Research Paper CHEMISTRY

Effects of Meditation on Chemistry of Brain (A review)

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ABSTRACT

The purpose of this paper is to clarify conceptually what the term meditation means and derive from these standard claims on meditation possible contributions of meditation to neurosciences and develop tentative proposals for a neuroscientific understanding of the cognitive and affective processes that are altered by training in meditation.

KEYWORDS Meditation, consciousness, neuroimaging, ego, happiness.

In recent years, though, we have started to better understand the neural bases of states like happiness, gratitude, resilience, love, compassion, and so forth. And better understanding them means we can skilfully stimulate the neural substrates of those states—which, in turn, means we can strengthen them. Because as the famous saying by the Canadian scientist Donald Hebb goes, "Neurons that fire together, wire together."

Ultimately, what this can mean is that with proper practice, we can increasingly trick our neural machinery to cultivate positive states of mind.

Meditation is one of techniques which can help to acquire a state of mental peace and tranquillity , A calm mind, good concentration, clarity of perception, improvement in communication, blossoming of skills and talents, an unshakeable inner strength, healing, the ability to connect to an inner source of energy, relaxation, rejuvenation.

Meditation is a practised by persons of almost all countries. The word meditation carries different meanings in different contexts; dictionary meaning of meditation is continuous and profound contemplation

Effect of meditation on Brain;
To know how the meditation changes brain we need to know something about brain,it has following parts

- Lateral prefrontal cortex(**Assessment Center)**: the part of the brain that allows you to look at things from a more rational, logical and balanced perspective.
- Medial prefrontal cortex("**Ego Center**"): the part of the brain that constantly references back to you, your perspective and experiences. We call it the Self-Referencing Center.

Medial PreFrontal Cortex (mPFC) is that it actually has *two* sections:

- Ventromedial medial prefrontal cortex (vmPFC) – involved in processing information related to you and people that you view as *similar* to you. Dorsomedial Prefrontal Cortex (dmPFC) – involved in processing information related to people who you perceive as being *dissimilar* from you. This very important part of the brain is involved in feeling empathy (especially for people who we perceive of as not being like us) and maintaining social connections.
- Insula(**bodily sensations)** : the part of the brain is involved in experiencing "gut-level" feelings. Along with other brain areas, it helps "guide" how strongly you will respond to what you sense in your body
- Amygdala("**Fear Center**."): This primal region of the brain, associated with fear and emotion, is involved in the initiation of the body's response to stress.

Recent advances in medical imaging, such as rCBF (regional Cerebral Blood Flow), real time MRI (Magnetic Resonance Imaging), MEG (magnetoencephalography), and improved EEG (electoencephalography) allow detailed studies that are reshaping our understanding of the effects of meditation on neural behaviour. Already there are several basic effects that have been discovered through scientific research in the recent past which demonstrate the profound influence meditation has on neurophysiology.

After an eight-week course of meditation, the brain's "fight or flight" center, the amygdala, appears to shrink. This primal region of the brain, associated with fear and emotion, is involved in the initiation of the body's response to stress.

As the amygdala shrinks, the pre-frontal cortex – associated with higher order brain functions such as awareness, concentration and decision-making – becomes thicker.

The "functional connectivity" between these regions – i.e. how often they are activated together – also changes. The connection between the amygdala and the rest of the brain gets weaker, while the connections between areas associated with attention and concentration get stronger.

There are reports (Davidson , 2003) that there is increases in left-sided anterior activation, a pattern previously associated with positive effect, in the meditators compared with the non-meditators. Also there is significant increases in antibody titers to influenza vaccine among subjects in the meditation compared with those in the wait-list control group.The magnitude of increase in left-sided activation predicted the magnitude of antibody titer rise to the vaccine. These findings suggest that meditation may change brain and immune function in positive ways and underscore the need for additional research.

"Although the practice of meditation is associated with a sense of peacefulness and physical relaxation, practitioners have long claimed that meditation also provides cognitive and psychological benefits that persist throughout the day."

Dr. Richard Davidson at the University of Wisconsin. Using imaging devices that show what occurs in the brain during meditation,has shown that meditation strengthens the neurological circuits.

A new study (Jian et al.,2014) has investigated that there is increase in signal for the *nondirective meditation as compared to rest* in several regions, including orbitofrontal, motor, somatosensory, visual, association, and limbic areas.

Dalai lama(Lama,2007)a spiritual mystic pointed out that in addition to the brain giving rise to thoughts and hopes and beliefs and emotions that add up to this thing we call the mind, may be the mind also acts back on the brain to cause physical changes in the very matter that created it. In the last decade of the 20th century, neuroscientists overthrew the dogma that the adult brain can't change. To the contrary,its structure and activity can morph in response to experience, an ability called neuroplasticity. The discovery has led to promising new treatments for children with dyslexia and for stroke patients, among others.But the brain changes that were discovered in the first rounds of the neuroplasticity revolution reflected input from the outside world. For instance, certain synthesized speech can alter the auditory cortex of dyslexic kids in a way that lets their brains hear previously garbled syllables; intensely practiced movements can alter the motor cortex of stroke patients and allow them to move once paralyzed arms or legs.

A study (Lazar, et al., 2005) shows thicker cortical regions related to attention and sensory processing in long-term meditation practitioners compared to non-meditators. Also it suggests that meditation practice may offset cortical thinning brought on by aging

However, to maintain gains, one has to keep meditating. Why? Because the brain can very easily revert back to its old ways if one is not vigilant . This means one has to keep meditating to ensure that the new neural pathways one worked so hard to form stay strong.

The Brain Without Meditation (egoistic-self centered);

If you were to look at people's brains before they began a meditation practice, you would likely see strong neural connections *within* the Ego Center and *between* the Ego Center and the bodily sensation/fear centers of the brain. That means the Ego Center is processing the bulk of the information. One is stuck in repeating loops of thought about our life, mistakes we made, how people feel about us, our bodies and so on.

This all happens because the Assessment Center's connection to the Ego Center is relatively weak. If the Assessment Center was working at a higher capacity, it would modulate the excessive activity of the vmPFC (the part that takes things personally) and enhance the activity of the dmPFC (the part involved in understanding other's thoughts and feelings). This would lead us to take in all the relevant information, discard erroneous data (that the Ego Center might want to focus on exclusively) and view whatever is happening from a more balanced perspective – essentially decreasing the over thinking The Assessment Center is as a sort of "brake" for the unhelpful parts of the Me Center.

CONCLUSION:

Meditation have a long-term impact on the brain and body in a way that is beneficial for physical health, illness and possibly well-being, strengthening the Assessment Center, weakening the unhelpful aspects of the Ego Center (that can cause to take things personally), strengthening the helpful parts of the Ego Center (involved with empathy and understanding others) and changing the connections to/from the bodily sensation/fear centers such that one experience sensations in a less reactive, more balanced and holistic way.However to maintain ecstatic state of mind one has to keep meditating daily.But the choice still remains between the selection of various meditative techniques,(Buddhist,Christian,Jainism,Transcendental,Osho,Shri Shri Ravi Shankar,J Krishnamurti and many more).

As all human beings are not same, everybody is having different type of psychology. So the selection of technique depends upon the nature of person. The meditation reduces anxiety, increase concentration leads to relaxed state of mind, but this state should not be confined to the period for which meditation is done, it should be the permanent state of mind while doing normal routine day to day activities also.

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