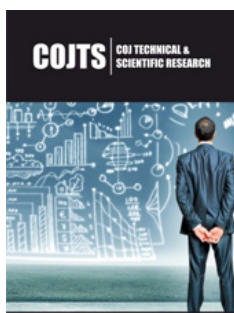


Road Mapping Survey of Yoga, Meditation and Intelligence Techniques

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Abstract

This study investigates the intelligent system approach of meditation and yoga. The intelligent systems are useful to monitor meditation and yoga as well as for the analysis of physiologic data gathered during these practices. Various intelligence techniques are applied to analyze the biophysiological and psychophysiological changes in humans are discussed in this study. Recent interest in how the meditation practices such as affect the human brain and technology shaping the way through which we decide the structural changes, neural correlates and emotional parameters by means of intelligent techniques.

Index Terms: Intelligence, Meditation, Sahaj Samadhi, Kundalini, Brain Waves, EEG Signal, Machine Learning, Deep Learning

Introduction

Meditation is a kind of exercise for the brain which has a positive effect on the overall performance of humans. Though it has a variety of kinds, the practice of meditation is done mainly in two ways as under:

i. Focused attention method: Focusing on a particular and specific thing, which could be the sensation or breathing of any part of our body.

ii. Open monitored attention method: Focusing on all the events happening around us [1]. Kundalini Chakras (Plexus) awakening through Kundalini Yoga/Samadhi Practice is a rarely used practice by expert meditation practitioners. Some studies of meditation have connected the practice to increase the different EEG activity in the left prefrontal cortex, which plays active role with problem solving, planning, concentration, meta-cognition (thinking about how to thinking), good feelings [2]. As with all the physical matters in our surrounding are linked to sound, light and color. To heal is to bring the seven body chakras into alignment and balance [3]. The uppermost crown chakra or Sahastrara is the chakra of consciousness, the mainchakra that controls all the other chakras. Pituitary gland plays similar role with crown chakra, secretes hormones to control the rest of the endocrine system which in combination with thalamus produces consciousness. The Third Eye Ajna Chakra is directly connected to the pineal gland. Third eye ajna is light sensitive chakra as well as the pineal gland is a light sensitive gland that regulates the instincts of going to sleep and awakening by the production of hormone melatonin. The Throat chakra or Vishuddhi sometimes Vishuddha, is said to be related to growth. This chakra is plays similar role to the thyroid gland that is also in the throat, and responsible to produce thyroid hormone for growth and maturity of human body. The Heart chakra or Anahata Chakra expresses love, well-being and equilibrium. It is analogous to the thymus located in the chest and part of the immune system and endocrine system both. It is responsible for fighting off disease (to develop immune) and is adversely affected by stress. The Solar plexus Manipura Chakra is associated with energy, assimilation and digestion processes. The pancreas and the outer adrenal gland cortex plays analogous role in digestion the food converted into energy for the human body. The Sacral Swadhisthanna Chakra is placed in the groin and is responsible to generate emotional activities, sexual functions and creativity of mind. This sacral chakra corresponds to the ovaries plays significant role in the production of several sex hormones involved in the reproduction process, which can lead to mood swings in humans. The Muladhara Chakra

is associated with security, survival and basic human potentiality. This center is located in the region between the genitals and the anus. Although no endocrine organ is placed here, it corresponds to the inner adrenal medulla which plays role for survival functions of human [4]. The practice of Kundalini Samadhi or Kundalini Yoga activates the hormones as well as generate electrical impulses or signals in the human body. The electrical impulse from brain that is Electroencephalogram (EEG) plays a vital role to analyse the positive effects of meditation practices [5]. Another famous meditation is Sahaj Samadhi Meditation. Sahaj Samadhi Meditation has the ability to create a feeling of ease, calmness, alertness and has the capability to transform your life! Some of the benefits of Sahaj Samadhi Meditation are:

- i. Increases focus and concentration
- ii. Enhances creative qualities
- iii. Makes you feel more energized
- iv. Experiencing inner peace and tranquility
- v. Helps to control your thoughts
- vi. Increases emotional stability
- vii. Imparts clarity of thoughts and increase in the level of self-awareness
- viii. Purifies your character and develops will power and intuitive ability
- ix. Increases the feelings of rejuvenation and vitality

This meditation techniques combined with yogic practices can ensure good health and a calm mind. Sahaj Samadhi Meditation is a mental practice with a simple and easy to learn procedure. A daily practice of 20 minutes is all you need to transform your life. This improves clarity of mind and thoughts [6]. The Mindfulness meditation is the practice of intentionally focusing on the present moment, accepting and non-judgmentally paying attention to the sensations, thoughts, and emotions that arise [7]. Another useful meditation is Mantra meditation. A mantra is a syllable or word, usually without any particular meaning, that is repeated for the purpose of focusing your mind. It is not an affirmation used to convince yourself of something. Some meditation teachers insist that both the choice of word, and its correct pronunciation, is very important, due to the "vibration" associated to the sound and meaning, and that for this reason an initiation into it is essential. Others say that the mantra itself is only a tool to focus the mind, and the chosen word is completely irrelevant [8,9].

Human intelligence, attention and neurophysiology of meditation

Attention plays important role in various meditation practices. Attention is the cognitive function that is used when selecting which stimuli to concentrate on when a number of stimuli are reaching the brain simultaneously. The five types of attention are focused attention, sustained attention, selective attention, alternating attention, and divided attention [10]. Focused attention is the

ability to respond quickly to stimulus and to being alert. Sustained attention is the ability to sustain attention on a particular object of choice for at least three minutes also called concentration. Selective attention is the ability to maintain attention on a task or an object and at the same time inhibit distractions from the external or internal world. Alternating attention means to switch our attention smoothly from one task or object to another. Divided attention is the ability to respond to a number of tasks at a single moment [11]. EEG studies of meditation typically compare experienced mediators to learners. In learner mediators, the most widely used meditative class is breath counting. In several experiments the most general and consistently observed EEG correlate of meditation is an increase in the power of lower frequency theta band (4-8 Hz) and the lower end of the alpha band (8-10 Hz). Alpha frequencies have been studied extensively in the literature. Alpha waves are highly variable among human subjects and alpha band activity in general is correlated to focused attention when eyes are open [12,13]. EEG signals may be a feasible objective measure of meditation ability because they are sensitive to the changes during, before and after meditation. EEG changes can be well-documented during, before and after meditation. EEG is suitable to analyse the state changes in long-term meditation. EEG signals are suitable to meditation using coherence, spectral analysis and synchrony techniques. Some literature studies have proven meditation state and trait-related effects on EEG voltage and power in certain frequency bands of certain EEG waves [14]. Spectral analysis can demonstrate the activity of brain over various regions in various states. The spectral coefficients can be used to develop a classifier for distinguishing between control and meditation conditions, with most suitable parameters, calculated on the basis of overall brain activity. Coherence or simply spectral co-variance includes both phase and amplitude in a measure of phase consistency between pairs of signals in each frequency band. Increased alpha-theta range coherence has been investigated both intra-hemispheric and inter-hemispheric changes during meditation. Although coherence is only an indirect measure of phase locking due to limitation that it does not separate the effects of phase and amplitude in the relations between two signals. As per Fourier analysis, which is highly dependent on the stationary nature of the measured signal; this is not the case in brain waves [15].

Intelligence techniques and meditation

Artificial Intelligence, Machine Learning, and Deep Learning are revolutionizing the researches in tropical and complementary medicine. Machine Learning and Deep Learning are recent growing and diverse fields of Artificial Intelligence which studies algorithms that are capable of automatically learning from data and making predictions based on data [16]. The basic theory of artificial intelligence comes from the Human brain neuronal structure. It's the most useful tool given to humanity. The reason behind intelligent human brain is the function of Neocortex. Neocortex by means of neuronal mechanism gives the power to think, act, do work, learn, remember, etc [17]. Machine Learning is a technique to implement artificial intelligence. There are various machine learning algorithms such as Decision trees, Naive Bayes, Random

forest, Support vector machine, K-nearest neighborhood, K-means clustering, Gaussian mixture model and Hidden Markov model etc. can be applied to analyse the meditation EEG data for better results [18]. Deep learning is another method to implement artificial intelligence. There are various methods are designed to apply deep learning on EEG data. Each proposed method has a specific applicability depending on kind of data, supervised or unsupervised learning and type of task. Some of the deep learning methods are; Convolutional Neural Network, Recurrent Neural Network, Long short-term memory and Auto Encoders etc [19]. Deep learning can also be utilized to encode human poses during meditation. Right poses of meditation are helpful to improve rehabilitation conditions [20,21].

Future scope and challenges

The measure challenge in such a research is to answer how does ancient tradition of meditation affects the brain signal and recent data technology applied over it? Only numerous researches have been done on the basis of recent intelligence techniques such as artificial intelligence, machine learning and deep learning. In future this study may be utilized to develop a self automated intelligent system to monitor neuronal dynamics during meditation.

Conclusion

In conclusion we posit that review has attempted to correlate descriptions of ancient meditation practices and the brain signals with respect to recent data technologies such as machine learning and deep learning. It discussed meditation from the perspective of recent working cognitive psychology, cognitive neuroscience, and neural dynamics that highlighted the requirement of different kind of multidisciplinary research in order to correlate ancient meditation practices with recent technology. Technical descriptions of intelligent techniques may provide considerable reference points for future developments in meditation applications to promoting human excellence as well as to develop future technologies.

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