses, it emits an electrical charge in response, called a *Cortical Evoked Response* (shown below). These electrical responses travel throughout the brain to become what you "see and hear".



When the brain is presented with a rhythmic stimulus, such as a drum beat for example, the rhythm is reproduced in the brain in the form of these electrical impulses. If the rhythm becomes fast and consistent enough, it can start to resemble the natural internal rhythms of the brain, called brainwaves. When this happens, the brain responds by synchronizing its own electric cycles to the same rhythm. This is commonly called the *Frequency Following Response* (or FFR):



FFR can be useful because brainwaves are very much related to mental state. For example, a 4 Hz brainwave is associated with sleep, so a 4 Hz sound pattern would help reproduce the sleep state in your brain. The same concept can be applied to nearly all mental states, including concentration, creativity and many others. It can even act as a gateway to exotic or extraordinary experiences, such as deep meditation or "lucid dreaming" type states.

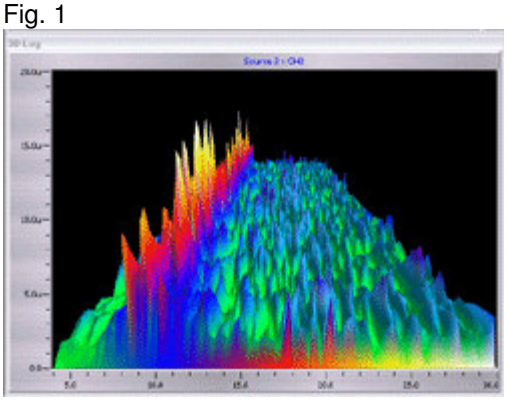
If you listen closely, you will hear small, rapid pulses of sound. As the session progresses, the frequency rate of

these pulses is changed slowly, thereby changing your brainwave patterns and guiding your mind to various useful mental states.

Brainwave Entrainment has over 70 years of solid research behind it. See a Short History Of Brainwave Entrainment.

Brain Sound Studio's unique approach to brainwave entrainment

Fig. 1



EEG Recording. Spectrogram View (4-30), ~1.2 minute time lapse, middle of an Alpha-focused session

Brain Sound Studio stimulates the brain by embedding brainwave entraining frequencies into sounds files. It uses the sound files as the "carrier waves" for the entrainment. Instead of relying on tones or noise, BSS manually forms the beats itself within the sounds you provide. For instance, one BSS filter modulates the sampling rate. Because BSS is filtering the sounds over and over each second, the brain fires neural responses to the same rhythm. After about 6 minutes, brainwave entrainment is established. The entraining frequencies may be barely noticeable to the listener(s) while, subconsciously, dramatically altering their brainwave patterns. This is just one example. There are many filters provided in BSS, all with different qualities, different advantages, and they can be used together for even stronger entrainment. Click here for more information.

BSS can also generate binaural or monaural beats, which are the most commonly used brainwave entrainment techniques. The tone beats are automatically synchronized with the frequencies embedded into the sound.

How can BSS be used without headphones?

Many entrainment techniques used in BSS are revolutionary in that they do not require headphones or even stereo speakers. Veterans of brainwave entrainment may find this strange, since headphones are such a traditional part of the brainwave entrainment experience. The reality of the matter is, however, that headphones have never been required for use with anything except Binaural beats, which present a slightly different tone to each ear. Monaural beats can be used very effectively without headphones, for example. So can pulses, clicks and light stimulation.

Any repeating stimulus can entrain the brain. Pulses of sound, light, vibrations or even electricity (CES machines). Brain Sound Studio uses many techniques that don't rely on left-right speaker assignments. In doing so, headphones become unnecessary. Neurons in the brain will fire a response to any stimulus, whether you have headphones on or not. By presenting a repeating stimulus to the brain, even one that is quite subtle, the brain will start to entrain, with or without headphones. What we have done with BSS is perfect this process through extensive testing and optimization. The results have been very exciting.

How effective are BSS techniques compared to Binaural Beats?

First, keep in mind that BSS *can* generate binaural beats - it can just do a lot more than that as well!

The advanced entrainment techniques used in Brain Sound Studio can be up to 2-3 times more effective than binaural beats. Studies done by experts such as David Siever and Dr. Gerald Oster concluded that binaural beats produce very small cortical evoked potentials, much smaller than that of pulses or other forms of entrainment (such as ones used in BSS).

Further Reading

Bermer, F. "Cerebral and cerebellar potentials." Physiological Review, 38, 357-388.

Chatrian, G., Petersen, M., Lazarte, J. "Responses to Clicks from the Human Brain: Some Depth Electrographic Observation." Electroencephalography and Clinical Neurophysiology, 12: 479-487

Gontgovsky, S., Montgomery, D. "The Physiological Response to "Beta Sweep" Entrainment." Proceedings AAPB Thirteenth Anniversary Annual Meeting, 62-65.

Oster, G. "Auditory beats in the brain." Scientific American, 229, 94-102.

Shealy, N., Cady, R., Cox, R., Liss, S., Clossen, W., Veehoff, D. "A Comparison of Depths of Relaxation Produced by Various Techniques and Neurotransmitters by Brainwave Entrainment" - Shealy and Forest Institute of Professional Psychology A study done for Comprehensive Health Care, Unpublished.

Siever, D. "Isochronic Tones and Brainwave Entrainment." Unpublished, but available through his book the Rediscovery of Audio-Visual Entrainment.

Walter, V. J. & Walter, W. G. "The central effects of rhythmic sensory stimulation." Electroencephalography and Clinical Neurophysiology, 1, 57-86.

See References for more.

More information on Brainwave Patterns

Brainwave Frequencies reference