

Meditation is an Integral Part of Yoga

Once confined to spiritual practices, meditation has found its way into mainstream wellness as an evidence-based science for mental and physical well-being. Its ancient roots trace back thousands of years, yet in the modern scientific landscape where its profound impact on the human brain and body is being unveiled. This age-old practice has garnered attention from researchers worldwide, prompting studies that explore its effects on the brain, physiology, and overall health.

However, meditation is gaining popularity as an independent mind-modifying technique, and because of this, its intricate role within yoga needs to be addressed. Meditation is the seventh step of *Ashtanga Yoga* (eight-step method) as described in *Patanjali Yoga* sutras. The principles and practice of yoga start from the moral code of conduct in the form of restraints (*Yamas*) and observances (*Niyamas*). These principles play an essential role when an individual wants to practice and progress in the path of meditation. A physical posture (*Asana*) provides the most critical platform to stay undisturbed while practicing meditation, which requires a seated position. Regulated breathing (*Pranayama*) directly impacts mental processes, including reduced distractions and enhanced focused attention. Various relaxation techniques also contribute to an augmented meditative experience. Hence, meditation was always considered part of advanced yoga practice, which involves internalization of awareness and being in an effortless, expansive state. Meditative experience is always viewed as the beginning of an internal journey that should take an individual to higher states of consciousness (*Samadhi*), featuring exceptional feats and special abilities.^[1]

While meditation can be used as an independent mind-modifying technique, isolating it from the core of yoga can result in (i) deriving compromised and short-term benefits of meditation, (ii) depriving individuals of actual benefits of meditation as a sequential progression of yoga, and (iii) disconnecting the seekers of meditation from its source knowledge base rooted in eastern (predominantly Indian) traditional knowledge systems. Numerous meditation techniques have evolved, but the goal remains the same. As described earlier, *Patanjali Yoga Sutras*, one of the most followed yoga scriptures, describes meditation as the natural mental state that emerges from the summation of intense focusing followed by effortless expansive being. This state is featured by silence and happiness accompanied by balanced emotions. To achieve such a meditative state and progress further, it is essential to utilize various other yoga techniques, both external (physical) and internal (mind modifying).

Initial scientific explorations were focused on understanding exceptional feats demonstrated by yoga masters. These studies were mostly confined to physiological changes following an advanced meditation practice. It is evident from the available scientific literature that one can develop the ability to voluntarily control involuntary functions.^[2,3] These volunteers commonly used meditation as an integral part of advanced yoga practice. The features observed were similar to physiological hibernation, with reduced metabolic requirements, slower cardiorespiratory functions, and enhanced higher brain functions.^[4]

The three main areas of scientific exploration of meditation include (i) physiological changes, (ii) neural correlates, and (iii) applications in health and disease.

- (i) Physiological changes: Autonomic changes following meditation have been the central focus, with studies demonstrating lowered physiological activity concerning heart rate, respiration, skin conductance, and oxygen consumption. Reduced cortisol levels and oxidative stress markers accompanied these physiological changes. As an outcome, meditation has shown clear signs of relaxation response.^[4]
- (ii) Neural correlates (neural plasticity): Studies utilizing both electrophysiology and neuroimaging have shed light on the brain's plasticity – the ability to reorganize and form new neural connections. This includes functional and structural plasticity, which is gaining popularity based on probable applications. Meditation seems to harness this extraordinary capability. Regular practice of meditation has been linked to structural changes in the brain, particularly in areas associated with emotional regulation, attention, and self-awareness. For instance, the anterior cingulate cortex (ACC), responsible for regulating cognitive processes, including attention, and areas of the limbic system (predominantly hippocampus), which regulate emotions and self-control, show increased gray matter density in experienced meditators. The prefrontal cortex, involved in decision-making and attention, also exhibits alterations in structure and function, indicating enhanced cognitive abilities among practitioners.^[5] Studies using an electroencephalogram and evoked potentials have also demonstrated that meditation can slow the brain's electrical activity and enhance neural plasticity.^[6] Multiple evoked potential studies have demonstrated that meditation increases the information processing speed in the brain (shorter latencies and increased amplitude in the auditory evoked potentials) recorded at the brain stem, thalamocortical areas, as well as association cortices within the prefrontal and temporal lobes.^[7]

Various neuroimaging studies have also supported the possibility of structural changes in the brain following meditative practices. It is consistent across studies to note that there is an increased thickness across areas within the frontal lobe (ACC, dorsolateral prefrontal cortex, and medial frontal gyrus), left precuneus, right thalamus, and parts of the limbic system (hippocampus).^[8]

- (iii) Applications in health and disease: Meditation is becoming trendy for its use in well-being. Meditation is also becoming synonymous with mindfulness. Although mindfulness has become a popular technique, the traditional meditative connotation, which involves the process of mastering mental modifications, emotional balance, and spiritual evolution, might lose its importance. Hence, it is important to explore meditation beyond mindfulness. Studies have demonstrated multiple health benefits of meditation, including its role in mental health conditions, managing stress and lifestyle-related health problems, pain management, as well as rehabilitation.^[9] Most of the studies have used meditation as part of an integrated yoga therapy protocol, while few selected studies have looked at the benefits of meditation as an independent intervention as well.

Other Well-known Benefits Include

Managing stress response

One of the most celebrated benefits of meditation lies in its ability to mitigate the body's stress response. Stress triggers the release of cortisol and adrenaline, impacting various physiological systems. Individuals can train their minds to reduce reactivity to stressors through various mind-body interventions. Meditation has evolved as a powerful tool in lowering autonomic reactivity and response to negative emotions. Studies illustrate that meditation reduces the activity of the amygdala (the brain's fear center). Simultaneously, it strengthens connections between the prefrontal cortex and the hippocampus, enabling better regulation of emotional responses. Consequently, regular meditation can lower stress hormones, decrease anxiety levels, and improve overall emotional well-being.^[10]

Strengthening the defense mechanism within (immune booster)

The impact of meditation can be seen not only at the physiological level but also at the cellular level. It can enhance and empower the immune system to defend against any compromised situation resulting from an external or internal challenge. Meditation can potentially boost immunity by reducing inflammatory markers and bolstering immune cell function. Studies on yoga, including *Pranayama* and meditation during the COVID-19 pandemic, have shown a more robust defense against infections and contagious diseases. However, further studies

are ongoing to understand this connection comprehensively. Meditation can prevent DNA damage on one side but also promote DNA repair mechanisms.^[9,11]

Transforming lifestyle

The practice of meditation is also associated with well-defined lifestyle modifications. When practiced as part of yoga, the four cardinal components of lifestyle, i.e., physical activity, mental relaxation, regulated habits (including sleep), and a healthy diet, are taken care of. Otherwise, individuals try compensating for these by various independent methods, including working out in a gym, fad diet, medically assisted sleep management, and leisure and entertainment-based relaxation. None of the above can facilitate a healthy lifestyle. However, long-term adherence to lifestyle modification programs has been the biggest challenge, resulting in low compliance. In addition, meditation is also known to reduce craving (for any sensory stimulants)^[12] and promote empathy, compassion, and prosocial behavior along with the experience of contentment and happiness.^[13]

Trends in Meditation

Incorporating Meditation into daily life

Despite its profound benefits, reaping the rewards of meditation requires commitment and consistency. Even short, regular sessions can yield positive outcomes over time. Whether through mindfulness or transcendental meditation, loving-kindness or heartfulness meditation, reciting a spiritual mantra or Om meditation, finding the approach that resonates with an individual is vital to establishing a sustainable practice.

Bringing meditation into professional institutions

As scientific evidence continues to mount, the integration of meditation into various fields ranging from medicine and psychology to education and corporate wellness programs is becoming more prevalent. Schools, health-care facilities, and workplaces are incorporating meditative practices to enhance focus, productivity, and overall well-being. Meditation also finds its place in sports and games. An integrated approach to yoga, including meditation, is gaining importance to promote optimal performance, injury prevention, and rehabilitation. Mental health-related issues (anxiety and depression) in sports personnel are increasing significantly due to the competitive and demanding nature of the game. *Pranayama* and meditation motivate individuals to develop optimism, determination, and positive intent.

Meditation as a profession and a sport

There is a new trend of promoting meditation as a profession and a professional sport. The recent development of the launch of the World Meditation Labs and World Meditation League is giving a new outlook to the objective

and practice of meditation. While the purpose and final goal of meditative experience should be conventionally rooted, an evidence-based approach to understanding the progress made in the journey of meditation shall facilitate a better understanding for a practitioner. Hence, there is a need for the scientific validity of the meditation process to establish benchmarks. The use of technology (virtual reality) and biofeedback-based tools for better meditative experience in novices is also becoming popular. In the future, individuals have easy access to such meditation laboratories where they can get themselves evaluated. However, as long as the purpose is to facilitate an individual's inward journey and detach from dependency on external objects of meditation, such new trends can encourage more individuals to try experiencing meditation and derive its positive benefits.

In summary, the science behind meditation elucidates its transformative effects on the human mind and body. Beyond its spiritual origins, meditation is a potent tool for cultivating mental resilience, managing stress, and fostering holistic health. Embracing this ancient practice as an integral part of yoga in our modern, fast-paced lives may be a gateway to a more balanced, healthier, and fulfilling existence.

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