

Manage Brainwaves through Meditation and Attain Samādhi

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Abstract: *Manage Brainwaves through Meditation and attain Samādhi. At the root of all our thoughts, emotions and behaviours are connected by neurons within our brain. Brainwaves are produced by synchronized electrical pulses from masses of neurons communicating with each other. The brain waves can be observed with an EEG (or an “electroencephalograph”) - a tool that allows researchers to note brain wave patterns. Brainwaves are detected using sensors placed on the scalp. They are divided into bandwidths to describe their functions, but are best thought of as a continuous spectrum of consciousness; from slow, loud and functional - to fast, subtle, and complex. Our brain’s ability to become flexible and/or transition through various brain wave frequencies plays a large role in how successful we are at managing stress, focusing on tasks, and getting a good sleep at night. If one of the five types of brain waves is either overproduced and/or under produced in our brain, it can cause problems. Throughout the day in your waking state, your EEG will display all 5 types of brain waves at the same time. However, one particular brain wave will be dominant depending on the state of consciousness that you are in.*

Keywords: Brainwaves, Alpha, Beta, Theta, Gamma, Samadhi, Buddhism

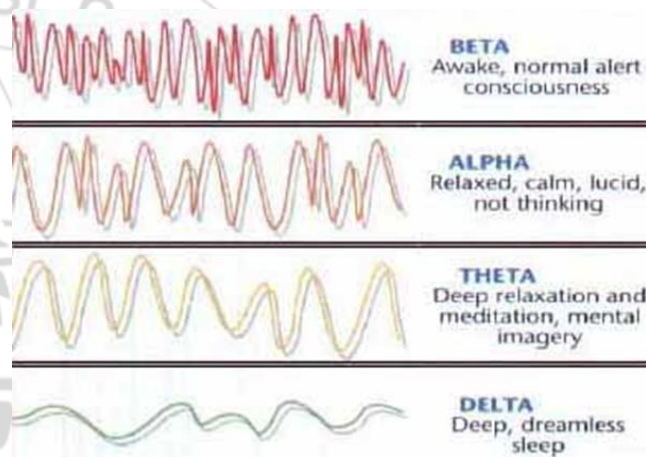
1. What are the Brainwaves?

At the root of all our thoughts, emotions and behaviours are connected by neurons within our brain. Brainwaves are produced by synchronized electrical pulses from masses of neurons communicating with each other. The brain waves can be observed with an EEG (or an “electroencephalograph”) - a tool that allows researchers to note brain wave patterns.

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Throughout the day in your waking state, your EEG will display all 5 types of brain waves at the same time. However, one particular brain wave will be dominant depending on the state of consciousness that you are in 05 kinds of brain waves



Delta waves

- Delta waves
- Delta brainwaves are slow, loud brainwaves (low frequency and deeply penetrating, like a drum beat). They are generated in deepest meditation and dreamless sleep.
- These are the slowest recorded brain waves in human beings. They are found most often in infants as well as young children. As we age, we tend to produce less delta even during deep sleep. They are associated with the deepest levels of relaxation and restorative, healing sleep. They have also been found to be involved in unconscious bodily functions such as regulating heart beat and digestion.
- **Frequency range:** 0 Hz to 3 Hz (Slowest)
- **Too much:** Brain injuries, learning problems, inability to think, severe ADHD(Attention-deficit/hyperactivity disorder (ADHD) is a brain disorder)
- **Too little:** Inability to rejuvenate body, inability to revitalize the brain, poor sleep
- **Optimal (if control):** Immune system, natural healing, restorative / deep sleep
- **Increase delta waves:** Depression, sleep
- Theta waves
- Theta waves - They are found in **day dreaming, dreaming, creativity, meditation, paranormal**

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phenomena, out of body experiences, shamanic journeys.

Theta brainwaves occur most often in sleep but are also dominant in deep meditation. It acts as our gateway to learning and memory.

In theta we are in a dream; vivid imagery, intuition and information beyond our normal conscious awareness. It's where we hold our 'stuff', our fears, troubled history, and nightmares.

- **Frequency range:** 4 Hz to 8 Hz (Slow)
- **Too much:** ADHD, depression, hyperactivity, impulsivity, inattentiveness
- **Too little:** Anxiety, poor emotional awareness, stress
- **Optimal:** Creativity, emotional connection, intuition, relaxation
- **Increase theta waves:** Depression

Theta State of Brain



Alpha waves

- **Alpha waves - They place the brain in states of relaxation times, non-arousal, meditation, hypnosis**
- Alpha brainwaves are dominant during quietly flowing thoughts, and in some meditative states. Alpha is 'the power of now', being here, in the present. Alpha is the resting state for the brain. Alpha waves aid overall mental coordination, calmness, alertness, mind/body integration and learning. It helps us calm down when necessary and promotes feelings of deep relaxation. If we become stressed, a phenomenon called "alpha blocking" may occur which involves excessive beta activity and very little alpha. Essentially the beta waves "block" out the production of alpha because we become too aroused.
- **Frequency range:** (9 — 13Hz per second)
- **Too much:** Daydreaming, inability to focus, too relaxed
- **Too little:** Anxiety, high stress, insomnia, OCD (Obsessive-Compulsive Disorder is a common, chronic and long-lasting disorder in which a person has uncontrollable, reoccurring thoughts (*obsessions*) and behaviors (*compulsions*) that he or she feels the urge to repeat over and over).
- **Optimal:** Relaxation
- **Increase alpha waves:** Alcohol, marijuana, relaxants, some antidepressants

Beta waves

- Beta waves - They awaken awareness, extroversion, concentration, logical thinking, active conversation.

- Normally we're in the beta state. In the beta state we're attentive, thinking actively and alert. It ranges from actively calm, to stressed out or mildly obsessive.
- Beta brainwaves dominate our normal waking state of consciousness when attention is directed towards cognitive tasks and the outside world. Beta is a 'fast' activity, present when we are alert, attentive, engaged in problem solving, judgment, decision making, and engaged in focused mental activity.
- **Frequency range:** (13 - 30Hz per second)
- **Too much:** Adrenaline, anxiety, high arousal, inability to relax, stress
- **Too little:** ADHD, daydreaming, depression, poor cognition
- **Optimal:** Conscious focus, memory, problem solving
- **Increase beta waves:** Coffee, energy drinks, various stimulant

Gamma waves

- Gamma brainwaves are the fastest of brain waves (high frequency, like a flute), and relate to simultaneous processing of information from different brain areas. It passes information rapidly, and as the most subtle of the brainwave frequencies, the mind has to be quiet to access it. Gamma was dismissed as 'spare brain noise' until researchers discovered it was highly active when in states of universal love, altruism, and the 'higher virtues'. Gamma is also above the frequency of neuronal firing, so how it is generated remains a mystery. It is speculated that Gamma rhythms modulate perception and consciousness, and that a greater presence of Gamma relates to expanded consciousness and spiritual emergence. When our brainwaves are out of balance, there will be corresponding problems in our emotional or neuro-physical health.
- Over-arousal in certain brain areas is linked with anxiety disorders, sleep problems, nightmares, hyper-vigilance, impulsive behaviour, anger/aggression, agitated depression, chronic nerve pain and spasticity. Under-arousal in certain brain areas leads to some types of depression, attention deficit, chronic pain and insomnia.
- Instabilities in brain rhythms correlate with tics, obsessive-compulsive disorder, aggressive behaviour, rage, bruxism, panic attacks, bipolar disorder, migraines, narcolepsy, epilepsy, sleep apnea, vertigo, tinnitus, anorexia/bulimia, diabetes, hypoglycemia and explosive behaviour. Over the long term, traditional eastern methods (such as meditation and yoga) train your brainwaves into balance. Of the newer methods, brainwave entertainment is an easy, low-cost method to temporarily alter your brainwave state.

As meditators have known for centuries and scientists can now prove, the benefits of meditation are profound. Meditation is perhaps the most crucial instrument to harness the power of thought, cultivate more peace, clarity and happiness. Mind strength is one of the most empowering tools we can employ to impact and improve all aspects of life.

2. Brain Activity During Meditation



The brain is an electrochemical organ (machine) using electromagnetic energy to function. Electrical activity emanating from the brain is displayed in the form of brainwaves. They range from the high amplitude, low frequency delta to the low amplitude, high frequency beta. During meditation brain waves alter.

What is Samādhi?

- In the suttassamādhi is defined as mental one pointedness (cittakaggata-M.N.I.301) and this definition is followed through rigorously in the Abhidhamma.
 - Unifying the mind on its object.
 - Rightly on a single object, undistracted and un-scattered.
- The commentaries define *samādhi* as the centering of the mind and mental factors rightly and evenly on an object. *Samadhi*, as wholesome concentration, collects together the ordinarily dispersed and dissipated stream of mental states to induce an inner unification. The two salient features of a concentrated mind are unbroken attentiveness to an object and the consequent tranquility of the mental functions, qualities which distinguish it from the un-concentrated mind.

Two samādhis

- 1) Wrong (unwholesome) concentration (micchāsamādhi)
- 2) Right (wholesome) concentration (sammāsamādhi)

Three levels of Samādhi

- 1) Parikamma samādhi- preliminary concentration which is produced as a result of the meditator's initial efforts to focus his mind on his meditation object
- 2) Upacārasamādhi –access concentration (upacārasamādhi)-marked by the suppression of the five hindrances, the manifestation of the jhāna factors.
- 3) Appanāsamādhi – absorption concentration-the complete immersion of the mind in its object effected by the full maturation of the jhāna factors.

Vipassanāsamādhi

Insight is the direct and penetrative realization of the three characteristics of existence, i.e.

- 1) Anicca –impermanence
- 2) Dukkha –suffering
- 3) Anatta - impersonality or soulless.

It is not a mere intellectual appreciation or conceptual knowledge of these truths, an indubitable and unshakable personal experience of them obtained and matured through repeated meditative confrontation with the facts underlying those truths.

It is the intrinsic nature of insight that it produces a growing detachment and an increasing freedom from craving, culminating in the final deliverance of the mind from all that causes its enslavement to the world of suffering.

Attainments of Samādhi

- Mental concentration, that is, meditative attachments , normally comprising the overcoming of the 5 mental hindrances (*kāmacchanda, vyāpāda, thīnamiddha, uddhacca, ukkuccha* and *vichikichchā*) ,one can attain 06 direct knowledge (*abhiññā*) which arises from the dhyānas.

Six abhiññās (*chalabhiññā*)

higher knowledge

- 1) Iddhividha – psychic power
- 2) Dibbasota –clairaudience/divine ear
- 3) Paracittavijānana -telepathy/mind reading.
- 4) Pubbenivāsānussati – Remember one's former abodes.
- 5) Dibbacakkhu –clairvoyance or the divine eye/knowledge or knowledge of the passing – away and re – appearance of beings.
- 6) Asavakkhaya – The knowledge of the destruction of mental influxes. [1]

The foundation of mindfulness

- 1) Mindfulness of breathing (*ānāpānasati*).
- 2) The contemplation of the body (*rūpa*).
- 3) The contemplation of the feelings (*vedanā*).
- 4) The contemplation of the signs (*saññā*).
- 5) The contemplation of the thoughts/fabrications (*saṃkhāra*).
- 6) The contemplation of the consciousness (*viññāna*).

In suttassamādhi is explained

- “*sīlamsamādhipaññanca-maggambodhāyabhāvayam Patoṣṣiparamamsuddhim-nihatotvamasiantakā*”
- [2] Having developed morality we have to develop our concentration and Wisdom. Then we can obtain the supreme state of spirituality defeating māra (God of death).
 “*itikhobhikkhaveavijjūpanisamkhārā.....jātūpanisamdukkhamdukkhūpanisāsaddhā,saddhūpanisampāmojjam,pāmojjūpanisapīti,pītūpanisāpassaddhi,passaddhūpanisasukhama,sukhūpanisomādhi,samadhūpanisamyathābhūtajñānadassanam,yathābhūtajñānadassanūpanisānibbidā,nibbidūpanisovirāgo,virāgūpanisāvimuttī,vimuttūpanisamkha yejnānam*” [3]
- "Thus fabrications have ignorance as their prerequisite, consciousness has fabrications as its prerequisite, name-&-form has consciousness as its prerequisite, the six sense media have name-&-form as their prerequisite, contact has the six sense media as its prerequisite, feeling has contact as its prerequisite, craving has feeling as its prerequisite, clinging has craving as its prerequisite, becoming has clinging as its prerequisite, birth has becoming as its prerequisite, stress & suffering have birth as their prerequisite, conviction has stress & suffering as its prerequisite, joy has conviction as its prerequisite, rapture has joy as its prerequisite, serenity has rapture as its prerequisite, pleasure has serenity as its prerequisite, concentration has pleasure as its prerequisite, knowledge & vision of things as they actually are present, disenchantment has knowledge & vision of things as they

actually are present as its prerequisite, dispassion has disenchantment as its prerequisite, release has dispassion as its prerequisite, knowledge of ending has release as its prerequisite. it has concentration as its prerequisite

- The sign-less concentration of mind
- “*tayo me bhikkhave akusalavitakka-kāma, byāpāda, vihimsā. Imecabhikkhave tayo akusalavitakkakva aparisesā nirujjhanti? catusvāsati patthānesu suppatitthita citta saviharato animit tamvāsamādhim bhāvayato yāvancidambhikkhave alameva animitto samādhim bhavetum. animitto bhikkhave samādhim bhāvī tobahulīkatamahapphalohotimahānisamso*” [4]
- The signless concentration of mind The term, “signless concentration of mind” (*animittaceto, samādhi*) is not fully explained in the Nikāyas, “but its placement after the eighth formless attainment [of S 40.9] suggests it is a samādhi qualitatively different from those attained in samatha meditation.” (S:B 1140 n180). The term, however, occurs in the explanation of the “signless liberation of mind” (*animittaceto, vimutti*) in the *Godatta Sutta* [5], “thus: And what, bhante, is the signless liberation of mind? Here, with non-attention to all signs, a monk enters and dwells in the signless concentration of mind. This is called the signless liberation of mind”.
- “The signless concentration of mind” is explained by the Majjhima Commentary as the concentration of mind in insight (*vipassanā citta samadhi*), which, as it is without a permanent sign, is called “signless” (*animitta*), so called because it is devoid of the signs of permanence, etc. [6]

Virtue/samādhi of one who is in training
 “*sekhopimāhānāmasīlamvuttam, asekhampisīlamvuttambhagavatā. sekhopisamādhivuttambhagavatā, asekhopisamādhivuttambhagavatā.*
Katamocamahānāmasekhasamādhi? Idhamahānāmabhikkhu viviccevakāmehi
*catutthamjānamupasampajjaviharati. ayamvuccatim ahānāmasekhasamādhi*” [7]

- “In this way, Mahanama, the Blessed One has talked both of the virtue of one who is in training and of the virtue of one whose training is complete. He has talked both of the concentration of one who is in training and of the concentration of one whose training is complete. He has talked both of the discernment of one who is in training and of the discernment of one whose training is complete.”
- “*sīlamsamādhipaññāca-vimuttīcaanuttaro anubuddhāmedhammā-gotamena yasassinā*” [8]
- Unexcelled virtue, concentration, discernment, & release: have been understood by Gotama of glorious stature. Having known them directly, he taught the Dhamma to the monks — the Awakened One the Teacher who has put an end to suffering & stress, the One with vision totally unbound.

3. Concentration is limitless, clever and thoughtful

Five kinds of knowledge arise to him internally
 “*samādhim bhikkhave bhavetha. appamānam nipakānam patissatā nam pañcañānāni paccattam ceva uppajanti.*

Katamānipañca?

ayaṃ samādhipaccuppannasukho ceva āyatiṃ casukhavipākoti paccattam ye vaññānam uppajati. (Knowledge arises to him internally, that this concentration is pleasant now and it will bring pleasant results in the future)

“Ayaṃ samādhiriyonirāmisoti paccattam ye vaññānam uppajati”. (Knowledge arises to him internally, that this concentration is noble and immaterial)

“Ayaṃ samādhikāpurisasevito’tipaccattam ye vaññānam uppajati”. (Knowledge arises to him internally, that this concentration is not shared by the ordinary).

“Ayaṃ samādhisantopañītopaṭippassaddhaladdho ekodibhāvādhigatonacasasamkhāraniggayhavāritavato’tipaccattam ye vaññānam uppajati”. Knowledge arises to him internally, that this concentration is peaceful, exalted, composes the body, brings the mind to a single point

“So khopānāhamimamsamādhimsatovasa māpajjāmisatovauṭṭhahāmi’tipaccattam ye vaññānam uppajati”. (settles determinations without rebukes and knowledge arises to him internally) [9]

“yatocakhottebhikkhu ayaṃ samādhievambhāvito hoti subhavitto, tatotebhikkhuevamsikkhitabbam”.
Metā, Karunā, muditā, upekkha me cetovimuttibhāvītā bhavissati, bahulīkata, yaṇīkatā, vatthukata, anuttithā, paricīṭā, susamāradhāti evam hi tebhikkhusikkhitabbam” [10]

After the deep concentration one will attain the great qualities such as loving kindness, compassion, altruistic joy and equanimity.

“yatocakhottebhikkhave bhikkhu tam tadevasamāpattimsamāpajjati, vutthātipi, tassamuducittam hoti kammanānam. mudunākammaññenacittena appamānosamādhivoti subhāvito

.so appamānenasamādhināsubhāvitenayassayassa bhīññasacchikaranīyassadhammassacittam abhininnāmeti. abhiññāsacchikiriyāyatratatrevasamkhitabbatampāpunāti. sati āyatane.

So saceākhm khatianekavīhitamiddhividhampaccanubhaveyya m, dibbasota, paracittavijānana, pubbenivāsānussati, dibbacakku.

So saceākhm khatīāsavānam khayānāsavam cetovimuttimpāññāvī vimuttimditthe vadhammesayam abhiññāsacchikatavāupasa mpajjavīhareyyanti” [11]

If he expects to attain the higher knowledge and liberation, it is easy to attain it with the help of samādhi.

Meditation is a medicine

- Now a further report by UCLA researchers suggests yet another benefit. Long-term meditators have larger amounts of gyrification (“folding” of the cortex, which may allow the brain to process information faster) than people who do not meditate. A direct correlation was found between the amount of gyrification and the number

of meditation years, possibly providing further proof of the brain's neuroplasticity, or ability to adapt to environmental changes.

Evidence Builds That Meditation Strengthens the Brain

Science Daily - March 15, 2012

- Earlier evidence out of UCLA suggested that meditating for years thickens the brain (in a good way) and strengthens the connections between brain cells.

How Meditation May change the Brain

New York Times - January 28, 2011

- The researchers report that those who meditated for about 30 minutes a day for eight weeks had measurable changes in gray-matter density in parts of the brain associated with memory, sense of self, empathy and stress.

Brain waves and meditation

Science Daily - March 31, 2010

- Meditation research explores how the brain works when we refrain from concentration, rumination and intentional thinking. Electrical brain waves suggest that mental activity during meditation is wakeful and relaxed.

Meditation found to Increase brain size

PhyOrg-January 31 2006

- People who meditate grow bigger brains than those who do not do it. Researchers at Harvard, Yale, and the Massachusetts Institute of Technology have found the first evidence that meditation can alter the physical structure of our brains. Brain scans they conducted reveal that experienced meditators boasted increased thickness in parts of the brain that deal with attention and processing sensory input.
- Using new scanning techniques, neuroscientists have discovered that certain areas of the brain light up

constantly in Buddhists, which indicates positive emotions and good mood. "We can now hypothesize with some confidence that those apparently happy, calm Buddhist souls one regularly comes across in places such as Dharamsala, India, really are happy,"

Meditation gives Brain a Charge

Washington Post - January 3, 2005

- Brain research is beginning to produce concrete evidence for something that Buddhist practitioners of meditation have maintained for centuries: Mental discipline and meditative practice can change the workings of the brain and allow people to achieve different levels of awareness. Those transformed states have traditionally been understood in transcendent terms, as something outside the world of physical measurement and objective evaluation.
- A lab experiment has done by **Richard Davidson** director of the Waisman laboratory for Brain imaging and behavior - University of Wisconsin
- He got a chance to examine Tibetan Buddhists in his own lab. In June 2002, Davidson's associate Antoine Lutz positioned 128 electrodes on the head of Matthieu Ricard. A French-born monk from the Shechen Monastery in Katmandu, Ricard had racked up more than of 10,000 hours of meditation.
- Dr Josipovic has found that some Buddhist monks and other experienced meditators have the ability to keep both neural networks active at the same time during meditation - that is to say, they have found a way to lift both sides of the seesaw simultaneously.
- And Dr Josipovic believes this ability to churn both the internal and external networks in the brain concurrently may lead the monks to experience a harmonious feeling of oneness with their environment.



Lutz asked Ricard to meditate on "unconditional loving-kindness and compassion." He immediately noticed powerful gamma activity – brain waves oscillating at

roughly 40 cycles per second -indicating intensely focused thought. Gamma waves are usually weak and difficult to see. Those emanating from Ricard were easily visible, even in

the raw EEG output. Moreover, oscillations from various parts of the cortex were synchronized – a phenomenon that sometimes occurs in patients under anesthesia.

Benefits of Meditations

- Meditations have been found to bring far-reaching benefits to those who practice them regularly. If you're new to meditations, you should expect a few benefits with even your first meditations. These benefits can include:
- Slowed heart rate
- Release of physical tension
- A sense of having a break from stress for a few minutes
- A calmer mood afterward
- With meditations, however, the benefits build over time. After regular meditations, you'll likely see more long-term benefits, such as:
- Less reactivity toward stress
- Lower blood pressure
- Greater mental and emotional clarity
- Better decision-making
- Greater resilience to stress

4. Conclusion

Every human being should meditate for their own physical and mental healthiness.

References

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- [4] S.N. khandhavagga,Khandhasamyukta,pindolasutta
- [5] S.N. 41.7
- [6] M.A 4:153
- [7] A.N. Tikanipāta,Anandavaga,Mahānāmasakkasutta
- [8] A.N.Catukkanipāta,pathamapannāsaka,Bhandagaāmavagga,Anubuddhasutta
- [9] A.N.Pañcakanipāta,Pañcangikavagga,Samādhisutta
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