

Mindfulness Meditation and Brain Signals: A Review

Seema S. Kute¹, Sonali B. Kulkarni²

Department of Master of Computer Applications
Marathwada Institute of Technology, Aurangabad[MH], India.
seemak0518@yahoo.in¹, sonalibkul@gmail.com²

Abstract: Medical science is already started to spread various effects of meditation on the brain using different tools and techniques like FMRI, brain mapping technology, EEG. This allows the researchers to be able to determine the outcome of meditation on the brain and brain rhythms. In clinical problems also the meditation plays the main role in solving the many mental and physical problems like chronic pain. In this paper, we see different types of meditation like yoga, TM, sahaji yoga, raj yoga, zen meditation their effects on the physical and psychological health of human being. Also, study the basics of EEG signals and the brain rhythms and behavioral states. Acknowledge the effect of meditation on brain through EEG signals.

Keywords: Introduction, Mindfulness Meditation, Electroencephalography, Literature Review.

Introduction: The recent developments in the field of meditation different types of meditation and methods used in the meditation. Various physical and psychological health problems overcome using meditation. The mindfulness meditation is the hearts of meditation this can be improve the physical and psychological health of the human being and automatically the healthiness in the society can be improved.

Mindfulness Meditation: Mindfulness is the vitality that aids us acknowledge the states of happiness that are previously present in our lives.[37] Mindfulness meditation practice is a commitment that many resist, but it requires far less time and effort than most people realize. [35] The heart of Buddhist meditation is mindfulness. Basically, mindfulness is an easy concept. Its potential responses in its implementation and its requisitions. In the current moment, and non-judgmentally paying attention in a specific way is mindfulness. This type of attention supports greater acknowledgement, transparency, and acceptance of present-moment truth. It arises us up to the feature that our lives extend only in moments. There are many situations occur when we are not attending all the moments, we miss the most important things in our life and also not understand the fitness as well as the improvement levels and changes. A reduced realization of the present moment naturally produces other difficulties for us as well through our insentient and involuntary activities and behaviors, often driven by deep seated fears and self-consciousness. These difficulties tend to construct over time if they are not attended to and can ultimately leave us feeling attached and beyond touch. Over time, we may lose trust in our potential to redirect our energies in ways that would lead to greater pleasure and cheerfulness, possibly even to greater health. Mindfulness gives a simple but strong direction for getting

ourselves unstuck, back into touch with our own intelligence as well as liveliness. [36]

Electroencephalography (EEG):

In the form of tiny electrical signals the outcome of the livelihood brain generate, usually known as electroencephalogram(EEG), is the representation of all the postsynaptic powers of the neurons in the cerebral cortex. There are four fundamental EEG frequency rhythms as follows: [38] some behaviours and mental states usually related with the four absolute frequencies are as shown in below table:

EEG Brain Rhythms	Frequency Range	Behavioural / Mental state
Alpha	8-13 Hz	Realization, unfocused, de-stressed, sleepy.
Beta	14-30 Hz	Realization, vigilant, problem solving
Theta	4-7 Hz	Perceptible imagery, light sleep.
Delta	1-3 Hz	Extensive, relaxed sleep, indeterminate dream states.

Table 1. EEG Brain Rhythms and Behavioral States [38]

Literature Review:

The medical science is used to achieve the physical and psychological health for the human being. It is actually the

aim of the medical science. The yoga practices also have the similar aim. Both ends are same only the techniques as well as modalities are different for accomplishing these ends. During contemporary periods there has been lot much of the people are interested in yoga. Excellent results can achieve using both medicine and yoga together in body as well as mind. A basic problem is deficiency of understanding of the scheme of concepts. No alpha suppression in response to the variety of stimuli of two yogis is observed in the rajyoga meditation using EEG signals in 1961. [1]

In 1965 the vulnerable Mahasi Sayadaw showed that the stages of purification performs insight progress in Buddhist Satipatthana meditation in this study he used samatha & vipassana meditation practice. In this stages of purification observed that in the first stage awareness between the mental and physical processes. In second stage, the effect and causes of samatha & vipassana meditation practice on mind as well as matter and also realization. In the third stage, confidence becomes well built. In fourth stage, it observes that intuition proficiency of conclusion. In fifth stage, it observed insight knowledge of fearfulness. In sixth stage, the insight unsteady and undesirable essence of matter and mind. In seventh stage, it observed insight revulsion. In eighth stage, insight knowledge of liberation. In ninth stage, it shows inside understanding of re-observation. In tenth stage, it observed that the knowledge is the ability to perceive all things with calmness. In eleventh stage, this makes mind ready. In twelfth stage, observed that it can adapt the new situations or changes very easily. In last stage, it represents inside understanding of maturity. [2]

Zen meditation is one of the types of mindfulness meditation. In Zen meditation create the posture recognition as well as strength in the body in result it create stability in mind. Zen meditation could also help treat attention deficit and hyperactivity disorder, obsessive-compulsive disorder, anxiety disorder, major depression and other disorders marked by distracting thoughts using EEG signals in 1969.[3][25] In 1980 Brown, Daniel P. Engler, Jack studied present time original Buddhist meditation implementation noticed that the traditional impressionistic details of meditation steps are superior than trusted systems. [4]

To comprehend, manage and prevent anger by using Mindfulness meditation techniques.[32] In 1982 stress reduction and relaxation program method is used in mindfulness meditation during this study notice that this work does not prove that the meditation practice is directly responsible for stress reduction and relaxation changes.[5] Neurocognitive studies investigating the effects of mindfulness meditation show evidence that our thoughts can change brain structures. Mindfulness training produces mental states that decrease our judgemental attitudes and emotional reactivity while enhancing our ability to

experience more objectively and accept our personal experiences. In line with the literature, the results from the present case studies show that when frequently and correctly applied, In summary, therapy models that incorporate mindfulness meditation are likely to help clients with ADHD benefit from the positive and rapid effects of neuroplasticity and be better equipped to address crisis and prevent relapse. [40] In Transdectional meditation using long term and short term meditators' group perceived that a family of techniques which have in common a conscious attempt to focus attention in a non analytical way as well as an attempt not to dwell on discursive, ruminating thought.[6]

Latency reduced in TM using P300 method.[7]In 1999 Cranson R. Goddard, P.H. Orme, Johnson D. found the remarkable thing that in yoga the (H2)150 PET method may measure CBF distribution in the meditative state as well as during the resting state of normal consciousness and that characteristic patterns of neural activity support each state.[8] Elizabeth R. Valentine Philip L.G. Sweet spotted that in mindfulness meditation by applying Wilkin's counting technique improvements in performance on a task of sustained attention for both concentrative and mindfulness meditators in comparison with controls, with greater improvements being associated with longer durations of practice.[9] The FMI is a useful, valid and reliable questionnaire for measuring mindfulness is detected in 2001.[10]

By applying hdEEG technique EEG gamma activity during sleep represents a sensitive measure of the long lasting, plastic effects of meditative training on brain function is detected in 2003.[11] When high resolution EEG technique is applied in sahaji yoga meditation the theta and alpha activity in narrow frequency bands reflect the activity of multifunctional neural networks selectively associated with processes of cognitive and affective activity.[12]

Mindfulness skills are differential related to aspects of personality and mental health, including neuroticism psychological symptoms, emotional intelligence, alexithymia, experiential avoidance, dissociation and absorption.[13] When MBSR method is used in mindfulness meditation practice primarily leads to decreases in ruminative thinking, even after controlling for reductions in affective symptoms and dysfunctional beliefs.[14] Meditation state and trait shows considerable discrepancy among results, a fact most likely related to the lack of standardized designs for assessing meditation effects across studies.[15] The divine sound is expected to be very safe for human physiological systems and may be used as a good meditative guidance, even for a whole day continuously in yoga.[16]

Eberth, J., & Sedlmeier, P. studied that In mindfulness meditation Mindfulness Based Stress Reduction appears to have its strongest reaction on accomplishing giant mental health. But in the actual mindfulness meditation study detailed that the noticeable results on arguments linked with

the idea of mindfulness. [17][39] Significant improvement in the attention regulation of the students after meditation practice is observed in yogic meditation by using quasi experimental design.[18] Wavelet transform proves out to be the best method for the time frequency analysis of EEG signals as it gives the required frequency information along with the time instance at which it occurs in sudarshan kriya.[19]

TM practice is more effective than treatment as usual and most alternative treatments with greatest effects observed in individuals with high anxiety using comprehensive Meta analysis.[20] Oldrich Vysata, Martin Schatz, Jakub Kopal, Jan Burian, Ales Prochazka, Kuchynka Jir, Jakub Hort, Martin Valis observed that during Samatha-Vippassana extended FD in meditation can be illuminated as an increase in person's resemblance of EEG signals during person's associations of hierarchical formation oscillators in the brain.[21] Yoga gives good effects on stress reduction because high stress affects students' performance negatively.[22]

In mindfulness by applying MRI, VBM the positive correlation between meditation practice years and asymmetry near the posterior intraparietal sulcus may suggest that meditation is accompanied by changes in attention processing.[23][26] Studying the default mode network using EEG functional connectivity as well as the importance of studying meditation in relation to it is also observed in mindfulness meditation.[24] RCTs show that mindfulness meditation training interventions reduce reactivity to acute stressors.[27][28]

Mandy D. Bamber, Joanne Kraenzle Schneider shows that mindfulness meditation is very helpful for the college students it decreases tension, nervousness in college students as well as there are frequency, instructional method, duration like various distinctions in mindfulness involvement in covers yoga also, quantitative study(meta-analysis) is necessary for finding out which method is worthwhile. [29][41] Preferably, MBIs split the structuring essentials of mindfulness, not only to stay focus, but also release the brain along insight and prepares mental states. MBIs share basic curricular constituents that summon members to explore the four basics of mindfulness with the purpose of generating the surrounds for this specific, intensify psychological aspect of mindfulness to emerge. [30]

Yan Song, Haixia Lu., Honglin Chen, Guiling Geng, Jing Wang presented in their research study that there is not sufficient proofs which concluded that mindfulness involvement is beneficial for decreasing pain extremity. However, there is some proofs that shown mindfulness involvement increases unhappiness and fear in patients long-term discomfort. Their findings also give basic help to health care professionals to combine the utilization of mindfulness involvement into the treatment of patients with long-term discomfort, specially, those with metal primary diseases. They showed that mindfulness meditation involvement is beneficial in the depression and anxiety with

chronic pain. [31] Meditation practice may achieve the performance not only in a body and mind related problems but also in shooters. An interconnection between a stress, anxiety and good performance was also noticed. [33]

Meditation plays very important role in the variety of mental tasks and their practices. Recently, meditation becomes paramount research area. Different attentional and concentrative commitment beyond meditation may develop various psychological results. Various changes in ERP constituent amplitudes steady with reduced frontal engagement in the processing of unpredicted impulse throughout meditation in experienced meditative persons in vipassana meditation. The mindfulness-based Vipassana, more attentive forms of meditative practice could elicit powerful changes of ERPs as these practices encourage restriction of attentiveness focus in a trend that may eliminate the attentiveness structures even far from the instantaneous sensory surround. It therefore should be productive to appeal a similar paradigm to meditators practicing more concentrative forms of meditation such as mantra or visualization-based techniques. Analysis of clinical populations with auxiliary analysis of sensory and cognitive processing as affected by meditative training might aid to illuminate the essential neurophysiologic changes that contribute to positive health results required to meditation and mindfulness involvement. [34]

Conclusion:

In this review, we reviewed various types of meditation which are very effective in the physical as well as mental healthiness. Meditation can decrease nervousness, also helpful to develop the attention and concentration level and improves the physical and psychological health. Mindfulness meditation is the ancient concept it gives very effective results in the various clinical problems. This effect on brain states can be measured by using EEG signals. EEG signals are also helpful in detecting and avoiding structural and behavioral difficulties. Mindfulness Meditation really plays very important role in the life of human beings.

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