

BUDDHISM AND BRAIN: BEYOND THE LIMITATION OF HUMAN BRAINWAVES BY BUDDHIST AUTOGENIC MEDITATION



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ABSTRACT

Human's brain is the most complex and electrochemical organ in our body. The human brain communicate with specialized nerve cells known as neurons, the brain produces waves into bandwidths to describe their functions, namely Beta, Alpha, Theta, Delta and Gamma. Each frequency, measured in cycles per second (Hertz, Hz) by the EEG, Electroencephalography, the meditation research shown that during meditation brainwaves alter and range from the high amplitude, low frequency delta to the low amplitude, high frequency beta. The first evidence, Institute of Technology, found that he meditation can alter the physical structure of our brain by brain scan – the meditation grow bigger brains than those who do not do it. And electrical brain waves suggest that during meditation is wakeful and relax.

Keywords: brainwave, meditation, buddhism, alpha, beta, theta, gamma

INTRODUCTION

The Buddha taught:

The Thought manifests as the word;
 The Word manifests as the deed;
 The Deed develops into habit;
 And the Habit into character.
 So, watch the thought and its ways with care.
 As the shadow follows the body,
 As we think, so we become.

The Buddha

As the phase, it reveals that the mind drives and govern directly our behaviors: action and verbalization, not because our brain does. Even the term of “brain” in Buddhism the point of view is quite different. When we can’t able to give a precise answer about the brain and mind, just because we are still confused these in term of Buddhism the point of view. Some people think that the mind is the brain or some other part or function of the body, but this is incorrect. In Buddhist Scriptures, the brain is a physical object. The mind, on the other hand, is not a physical object. It cannot be seen with the eyes, nor can it be photographed or repaired by surgery. The brain, therefore, is not the mind but simply part of the body.¹

In the Buddhism view, the mind or consciousness or *citta* is the leader in knowing what appears, such as seeing or hearing. In so far as *citta*, *mano* and *viññāṇa* as “non-physical or conscious aggregate” designating both the conscious and subconscious parts of mentality of sentient beings, having the characteristic of cognizing objects, in contrast with the physical body (*cārummahābhūtika kāya*), they are interchangeably used as synonym.² The body or physical phenomenon or *rūpa* is the dhamma that does not know or experience anything. The meaning is different from matter in the conventional sense, such as table,

¹Geshe Kelsang Gyatso, **How to Transform Your Life**, (USA: Tharpa Publications US, 2016), pp. 15-16.

²S.II.94; Thich Hanh Nhat, **Nature Of Citta, Mano And Viññāṇa**. Retrieved on 18th April 2017. <http://www.undv.org/vesak2012/iabudoc/10ThichNhatTuFINAL.pdf>.

chair, or book. The *rūpa* is consist of the four principle which are: earth(*paṭhavī-dhātu*), water(*āpo-dhātu*), fire(*ejo-dhātu*), wind (*vāyodhātu*).³ So in the Buddhism, the term of the body is consist of those things as well.

In science view, there are some different view, the body-brain-mind are work together. The mind is the flow of information within the nervous system and In essence then, apart from hypothetical transcendental factors, the mind is what the brain does. The brain is necessary, proximally sufficient condition for mind: The brain depends on the nervous system, which intertwines with and depends on other bodily systems. These systems in turn intertwine with and depend upon nature and culture, both presently and over time. And as we'll see, the brain also depends on the mind.⁴

we have limited evolve over the brain and body. Is it possible to push the limits of the brain by Buddhism Path? The autogenic meditation of is the new solution to cross over those limits by meditation research and at the place of meditation in psychological and neurosciencetific research. All this is proceeded by a review of the exiting typologies of the evolving relations between Buddhism and science.⁵

THE SCIENTIFIC STUDY OF MEDITATION

History of the Scientific Study of Meditation, Meditation has been the subject of scientific research for about the past 40 years but only started to gain popularity in the late 1990s. The neuroscientific study of meditation has involved both fundamental and clinical research and aims at understanding how mental training affects the brain, the body, and overall health. In fundamental research, experience-induced changes in brain activity and anatomy, that is neuroplasticity, are a major focus of study⁶

³Nina Van Gorkom, **Practical Abhidhamma Course**, Retrieved on 18th April 2017. practicalabhidhamma.com/assets/practical-abhidhamma.pdf.

⁴Rick Hanson, **The Practical Neuroscience of Inner Peace**, Retrieved on 18th April 2017. <http://www.wisebrain.org/slidesets/SlidesHollyhockSept2011.pdf>.

⁵Asaf Federman, "Mind and Brain", **What Buddhism Taught Cognitive Science about Self**. Vol. 47, (2011): 41.

⁶Claire Braboszcz, Stéphanie Hahusseau, and Arnaud Delorme, "Meditation and Neuroscience: from basic research to clinical practice," in **Integrative Clinical Psychology, Psychiatry and Behavioral Medicine: Perspectives, Practices and Research**, R. Carlstedt (ed.), (Springer Publishing, 2010), pp. 1910-1926.

ELECTROENCEPHALOGRAPHY (EEG)

Today we have the technology to better understand the true relationship between the brain and the experience of meditating. The Use of EEG (electroencephalogram) Technology allows us to monitor and record brainwave activity. A ability to measure the effects of meditation on the brain and brainwave constitutions. Electroencephalographic, and neuroimaging studies have revealed the importance of investigating meditation states to achieve an increased understanding of cognitive and affective neural plasticity, attention, and self-awareness as well as to evaluate their possible clinical implications. The function of electroencephalography is to detect and amplify the bioelectric potential of the brain by electrodes placed on the surface of the scalp. EEG has several strong points as a tool for exploring brain activity. The EEG measures brainwaves of different frequencies within the brain. Each frequency, measured in cycles per second (Hertz, Hz). In relation with the EEG signals, a lot of work has been done to find the significant changes between the signals and the mental states by using different advanced signal processing techniques. EEG studies have utilized these methods to portray the brainwave changes that occur in meditation.⁷

CONSTANT BRAINWAVES

Throughout the day in your waking state, your EEG display all 5 types of brain waves at the same time. But the brain wave will be dominant depending on the state of consciousness.⁸

The brain is an electrochemical organ (machine) using electromagnetic energy to function, is displayed in the form of brainwaves. The brain produces waves into bandwidths to describe their functions and have a unique state of consciousness. The brain waves are divided into 5 Types are following:

Beta brain waves have a frequency range: 13 - 30Hz per second, are associated with normal waking consciousness and a heightened state of alertness, logic and critical

⁷ Yugandhara Meshram, Prajakta Fulpatil, "Review Paper on Electroencephalographic Evaluation of Sudarshan Kriya" **International Journal of Science and Research (IJSR)**. Vol.3, No. 7. (2014): 249-251.

⁸ **Five Types Of Brain Waves Frequencies: Gamma, Beta, Alpha, Theta, Delta.** Retrieved on 18th April 2017. <http://mentalhealthdaily.com/2014/04/15/5-types-of-brain-waves-frequencies-gamma-beta-alpha-theta-delta/>

reasoning. As you go about your daily activities you are at Beta. Normally we are in the beta state. If you have a higher Beta levels translate into stress, anxiety and restlessness. In case you have too little translate into daydreaming, depression, poor cognition

Beside, Beta is a fast activity, present when we are alert, attentive, engaged in problem solving, judgment, decision making, and engaged in focused mental activity.

Alpha Brain waves have a frequency range: 9 — 13Hz per second. They place the brain in states of relaxation times. Alpha brain waves are present in deep relaxation. The relaxed detached awareness achieved during light meditation is characteristic of Alpha and is optimal for programming your mind for success. Alpha heightens your imagination, visualization, memory, learning and concentration. It lies at the base of your conscious awareness and is the gateway to your subconscious mind. It also helps us calm down when necessary and promotes feelings of deep relaxation.

Theta brain waves have a frequency range: 4 Hz to 8 Hz (Slow) are present during deep meditation and light sleep, including the REM dream state. Theta is the realm of your subconscious mind. 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. If you have too much, you are depression, hyperactivity, impulsivity.

Delta brain waves have a frequency range: 0 Hz to 3 Hz, are the slowest and is present in deep. They are generated in dreamless sleep and deepest meditation where awareness is completely detached. Delta is the realm of your unconscious mind. Besides Delta is associated with deep healing and regeneration, underlining the importance of deep sleep to the healing process. They are also found most often in infants as well as young children. As we age, we tend to produce less delta even during deep sleep because they are associated with the deepest levels of relaxation and healing sleep. They have also been found to be involved in unconscious bodily functions such as regulating heart beat and digestion.

Gamma brain waves have a high frequency: 40 Hz to 100 Hz and relate to simultaneous processing of information from different brain areas. It passes information rapidly, and as the most subtle of the brainwave frequencies, and that a greater expanded consciousness and spiritual emergence. When our brainwaves are out of balance, there will be corresponding problems in our emotional or neuro-physical health. In long term, the meditation methods train your brainwaves into balance.

AUTOGENIC MEDITATION

Meditation is the mental traditional training, As the Buddhist Doctrine mentions about the effective method to develop and cultivate the mindfulness skill is the Four Foundation of mindfulness to contribute the *samādhi* skill. Formal references to meditation can be found in ancient texts as early as in the Buddhist writings of the *Abhidhamma*⁹.

“This is, bhikkhava, this direct path to the purification of beings, for overcoming of sorrow and distress, for the disappearance of pain and sadness, for the gaining of the right path, for the realization of Nibbāna- that is the four foundations of mindfulness”¹⁰ mentioned in *Mahāsatipatthāna Sutta*¹¹ The Pāli term *satipaṭṭhāna* is a compound term made up of two words. ‘Sati’ means “mindfulness, “awareness”, and *upaṭṭhāna* in Pāli term means “placing near” in the present context refers to a particular way of “being present” and “attending” to something with mindfulness. *Satipaṭṭhāna* can then be translated as “presence of mindfulness” or as “attending with mindfulness”¹²

THE CONCEPT OF THE FOUR FOUNDATIONS OF MINDFULNESS (SATIPAṬṬHĀNA)

Satipaṭṭhāna Sutta of the *Majjhima Nikāya*.¹³ Precisely the discourse recurs as the *Mahāsatipatthāna Sutta* of the *Dīgha Nikāya*, the only difference being that this version offer a more extensive treatment of the four noble truths, the last of the *satipaṭṭhāna* contemplation.¹⁴ The commentary to the *Satipaṭṭhāna Sutta* which appears the 10th discourse

⁹Claire Braboszcz, Stéphanie Hahusseau, and Arnaud Delorme, “ Meditation and Neuroscience: from basic research to clinical practice,” in **Integrative Clinical Psychology, Psychiatry and Behavioral Medicine: Perspectives, Practices and Research**, R. Carlstedt (ed.), (Springer Publishing, 2010), pp. 1910-1926.

¹⁰Maurice Walshe, tr., **The long discourses of the Buddha : a translation of the Dīgha Nihya**, (United States of America: Wisdom Publications, 1996) , pp. 335-350, D.II., 290-315 ; M.I., 55-63

¹¹**D II** 290-135.

¹²Anālayo. *Satipaṭṭhāna, Satipaṭṭhāna: The Direct Path to Realization*, (Birmingham: Windhorse Publications, 2006), pp. 29-30.

¹³**MI 55-63**, the ten discourse of the *Majjhima Nikāya*.

¹⁴**D II** 305-11.

of the Majjhima Nikāya, was written in fourth century AC by Buddhaghosa.¹⁵

The Contemplation of Body (*kāyānupassanā*)¹⁶ which consists of main principles of practice: awareness of breathing, awareness of bodily postures, clear knowledge in regard to bodily activities, analysis of the body into its anatomical parts, and analysis of the body into its elementary qualities, and contemplation of a dead body in nine consecutive stages of decay.¹⁷

The Contemplation of the Feelings (*Vedanānupassanā*)¹⁸. Dwell Contemplation is of the mind: pleasant feeling [*sukha-vedanā*], unpleasant feeling [*dukkha-vedanā*], feeling a neither-painful-nor-pleasant [*Adukkhamasukha-avedanā*], in three with subdivisions, making a total of nine : Feeling happiness, pain or equanimity. Feeling internal or external or both. Reflects on the arising of feeling, Cessation of feeling or both arising and cessation. The mindfulness is the present, as far as required for realization and self-reflection.

The Contemplation of the Mind (*Cittānupassanā*)¹⁹ Dwell contemplation is of the feeling, in its sixteen states such as: knows whether the mind is in a state of lust or free from lust, a state of hatred or free from hatred, a state of ignorance or free from ignorance, or whether in a state of torpor or distraction, with *Jhāna* or without *Jhāna*, on above of *Kāma* level or above the *Kāma* level, concentrated or not concentrated, released or not released.

All feelings (*vedanās*) are arising in one, they should be clearly perceived and noticed as they really are so that he could know and identify what it is whether agreeable and disagreeable feeling of the body and mind, sensual and super-sensual feeling, or indifferent feeling.

The Contemplation of the Mind-objects (*Dhammānupassā*)²⁰ Deals with Dhammā, the mental objects or thoughts divided into five aspects: The five hindrance, The five ag-

¹⁵ Roberta Szekeres. “An Analytical Study of Vedanā in the Practice of Satipatthāna”, **Master’s Degree Thesis**, (Graduate School: Mahachulalongkornrajavidyalaya University), 2548, p. 40.

¹⁶ **M I** 59.

¹⁷ Meas Savoeun (Sumedho), “A Study of the Kāyagatāsati Sutta and Related Texts Concerning Buddhist Meditation Practice”, **Master’s Degree Thesis**, (Graduate School: Mahachulalongkornrajavidyalaya University), 2553, p. 37.

¹⁸ **M I** 59.

¹⁹ **M I** 59.

²⁰ **M I** 59.

gregates, The six bases of sensation, The seven principles of enlightenment and The four Noble Truths.²¹

Conclusion of The Four Foundations of Mindfulness (*Satipaṭṭhāna 4*) as shown in the table below:

Table 1: The underlying structure of the Satipaṭṭhāna 4

The Contemplation of Body	The Contemplation of Feeling	The Contemplation of Mind	The Contemplation of Dhammā
1. Mindfulness of Breathing (Ānāpāna-sati) 2. Postures of the Body (iriyāpatha) 3. Mindfulness with Clear comprehension (satisampajañña) 4. The Section on Contemplation on Elements (dhātuvavatthāna) 5. Reflection on the repulsiveness of the Body (kāyagat āsati) 6. Nine Cemetery of Contemplations (sī vathikā)	1. Pleasure 2. Unpleasure 3. Equanimiment or neutral	Dwell perceiving the phenomenon of the mind: ie. greed, or not Anger , or not Delusion, or not	1. The five hindrance (nīvarana) 2. The five aggregates (khandhas) 3. The six bases of sensation (internal and external) (āyatana 12) 4. The seven principles of enlightenment (bojjhanga) 5. The four Noble Truths (saccas)

²¹ Paravahera Vajiranāna mahāthera, **Buddhist meditation in theory and practice**, (Malaysia: P.K.S, 1987), p. 488.

CONCENTRATION IS LIMITLESS, CLEVER AND THOUGHTFUL

The Bliss of continue the practice of these four contemplations of mindfulness thus for 7 years, the results may be expected: either arhatship, shortest possible period is seven day.

Two fruits may be expected by him: highest knowledge (arahantship) here and now, or if some remainder of clinging is yet present, the state of nonreturning.

Mindfulness may be described as sustained awareness aimed at nonreactive and nonattached mental observation, without cognitive or emotional interpretation of the unfolding moment-to-moment experience (Gunaratana, 2002)

BEYOND BRAINWAVES: MEDITATION EFFECT ON OUR BRAIN

Vipassana meditation is another meditation technique that is now widespread in the West. In Vipassana, practitioners begin by observing their breath around the area of the nostrils to help the mind develop sustained, focused attention. Every time the mind wanders, they have to bring it back to the sensation of breathing. (Claire Braboszcz, Stéphanie Hahusseau, Arnaud Delorme: 2010)

Numerous researchers already conduct the many research study on meditation the outcome of meditation on stress relief and disease improvement. In this review we see the mindfulness meditation plays an important role in the mental health and mindfulness meditation theory and also effects of mindfulness meditation (Seema S. Kute, Sonali B. Kulkarni: 2016), Transcendental Meditation and Brainwaves state. The long-term Buddhist practitioners self-induce sustained electroencephalographic high-amplitude gamma-band oscillations and phase-synchrony during meditation. (Lutz, Antoine, Lawrence L. Greischar, Nancy B. Rawlings, Matthieu Ricard, and Richard J. Davidson: 2004)

The effect of meditation on human brain and body using EEG signals. To get the awareness into the nature of EEG during meditation . 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.

Neuroelectric and imaging studies of meditation are reviewed. Electroencephalographic measures indicate an overall slowing subsequent to meditation, with theta and alpha activation related to proficiency of practice. meditation appears to reflect changes in anterior cingulate cortex and dorsolateral prefrontal areas. (B. Rael Cahn, John Polich:

2006) Interestingly recent results suggest that meditation, which is a purely mental activity, may also induce brain plasticity (Lutz, Greischar, Rawlings, Ricard, & Davidson, 2004).

During meditation, theta waves were most abundant in the frontal and middle parts of the brain. As the research of The Norwegian University of Science and Technology (NTNU): (Nancy Bazilchuk: 2010) are revealed as followed:

“Previous studies have shown that theta waves indicate deep relaxation and occur more frequently in highly experienced meditation practitioners. When we measure mental calm, these regions signal to lower parts of the brain, inducing the physical relaxation response that occurs during meditation.” Besides, “The amount of alpha waves increases when the brain relaxes from intentional, goal-oriented tasks. This is a sign of deep relaxation, -- but it does not mean that the mind is void.”

Some reliable meditation-related EEG frequency effects for theta and alpha activity, Thickens and strengthens the anterior (frontal) cingulate cortex and the insula. (B. Rael Cahn, John Polich: 2006). Those regions are involved with controlled attention, empathy, and compassion – and meditation improves those functions. Increases the power and reach of fast, gamma brainwaves (Rick Hanson: 2015)

Silent experiences with alpha Alpha waves were more abundant in the posterior parts of the brain during meditation than during simple relaxation. They are characteristic of wakeful rest.

“Spontaneous wandering of the mind is something you become more aware of and familiar with when you meditate,” continues Ellingsen, who is an experienced practitioner. “This default activity of the brain is often underestimated. It probably represents a kind of mental processing that connects various experiences and emotional residues, puts them into perspective and lays them to rest.”

During meditation, theta waves were most abundant in the frontal and middle parts of the brain.

“These types of waves likely originate from a relaxed attention that monitors our inner experiences. Here lies a significant difference between meditation and relaxing without any specific technique,” emphasizes Lagopoulos.

“Previous studies have shown that theta waves indicate deep relaxation and occur more frequently in highly experienced meditation practitioners. The source is probably frontal parts of the brain, which are associated with monitoring of other mental processes.”

“When we measure mental calm, these regions signal to lower parts of the brain, inducing the physical relaxation response that occurs during meditation.”

The brain wave of delta and beta is different from sleep as well. Normally delta waves are characteristic of sleep. There was little delta during the relaxing and meditative tasks, confirming that nondirective meditation is different from sleep. Also beta waves occur when the brain is working on goal-oriented tasks, such as planning a date or reflecting actively over a particular issue. EEG showed few beta waves during meditation and resting.

We found robust gamma-band oscillation and long-distance phase-synchrony during the generation of the nonreferential compassion meditative state. It is likely based on descriptions of various meditation practices and mental strategies that are reported by practitioners that there will be differences in brain function associated with different types of meditation. Antoine Lutz, Lawrence L. Greischar, Nancy B. Rawlings, Matthieu Ricard, and Richard J. Davidson: 2004)

CONCLUSION

Today, “meditation” is used as a generic term to refer to a wide range of practices for self-regulation of emotion and attention (Gunaratana, 2002) and is considered an experiential practice present in most religions. Meditation generally involves focusing one’s attention on a particular physical or mental object. When mind wandering occurs, the meditative task is instructed to bring their attention back. Meditation practices often involve altered states of consciousness. Meditation practitioners often perform daily meditation for a period of time ranging from 15 minutes to several hours with the goal of getting insight into the nature of their minds, connecting with the infinite (or a divinity, depending on the meditation tradition) and the universe or reaching a state beyond the materialistic world and out of the suffering.

Every human being should meditate for their own physical and mental healthiness. Besides, the meditation effect on psychical functions, mind and brain. There are some more benefits of meditations after regular meditations in long term benefits; such as a sense of having a break from stress for a few minutes, less reactivity toward stress, lower blood pressure, greater mental and emotional clarity, better decision-making, greater resilience to stress.

This is the effective method to cross over the limitation of brain system, this regular meditations which can do everywhere to train your brainwaves into balance and equanimity with low-cost method to alter your brainwaves state to achieve the most from your intended personal transformation.

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