

# THE ART AND SCIENCE OF MEDITATION

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We exist in at least 3 forms: Physical body, Mental-Emotional body and Spiritual body. We spend most of the time of our day and our life, our whole energy after our physical body: its care taking, its exercises, wellbeing & its pleasures. Somehow, we are not taught to take care of our mental & spiritual bodies, their exercises & their pleasures & well beings.

Meditation is one powerful way to correct these mistakes. You can call it as the exercise of mind to keep it healthy & free of perversions. Actually, in the depth of Meditation, one experience a dialogue with one's own self/soul. However, let us keep the discussion of soul aside for a while, at least we are aware of our faculty of mind.

Our miseries as human being are primarily due to our thoughts, emotions, desires-aspiration, ego, perceptions, liking-disliking (raga-dweshha), attitude & our constant shifts between past & present tense. If we carefully analyze, these are all the functions of our mind. If we learn to improve on these, our miseries would be gone. And meditation teaches us to improve on all these aspects.

Peace & happiness are sought for by each and every person. But our search for them is in outside world. At some stage, we realize that peace & happiness

actually reside in our own selves. The day we begin internal journey, we start getting peace & happiness. This internal journey is gifted and guaranteed by meditation.

All great prophets, religious path makers & saints have done meditation in some or other form to achieve the greatness and enlightenment. From oriental and western spiritual texts, it is clear that Right from Lords like Shiva, Mahavir, Buddha to Rama, Krishna ,Patanjali and from Christ to Prophet Mohmmmed to Asho Jarthusutra to recent most saints.....all have meditated for a prolonged time during their self realization or enlightenment process.

So, if we really want peace & happiness & eliminate our miseries or if we want to experience god, we must meditate.

Definition: Meditation is thinking deeply or spiritually about a subject; as per dictionary definition. It's a complex cognitive task. It is more than relaxation, concentration, contemplation or posturing. Through it one achieves enlightenment Illumination. It's a state of altered consciousness, 4<sup>th</sup> stage, according to some neuroscientists (1). It's a spiritual ecstasy with neurological manifestations. It's not hallucination.

There are different views about defining meditation: some call it as "stability of mind", some call it "concentration on one target", one can say as "unified thought

process”, while others call it a “thoughtlessness state”. One considers it as “introspection”, others as “lack of activity” or “leaving –giving away”. While others define it as either “intentional self regulation” or “dedication process” or even “staying connected constantly to supreme force”... Whatever one calls it, basically it's hard work. It demands the highest form of discipline which comes through constant awareness, not only of the things about you outwardly, but also inwardly. According to Shri J.Krishnamurthy, it's an effortless, choiceless, constant neutral awareness.

#### BENEFITS OF MEDITATION:

There are several advantages of meditation. Real meditation can restore physical, mental & emotional health. It can be helpful in controlling several lifestyle disorders, psychosomatic disorders including high BP, coronary artery disease, diabetes, asthma, rheumatism etc. In this stressful life, it's a powerful weapon or antidote to acute as well as chronic stress. It improves concentration and sharpness. It reduces reactivity to a situation or a person, so one remains serene.

The neurochemistry of meditation is entirely the reverse of stress. Meditation up-regulates the parasympathetic system, while stress up-regulates the sympathetic system – responsible for increase in heart rate, respiration, blood pressure etc(2,3).

As per our oriental spiritual texts and our spiritual masters, we should meditate for much higher gain than above mentioned physical & mental benefits. The real purpose of meditation is taming the mind, elimination of ego and then elimination of mind itself, thus attaining Samadhi- total bliss. Here soul remains uninhibited, manifesting its complete knowledge, complete revelations etc. The state of self realization, God realization comes here. This is the part of Enlightenment & Liberation as per our masters & texts.

“However meditation is not a pushbutton system. One has to have patience courage, hard work and perseverance. This coupled with right guide, right technique, right understanding and real belief and dedication can bring success. There is a high failure rate amongst meditators, usually this is due to nonfulfilling of above criteria. It is said, that meditation has become a business of billions and many opportunists have misused and abused this sacred spiritual science. Therefore one should be careful.

There are several techniques of meditation. Basically all methods & practices of meditation come from basic eight techniques.

One can focus on breathing, one can focus on an object (eg. light), focus on a sound, focus on a thought, focus on sensory perceptions, or on a sensual object. It

could be a guided imagery or the meditation on the soul by the soul itself. Let us take one technique for example. i.e. focus on breathing.

Anapan Sati: This technique is about moment to moment awareness of one's own breathing. It is concentration or focus on breathing, but not a pranayam. Pranayam is controlling breathing, but here one has to see and know every natural breath that goes in and comes out. Just no other thoughts, no other objects. Be aware of your own natural breathing, moment to moment in an effortless, choice less way. Please do not lose a single breath. When the mind gets distressed, as it usually happens with every beginners, one has to bring it back to breathing very quietly, without criticizing or cursing the mind. With months and perhaps years of practice, one learns to be with every breath for several minutes to hour. This facilitates the awakening process or enlightenment.

Here, there is no deity, no sect, and no religion; hence it's perfectly a secular technique. Also breathing is a vital process, without it nobody can survive; therefore it's a vital technique. Breathing is always with you wherever you are and whenever you go; hence this is a hassle free, easy and handy technique.

Breathing is the carrier of our emotions .Our breathing changes with different emotions and perversions. With anger, hatred the breathing becomes fast. With

jealousy, it becomes irregular. With love towards living beings it becomes slow; with compassion it becomes slower and even effective.

So, for a regular practitioner of breathing meditation, it becomes a feedback of one's own emotions and perversions. It's an auto check mechanism and whenever there is a negative emotion; one becomes alert, as one's own breathing tells: look here, something is wrong, control it! This is a wonderful reason, why breath practitioner becomes quiet, calm and compassionate and is always full of positive emotions/energy.

Most important: finally, our breathing is our own present tense, present moment. When we stay on breath, we actually remain in present moment i.e. "Now" ! our mind always fluctuates , between past and future, that is one of the major tragedy, root of our miseries. This meditation technique is a straight training of remaining in present tense. Though it is not easy to dwell on breathing, without losing a single breath; with hard work, dedication and commitment, this can be achieved.

Similarly, with all other techniques...there is some science and some logic in each one of them. In meditation over thought, one has to either pursue one and unified thought process e.g. a good or noble thought..or just simply watch the stream of thoughts ,as they come one after the other , and the next..in a non judgmental

way..a bare neutral awareness .Similarly for sound meditation, one can chant a mantra several times (loudly or internally without vocalizing) or listen calmly in a quiet place at night or in a jungle the subtle sound that enters the ears and concentrate on that..In object based meditation, one stares at the object continuously even without blinking eyes.

Based on these techniques, several masters have designed different methods. We know them as Patanjala Rajyoga, Anapan Sati, Smriti Upasthan, Vipashyana, Prekshadhyan, Jaindhyana, Transcendental meditation to name few important methods. Amongst others are Mantra dhyana, Zen meditation, Yoganindra, Nyas, Dynamic(Hoo Dhyana) meditation, Sahajdhyana, Tratak, Kayotsarga, Atitdhyana, Bhavidhyana, Swapnadhyana, Tahata, Spand dhyana etc.

If one understands the basics of meditation, one can really design one's own tailor made system, suitable to one. Initially one should learn one standard method, follow it for few years, then after mastering it, at some stage one can modify.

Most of these oriental techniques have come from teachings of Lord Shiva, Patanjali, Buddha, Adinath, Mahavir, amongst several others.

No one method is better than others really. All methods are great & equally beneficial. Comparison is dangerous & has no meaning. One has to choose the

method that suits to one. One should remember that all methods teach to remain in present tense, this particular moment. Choiceless, effortless, non judgmental awareness. This brings happiness & joy. As nicely described in Vipashyana Method, actually speaking, meditation is an operation of mind, by the mind. The tools of mind are calm and quiet mind, Awake & attentive mind, an equanimous mind. When this state is practiced several times over weeks & months & years, one achieves what is called mindfulness practice. Here meditator remains in a state of constant awareness..... in whatever he/she does. Eating meditation, sitting meditation, working meditation and walking meditation.

For the beginners, it may be worth observing total silence (No speech & no movement of body), as pilot exercise. Total isolation from all distraction is useful. Pranayam is helpful as warming up before each meditation session, though its not a prerequisite. A beginner may find it easy to do chanting (sound) meditation. Later focusing on object may be considered, with open eyes initially, followed by closed eyes. Focus on breathing & thought are harder meditation techniques, but are equally rewarding.

Health related Effects of meditation:

1. During meditation oxygen consumption is reduced by 16%, even greater than the reduction of 12% that occurs during in sleep (4).
2. Diurnal fluctuation in secretion of stress hormone is much controlled, in favour of peace and harmony.
3. Neural structures that are intimately related to the control of the autonomic nervous system are activated, more of parasympathetic drive.

Because of several good effects on health, including control of several diseases, many doctors, psychotherapists & other health professional are increasingly adding meditation techniques to their practice of mainstream, as prescription. They consider meditation a key element of an integrated health program (5).

Here are certain diseases, where there is a documented effect of meditation in alleviating them or reducing their severity in varying proportion (5). You will find several studies of the positive effects of meditation in these diseases in medical literature on internet or journals.

1. Arthritis
2. Allergies
3. Asthma
4. Hypertension
5. Coronary artery disease(6)
6. Irritable bowel disease
7. Heart burn
8. Constipation
9. Tension, Headaches & Migraines(7)
- 10.PMS & menstrual discomfort
- 11.Menopausal problems
- 12.Pain in the back, hips & knees. Fibromyalgia
- 13.Depression & anxiety (8)
- 14.Substance abuse
- 15.Skin disorders, eg. Psoriasis (9)

16.Chronic fatigue syndrome

17.Stroke

18.Over weight with Obesity

19.Sleep disorder

20.Terminal cancer related pain &other problems(10)

21.Multiple sclerosis(11)

In general, many psychosomatic & lifestyle disorders can be totally or partially eliminated with practice of meditation over a sufficient period. Stress can be very nicely tackled with learning art of meditation(12).

It is estimated that people who meditated over a period of five years had over 50% reduction in doctor visits & hospital admissions (13).

Contraindications: However, certain people should not do meditation. Those who are suffering from psychosis, severe depression or confusional states; extreme anxiety states & people who are demented can not & should not do meditation.

## Physiology of meditation

Meditation produces a specific physiological response pattern that involves various biological systems. Effect of meditation are on metabolic, autonomic , endocrine, neurological & psychological systems. These effect are multidimensional & interactive.

### Neuroelectrical effects:

(A) EEG changes: there are usually four types of waves in EEG: alpha, beta, theta & delta. The meditation brainwave pattern is a combination of alpha & theta, where theta provides the depth & profundity of the meditation experience, the subconscious inner space from which creativity, insight & healing spring & alpha provides the bridge or the link, to the conscious thinking mind so that you can actually remember the content of your meditation.

Awakened mind brainwave pattern emerges with people doing meditation over years with perfection.

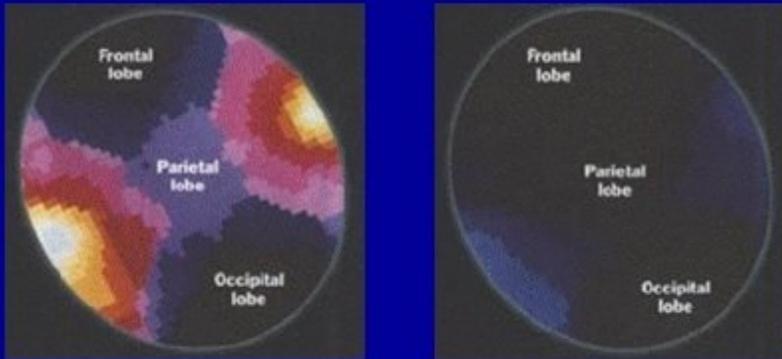
Regardless of their theology, philosophy or meditation technique, in higher states of consciousness, the meditators achieve peak experience, that can be found in all form of creativity & high performance.

In general amplitude of alpha wave improves with slowing of its frequency. Rhythmic theta waves appear & there is increased synchronization pattern of alpha(14,15). There can be Transcendental signal & dissociation of perception from the external sense organs. In chronic meditator, we find even Gamma waves(16).

During calm & focused attention type of meditation alpha waves are found. During highly focused concentration high beta activity is seen, while theta pattern is seen during imagery & reverie & it improves creativity.

It is observed that even after first meditation session, in a beginner(common person) there is perceptible changes of waves.

## Decrease in Beta-wave activity after meditation



(B) Evoked potentials:

Meditation sometimes produces altered amplitude with practitioner seeming to demonstrate decreased amplitude & latency for sensory EPs(14) with mindfulness inducing a decrease in habituation.

Neurobiology of meditation

Neuroimaging with MRI, rCBF (regional cerebral blood flow), MEG(magnetoencephalography) and improved EEG(electroencephalography) allow detailed studies in understanding the effect of meditation on neural behavior.

Dr. Andrew Newberg et al from Philadelphia published a path breaking paper (Jan 2001) that revolutionized the belief of scientific world. It was a SPECT study on Buddhist lamas. It proved that higher meditative states are no more hallucinations; these are actual neurological events, a neurobiological phenomena (17).

1. The parietal lobe of the brain is thought to be responsible for giving us a sense of our orientation in time & space. By blocking all sensory and cognitive input into this area, meditation results in the sense of no space & no time.

During SPECT study, it was demonstrated that there was significant reduction of rCBF during depth of meditation by Lamas.

2. The second important finding was observed in prefrontal lobe. As we know, this area is well developed only in human race and therefore human have higher cognition, capacity of judgment, intuitive memory and complex tasks, including tactfulness along with rational evolved behavior with social etiquette. The more the developed area, the person is more intelligent. During deep meditation, it is

recorded that rCBF increases in this area. I think, therefore all meditators doing the practice over few months to years, are cognitively more evolved and their behavior is more compassionate. Also it tells us that meditation is a higher state of consciousness.

These findings of SPECT study are reproducible, with different meditation.

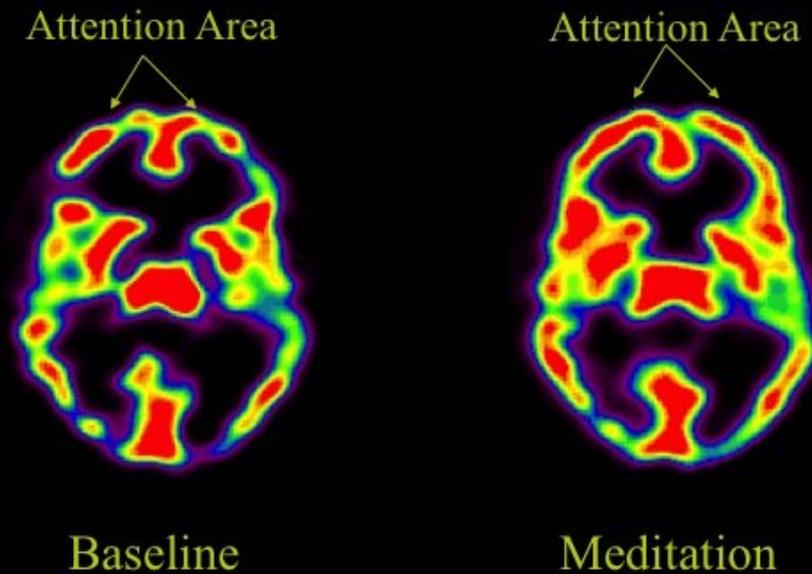
FMRI studies also were conducted by different groups and the results were similar. In fact, FMRI studies literally unfolded the whole circuitry involved in meditation process and demonstrated the significant signal increases in the dorso lateral prefrontal and parietal cortices, hippocampal/parahippocampal formation, amygdala, temporal lobe, pregenual anterior cingulated cortex, striatum and pre and post central gyri during meditation(18).

This indicates that the practice of meditation activates neural structures involved in attention and control of the autonomic nervous system.

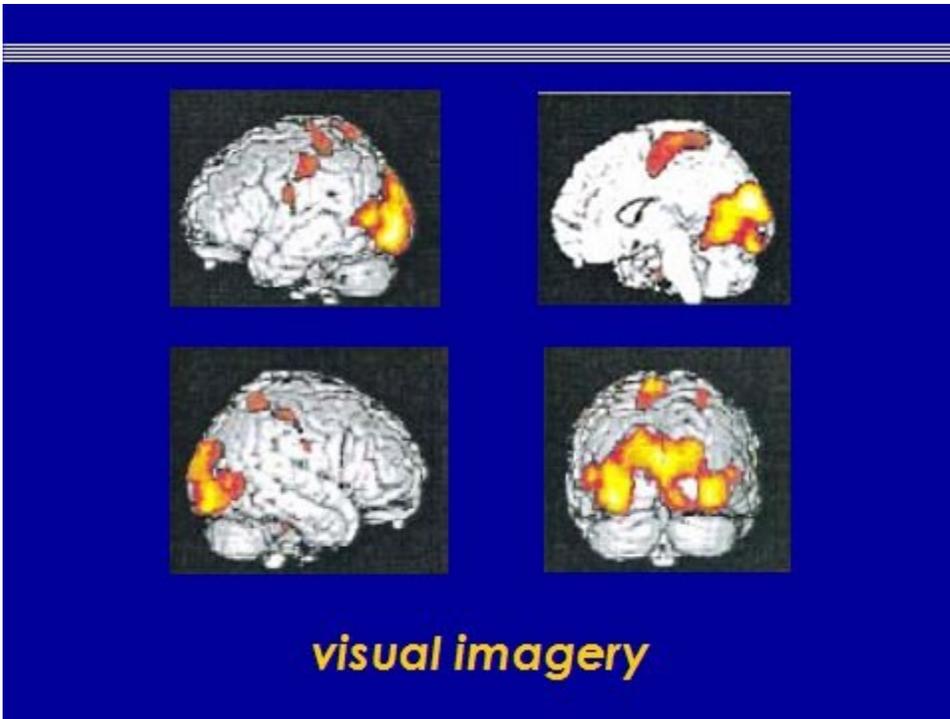
## MRI changes during Meditation

- PET, SPECT & fMRI allow examination of changes in regional blood flow, metabolism or receptor (sites of neurochemical and drug actions) activation in the brain in response to various tasks (17,19,20)
- Most types of meditation, which involve an initial focusing of attention, are associated with increased regional blood flow or glucose metabolism in the prefrontal and cingulate cortex, areas that are important in selection of a mental task
- The frontal lobes, especially the prefrontal regions help to organize, prioritize, plan and focus attention

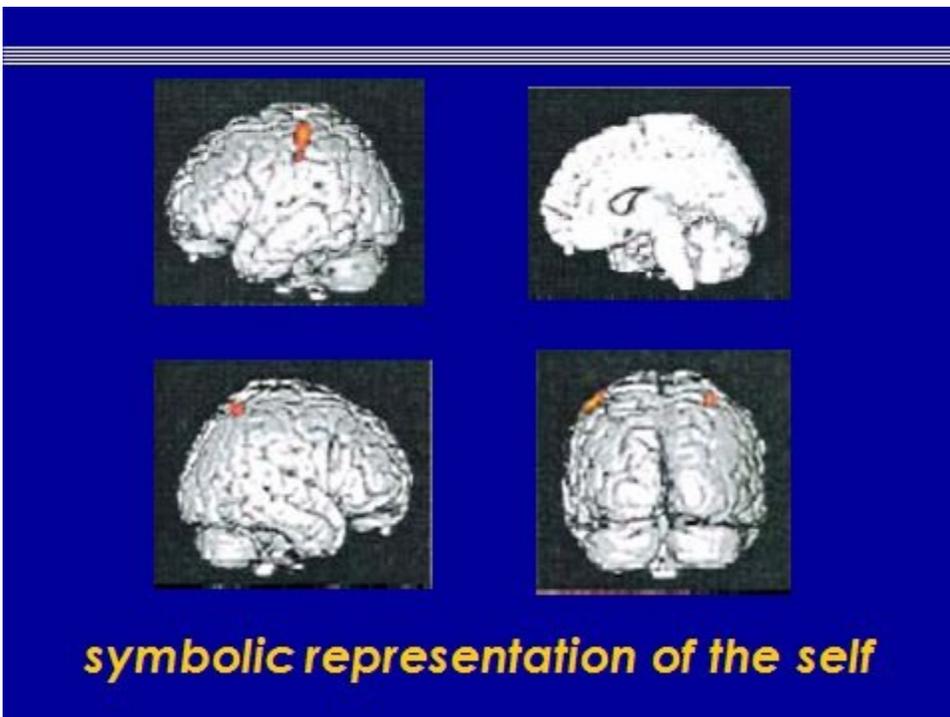
## SPECT Images at Baseline and During Meditation



- During visualization regional blood flow increases in the “visual cortex” and visual association areas in the occipital lobes



- In contemplation of “self” the parietal lobes on both sides are activated

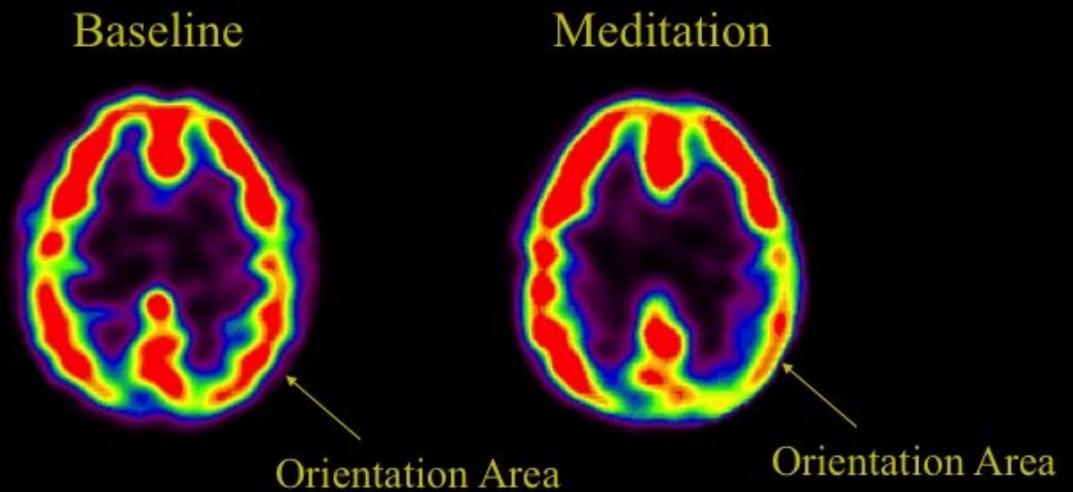


- Meditation appears to begin by activating prefrontal & cingulate cortex, associated with the will or intent to clear one's mind of thoughts or to focus on an object
- There also occurs deafferentation of PSPL(the posterior superior parietal lobule), means a decrease in arrival of distracting stimuli to striate cortex & PSPL, enhancing sense of focus during meditation

 results in

altered perception of self-experience during spiritual or meditative practices

## SPECT Images at Baseline and During Meditation



- Thalamus is a relay station and filtering station for sensory information that reaches the cerebral cortex for further processing
- During meditation the thalamus filters sensory input to part of the parietal lobe (the posterior superior parietal lobule or PSPL), involved in “body awareness”



decreased activation of the PSPL

- Increased thalamic blood flow during meditation implies that this is an active process of filtering of information and processing of information about the body
- Some studies during meditation show increased activity in the Hippocampus or inner aspect of the temporal lobe
- Hippocampus has close functional connections with hypothalamus and autonomic nervous system
- During meditation, integration of autonomic nervous system activity with different parts of brain involved in meditation is increased
- fMRI studies of Kundalini yoga support increased activity of hippocampus and amygdala in meditation
- Stimulation of right lateral amygdala results in stimulation of ventromedial hypothalamus & peripheral parasympathetic system



associated with a subjective sensation, first of relaxation & later, a more profound sense of quiescence

## Neurochemical effects :

Meditation has been shown to increase serotonin production. Serotonin is an important neurotransmitter and neuropeptide that influences mood and behavior in many ways. Meditation has also been associated with increased melatonin availability. In general during meditation GABA is increased in dorsal raphe nuclei. Cortisol is decreased in paraventricular nucleus and B-endorphin diurnal rhythms are changed for better. i.e. peace and pleasure feelings (19).

Heart rate and breathing slows down during meditation and stress response is cut down. There is a relatively greater parasympathetic nervous system activity during meditation, so productions of catecholamines are reduced. So the patients with hypertension, coronary disease and other stress related diseases are benefited.

Increased serotonin level helps improving mood of person with meditation. It is observed that there is increase skin resistance with meditation. There is decreased limbic arousal, which in turn explains how, meditation strengthens and enhances the ability to cope with stress and reduces reactivity of a person. So these are the good effects on autonomic nervous system during meditation.

Effects of meditation on CNS are further seen as it accelerates neural conduction or augments the release of neurotransmitters, thereby decreasing synaptic time. This results in a change in muscle firing threshold and pattern.

By inhibiting the left cortical hemisphere, the sense of time and logic no longer dominate consciousness during meditation. Therefore manifestation of ego is suppressed. The thoughts, desires, perceptions, perversions and duality....all are reduced....As we know, these are all functions attributed to mind and hence the faculty of mind is reduced more and more with depth of meditation, particularly in long term practitioners. Once faculty of mind is reduced or controlled, the meditator enjoys enormous bliss and peace. This is because the root of our miseries is our own mind which is normally not in our control.

## RECENT HYPOTHESIS IN THIS CONTEXT

- When meditation acts as a constant repetitive stimulus, certain permanent qualitative and quantitative changes develop in nervous system.
- Neurotransmitters and neuromodulators may stimulate growth of dormant neurons to develop a centre higher than neocortex- God module.

- This higher centre will exert inhibitory control over present neocortex and thereby over mind as a whole- thereby suppressing consciousness and all mental activities.
- Spiritual ascent is from the least evolved state of consciousness to near perfect state with which the mind itself will cease to be and there will remain only non-dual experience.

When meditation acts as a constant repetitive stimulus, certain qualitative and quantitative changes occur permanently..... Only Nondual experience.

As we see effects of meditation on metabolism, we realize there is decreased heart rate, decreased breathing and decreased B P.

By well documented studies it is shown that the blood flow to liver and kidneys is reduced with increase in cardiac output. The oxygen utilization level is decreased in muscles.

It may be worth noting, that the metabolic changes arise from a natural reduction in metabolic action at the cellular level, not from a forced reduction of breathing. All these transpire in to longevity and delayed aging, which we often observe in real saints and meditators.

At psychology level, meditator achieves improved cognition, increased concentration and reduced susceptibility to stress. Meditation enhances perceptual sensitivity. Most importantly it improves the attitude and personality of a person as studies reveal. The creativity and productivity of a person improve. Also the mood and sleep of meditator improves.

If we talk about most recent findings on neuroplasticity, a recent study showed that brain regions associated with attention, interoception and sensory processing like the prefrontal cortex, right anterior insula were thicker in meditation practitioners. Prefrontal cortices thickness was most pronounced in older participants. This can be explained by the fact that meditation probably offsets age related cortical thinning. In general, meditation practices promote neuroplasticity.

Looking to all above positive benefits of meditation, at physical, mental emotional and spiritual levels, we can conclude that meditation is an invaluable treasure that we have lost in the stride of day to day hassles and plights.

Actually, pain may be inevitable, but suffering is optional. We all have problems....Several problems. But, we must realize that there is a cause behind our problem. If we pinpoint the cause (root of our miseries) than we also know that

there is a way out. If we follow that path, our problems will be solved. We will get peace, joy and inner happiness.

The root cause of our problems/miseries is our own mind. The thoughts, desires, emotions, ego, perceptions, attitude etc. cause the problems. If we tame our mind, the miseries will be gone. The powerful way to tackle our mind, is meditation.

At the end, let us remember immortal statements of versatile masters and teachers of meditation and salvation.

(1) Lord Mahavir: Please remain aware at every second, at every fraction of second. Please do not be unaware (pramad) and watch and guard your every thoughts, every words and every actions.

(2) Lord Buddha: (At his death bed) Monks; whatever is composed will decay. Continue working in the direction of your salvation, sincerely, incessantly

(3) Swami Vivekanand : (last sentence of his life) Wait and meditate, till I call you back.

So let's meditate from today and now! From this moment on!

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