



Review Article

A century of 'The science of yoga' (1921–2021): Revival, renewal and renaissance



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ABSTRACT

There is a worldwide interest in yoga for wellness, mind-body medicine, research in consciousness, prevention/management of life-style disorders and spiritual quest for self-realization. An important question is "Is yoga a therapy or a lifestyle?" However, the universe of yoga has many sets and subsets, evolved over millennia, by great yogis and acharyas. The proliferation of the names of yoga, by several teachers and schools, is often guided by the motive of creating a brand rather than a revival, renewal or renaissance in yoga. The latter demands a panoramic overview of tireless endeavor of great masters, beyond any commercial interests, in exploration of "The Science of Yoga." Sincere and meticulous enquiry into the physiological and psychological effects of yoga began, a century ago, in a quiet hamlet in Amalner, Maharashtra.

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1. Introduction

There is a worldwide interest in yoga for wellness, mind-body medicine, research on consciousness, prevention/management of life-style disorders, and spiritual quest for self-realization. Recently, in an inter-system global dialogue, one of the authors (RAV) raised a basic question, "Is yoga a therapy or a lifestyle?" To this query, V. Prakash responded with a quotable maxim. "Yoga is therapy for lifestyles!"

However, the universe of yoga has many sets and subsets, evolved over millennia, by great yogis and acharyas. Swami Vivekananda, in his inspired lectures, described and simplified the traditions into four categories: (1) Raja yoga, (2) Karma yoga, (3) Bhakti yoga and (4) Gnyana yoga [1]. The proliferation of the names of yoga, by several teachers and schools, is often guided by the motive of creating a brand rather than a revival, renewal or renaissance in yoga. The latter demands a panoramic overview of tireless endeavour of great masters, beyond any commercial interests, in exploration of "The Science of Yoga." Sincere and meticulous enquiry into the physiological and psychological effects of yoga began, a century ago, in a quiet hamlet in Amalner, Maharashtra.

2. Sri Madhavadasji

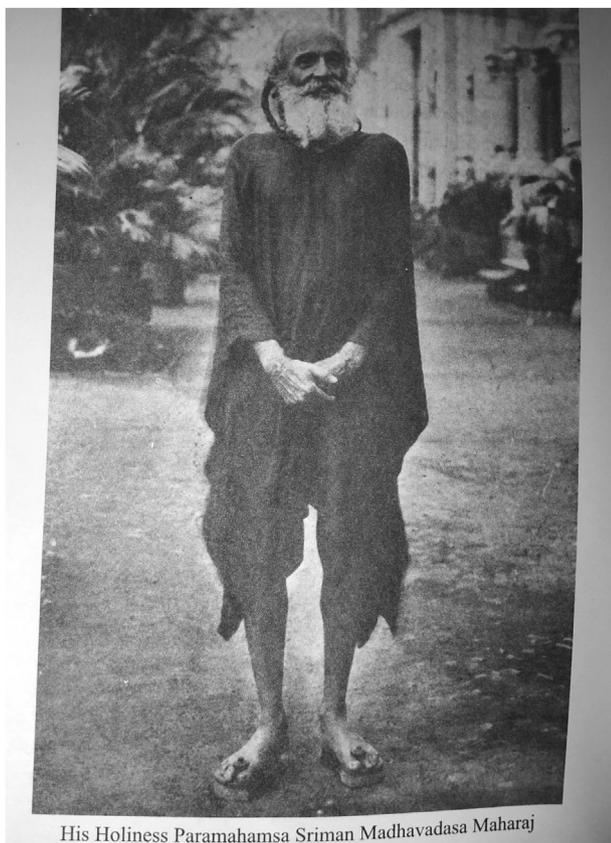
Paramahansa Madhavadasji ignited the young minds of Swami Kunalayanandji (SK) and Sri Yogendraji to dedicate their lives to popularize and explore the science of yoga, during the first two decades of the twentieth century. Sri Madhavadasji, along with Swami Vivekananda, was a great yogi who stressed the importance of synergizing the ancient traditions of yoga with the experimental approach of modern science (Fig. 1). Madhavadasji himself was truly an example of a perfect yogi. He is reported to have lived for 123 years (1798–1921). He was the fourth mentor of Jagannatha Ganesh Gune (SK), only for a short period of two years before his *samadhi*. He stimulated Gune 'to delve deeply into the efficacy of yoga through authentic and documented experimental studies' [2]. In the year 1921, SK initiated rigorous practice of yoga himself and also the first studies on its physiological effects. So, 1921 marks out as a significant year for both: the demise of Madhavadasji and the very first physiological studies in yoga.

It is worthwhile to reflect on the life of Sri Madhavadasji, for the benefit of the present and the future generations interested in yogic research and therapy. He was born in a Vaishnavite family in Bengal, belonging to the great tradition of Chaitanya Mahaprabhu, worshiped as an incarnation of God and the founder of the *bhakti sampradaya*. His guru was said to be Bhaktichandradas, whom he followed for many years. During the first war of Indian independence, at the ripe age of 59, he left for Himalayas and had intense

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His Holiness Paramahansa Sriman Madhavadasa Maharaj

Fig. 1. Great Yogi Madhavadasji.

tapasharya for twelve years. He has been reported to have travelled 11 times by foot all over India during 19th century. Then he settled at Kanakeshwar, Raigad district in Maharashtra, for a ceaseless practice of yoga for 12 years. He was admired as a spiritually advanced yogi with miraculous powers. He was well-known as 'Mirachibaba', as he lived only on green chillies and buttermilk (a diet worthwhile to do research on!). Later, he shifted to Malsar in Gujarat, where he breathed his last. He became a legendary figure in India. He was the chief of the Brihat Sadhu Samaj of India and organized many meetings of sadhus, to engage them in social good.

3. Swami Kavalayanandaji

SK, during his short apprenticeship, was very curious to learn about certain strange powers of siddha yogis. He persisted in asking Sri Madhavadasji, "Please show me a real yogi". The request was ignored for a long time. Finally, he was taken by his guru to a small island in the Narmada River. There, he showed him a yogi 'who had taken his intestine out through the mouth and had been washing them!'. SK was shaken and could not utter a word. It is reported that the disciple never again asked his guru for any such demonstration of miraculous yogic powers. That event further strengthened his will to investigate the science of yoga, in its lower and higher forms [2,3]. He had a vision to establish an institution, dedicated to the 'Science of Yoga'. Kaivalyadhama actualized this vision.

Kaivalyadhama, Lonavala, has meticulously preserved all the papers, photos, correspondence and other memorabilia of SK. Sri Om Prakash Tiwari, R.K Bodhe and G. Ramakrishna have done a great service in the publication of the biography of SK (Fig. 2). However, it is just a tip of the iceberg of a great life dedicated to

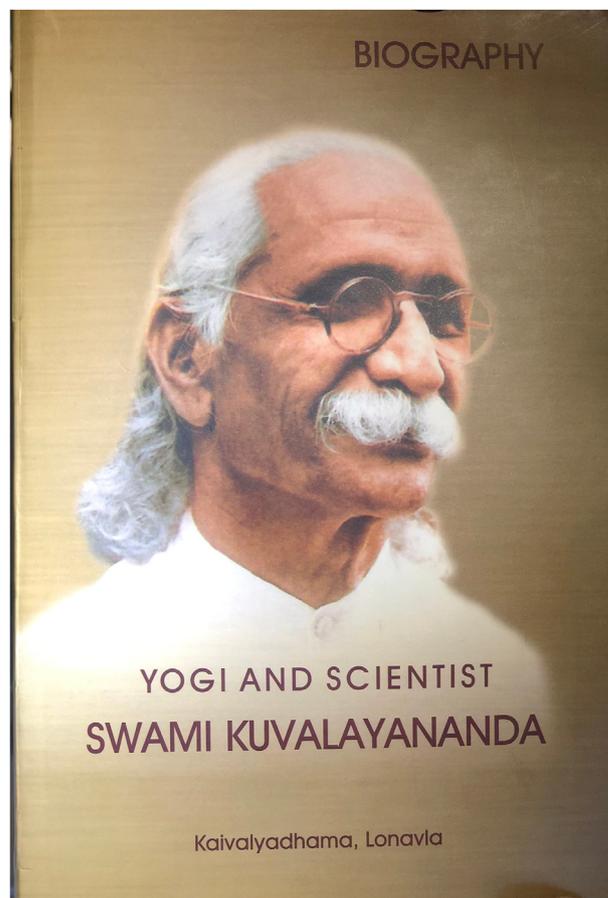


Fig. 2. The biography of Swami Kavalayanandaji.

three major ideals in his life. In SK's words, these were, "However, by undergoing secondary education in Pune I had taken two vows -(i) to remain unmarried throughout my life, (ii) not to accept service under the British Government. During these very days' three ideals of my life were fixed: (a) to prepare a patriotic young generation through secondary and higher education; (b) to master the Indian system of physical education and to integrate it in general education; (c) to combine science and spirituality by coordinating yoga with modern sciences, physically, mentally and spiritually."

During his childhood days he was an adherent listener to Pandav Pratap – valour, adventures and strife of the mythical five archetypes. He was also deeply influenced by the inspired life of Shivaji. He was an avid and regular reader, every week, of the roaring of the *Kesari* (lion), the periodical edited by Lokmanya Tilak. It is interesting to note that Tilak coined the term 'Ayurvediya' to suggest a transformation of Ayurveda by synergizing the knowledge system with modern bio-medical sciences.

SK was orphaned at the age of 14. Mr. A Talwalkar, in Pune, took him under his wings and encouraged the young Jagannath (SK) and supported his brilliant academic career. He won the coveted Shankar Seth Scholarship for scoring the highest marks in Sanskrit. He mastered Sanskrit, which has been the fountain-head of Indian culture and yoga. All the pioneers in Indian knowledge systems were exhorted by Swami Vivekananda to make their foundation strong in Sanskrit. For revival, renewal and renaissance in all Indian knowledge systems, it is most vital that our New Education Policy should make Sanskrit and Yoga as essential parts in the core curriculum in schools, starting from the primary education.

The influence of Lokmanya Tilak on SK for liberating the nation from the British rule was profound. He served as a reporter of 'Kesarī' for a few years early in his life. He actively participated in the movements launched for freedom by Tilak's followers, at Vadodara and Surat. He also sang patriotic kirtans in the villages of Gujarat. But soon he realized that there was a need to introduce physical education in all India's schools to strengthen its youth. He was fortunate to become a disciple of Prof. Manikrao, who took him under his wings and nurtured and developed Jagannath into the future indomitable SK. Manikrao was a dedicated and profound scholar, practitioner and teacher of *Shaastras* and scriptures and weapons.

In 1906, Indian National Congress was held at Kolkata. A variety of activities were held for the conference. An international athletic competition was held for fencing, wrestling and gymnastics. Participants were from several nations – USA, UK, France and Japan. Despite the fierce competition, Manikrao won gold medals in all three disciplines. Such laurels under the colonial regime were highly appreciated. Manikrao, educated to the then sixth standard (currently ninth), was given the title of 'Professor' by Lokmanya Tilak. Later, he introduced physical education into all Vadodara state schools under the guidance of Sayajirao Gaekwad.

At this time, Manikrao took the young SK under his care and development. SK used to suffer from chronic cold, cough and unbearable migraine. Under Manikrao's guidance, SK regularly underwent—Physical exercise and Yoga— and he soon started feeling well. He learnt the traditional aspects of yoga at Manikrao Jummadada Vyayam Mandir. Later for advanced yoga he served an apprenticeship with Sri Madhavadasji.

The latter was also in touch with all the top leaders of India involved in the freedom struggle. Lokmanya sent him as a revolutionary to live incognito with Manikrao. In 1956, SK paid his tribute to Prof. Manikrao, "Personally I revere him, no doubt, for his singular service to physical education: but I do so much more for his saintly virtue, which has gone a long way in making me what I am. Prof. Manikrao laid the foundation for my yogic life." Besides Tilak, Sri Aurobindo had a great influence on SK for his vision of the future of India.

4. Kaivalyadham

In the year 1964, SK established Kaivalyadham at Lonavala. But earlier, at Amalner, his hut with a miniature laboratory was also called Kaivalyadham. SK described multiple aspects of yoga, "The aim of the yogic system is to secure greater longevity with the highest physical efficacy and maximum brain power. It is especially appropriate for women. Yoga, a system of preventive exercise, is simply marvellous as it keeps the whole nervous and endocrine mechanism in the healthiest condition. As a system of therapeutics, yoga stands above all the other types of naturopathy. It is peculiarly capable of curing chronic diseases and mental disorders can best be set right by Yogic Therapeutics." SK described the physical and the mental benefits obtained through yoga as of a lower nature. Whereas, the higher yoga dealt with the highest states of human consciousness, siddhis and self-realization.

But SK was pragmatic enough to start with a focus on the scientific measurements of physical and psychological benefits. The effects of yoga on the cardiovascular and nervous system were the first to be studied at Kaivalyadham. During a visit to the centre, Dr. Vinekar explained the plan of research to Prof. B.K. Anand of the All-India Institute of Medical Sciences (AIIMS), New Delhi. Dr. Anand with his colleagues published the earliest results of yoga effects on Ramanand yogi [4]. But there were several reports in the journal Yoga Mimamsa - the scientific journal of Kaivalyadham. These

volumes of Yoga Mimamsa had a wide impact nationally and internationally.

It is interesting to note that, in 1931, Mr. K.T. Behanan was awarded a Sterling Fellowship from Yale University to conduct a scientific study of yoga in India, under SK, at Kaivalyadham. This research led to Behanan's thesis in Psychology. This dynamic young Keralite was the first to get his professor, the dean and the President of Yale University interested in research on the impact of Yoga on higher mental processes and consciousness. There was a proposal of inviting SK and two of his disciples, trained in advanced yoga, for experimental research in yoga at Yale for a period of four to five years. Unfortunately, this could not materialize due to the aftermath of the great depression in the US. However, it is worthwhile to mention that Behanan wrote a book – "Yoga: A Scientific Evaluation", based in part on his thesis research which remained in print for decades to follow, and was featured favourably in magazines like 'TIME', 'LIFE' and the 'New York Review of Books' [5]. The scientific database on experimental research in yoga would have been very strong had the proposal of SK, guiding research at Yale, materialized. Harvard University also invited SK for research in yoga. Much later, at the UCLA research in Transcendental Meditation was carried out by Keith Wallace for his Ph.D. particularly the effects TM. Subsequently, Benson, at the Harvard, enticed the young Keith Wallace reproduce his results from UCLA. In trying to minimize the Yoga Pratyahara used in TM by Wallace, Benson coined the term "Relaxation Response"—an inadequate imitation of the TM [6]. Wallace had shown that with TM there were changes in oxygen consumption, heart rate and EEG records, suggesting an explanation for the calm and relaxed state of yogis [7].

Kaivalyadham, subsequently, opened several other centres for Yoga practice. Its centre in Mumbai, also had a system of compulsory medical check-up for participants by an attending doctor who specialized in prescribing an individualized plan of yoga. Dr. Shrikrishna presented a paper on the role of Yoga in disease management, based on the study on 4153 case histories at the 1st World Congress on Yoga and Ayurveda held at San Marino, Italy in 1985. This paper was a landmark paper, but it was only the tip of an iceberg as 'more than 100 thousand persons have taken the benefit of training and therapy opportunities offered by the institute, since its inception in 1932.' Recently in an International Webinar on India-specific guidelines for diagnosis and management of Polycystic Ovary Syndrome (PCOS): Perspective of Yoga and Naturopathy, approaches to yoga management in PCOS and evidence of efficacy and safety were presented [8–10].

In 1925, SK wrote, "The East and the West have progressed for centuries along their respective lines ... Kaivalyadham proposes to have ... by starting institutions of higher education in sociology, spiritual and physical culture." He further added a visionary statement, "The world is awaiting the assimilations of the Eastern and the Western cultures and the consequent peace and prosperity to humanity." Kaivalyadham, Lonavala, had some highly qualified scientists and physicians among its faculty, including experts from yoga, biochemistry, pharmacology, psychology and Ayurveda. Setting up the Yogic hospital for clinical research in yoga was an initiative made long before any similar global effort.

The reputation of SK, in yogic therapy, spread far and wide. The first scientific book named yogic therapy was authored by SK. In later editions, Dr. S. Vinekar became a co-author. Dr. Vinekar had attended advanced training in research methodology in Los Angeles, USA. Many political, academic and business leaders knew SK personally and often availed of his therapeutic skills. The names of such eminent persons included Gandhiji, Dr. Rajendra Prasad and many more. Pandit Jawaharlal Nehru visited Kaivalyadham with Indira Gandhi [Fig. 3]. The correspondence between Babu and SK



Fig. 3. The visit of Pandit Nehru and Indira Gandhi to Kaivalyadham.

provides very interesting exchange. SK frankly expressed his views on Bapu's certain pet ideas, not based on evidence.

5. Advances in the science of yoga

Yoga besides giving an assurance for perfect health is also replete with examples of longevity in its steady expert practitioners. In a broadcast on the All-India Radio (1941), SK stated, "Doctor Alexis Carrel's experiments have proved that if excretion and nutrition are taken care of, the health and longevity of living cells can successfully be ensured. Now human body is merely systematized aggregate of living cells vitally cooperate ... yoga exercises and pranayama preserve and promote the health of digestive and excretory systems ... so if the physical and mental core of yogic health culture is followed faithfully, it is unfailingly capable of giving health and longevity." Recent research studies in aging have shown that a balanced hypo-caloric diet can prolong the lifespan in several species [11]. Yogis are known to be spare eaters with a balanced nutritious diet. It has also been shown that one of the major factors of premature aging is the oxidant damage of vital organs caused by free radicals. Meditation and pranayama have been shown to reduce oxidant damage. A reputed yogi – Tapaswiji Maharaj has been reported to have lived for 186 years, by undergoing Kayakalpa, in addition to his yogic practices [12]. Reversal of aging has been scientifically shown in animals.

Recently, rasayanas have shown extension of life span in fruit fly (*Drosophila melanogaster*) by Indian scientists [13]. It is vital to recognize yoga as a part of Ayurveda, particularly for *swasthya vritta*. As early as 1960, the Kerala government made an attempt in this direction, much before the announcement of AYUSH. However, SK had intended that yoga therapy should stand on its own.

6. Higher human consciousness research

One current focus of research in yoga is on its impact on human consciousness and emotional quotient. The Dalai Lama and several neuroscientists have been involved in such investigations conducted on advanced practitioners of yoga and meditation [14]. However, there is still much reluctance in research endeavours to understand the sutras in Patanjali's *Vibhutipad*. There have been scattered attempts to explore extra sensory perception, near death experiences, recall of past lives and unusual powers of mind

reading, clairvoyance etc. in relation to the yogic siddhis mentioned therein [15–18]. Stevenson, a psychiatrist, investigated reincarnation with scientific rigor [17]. There is a general reluctance for funding such research projects. Publications of results of yogic research are often rejected by reputed peer-reviewed scientific journals.

Attempts to understand higher states of consciousness often observed in accomplished yogis, have been made by several yogis, foundations and institutes. The book 'Autobiography of a Yogi', by Paramahansa Yogananda, documented the unique events and yogic powers of Mahavatar Babaji, Lahiri Mahashaya and Yukteshwar. When Gopi Krishna published his experience of Kundalini-awakening, there followed a significant national and international interest and support for research in the neuro-physiological correlates of Kundalini. Dr. Karan Singh, a philosopher, poet, youngest Health Minister, and later a presidential candidate for India, was one of the prime movers of these efforts. Sri Sukhlal Mehta, who knew SK and Dr. Karan Singh well, initiated with Sai Makarand Dave the Chetana Foundation to conduct case studies in higher states of consciousness [19].

At Chetana Foundation, we interviewed several persons who claimed to have Kundalini awakening. It was generally observed that most of these persons were not willing to subject themselves to instrumental monitoring by EEG, ECG, psycho-galvanic resistance and other bio-markers of stress and relaxation responses. However, a remarkable publication by the foundation- 'Antarvedi' (Inner Sacrificial Fire), narrating the methods and outcome of higher yoga was written by Sai Makarand Dave [20]. He wrote, "In order for us to accomplish this (harmonious movement to understand cosmos) we have to do two things together: we have to calibrate our inner laboratories; and, to study words of our Great Masters. One way would be to organise group meetings and invite the persons who have gone through experiments and experiences ... This is an adventure in consciousness ... This is a kind of awakening. Without pure awareness we will be stuck in twilight region. What is called peak experience is always combined with love, compassion, friendliness and goodwill towards all" [20].

It is foreseen that when research in consciousness by the advanced methods of neuroscience are coupled with psychological and social studies, we may get a glimpse of the impact of what SK called higher yoga and the unusual yogic powers, mentioned in the *Vibhutipad* chapter in Patanjali's *Yoga-Sutras*. More fundamental is research on *Sakshi*, the Witness power, described in *Mandukya Upanishad*. *Mandukya Upanishad* Richa 10 alludes to witnessing deep sleep. Several studies on the effects of yoga on cardiovascular, psychiatric and respiratory diseases [21–23].

A recent article 'Yoga Therapy and Polyvagal Theory' has proposed a new model for the convergence of traditional wisdom and contemporary neuroscience for self-regulation and resilience [21]. The authors have made a significant effort to explain the physiology of yoga in terms of the neural platform of the polyvagal theory. Both the ventral and dorsal vagal complexes, their mental and behavioural effects were correlated with the three *gunas-Sattva, Rajas* and *Tamas*, while their balance and harmonious effects shown to be a consequence of yoga practice. They stressed the need for the ethical and spiritual aspects of *Ashtanga Yoga*, *Angas I & II*, the *yama-niyama* [20]. However, the emphasis has been on well-being, eudaimonia, balanced emotions and actions. They addressed allostatic load vis-a-vis stress disorders and yoga as a therapy to reduce stressful effects.

One of the authors of the present article (ADBV), was advised by Sri Kaka Kalelkar, eminent Gandhian, freedom fighter and

educationist, to carry out neuropsychological research on the sutras of Vibhutipad. These sutras describe how *Samyama* (*Dhyana*, *Dharana* and *Samadhi* practised together as one) on a specific object or idea e.g., नाभचिक्रे कायद्यूह ज्ञानम् . *Samyama* on the navel one gains knowledge of the physiology and anatomy of the body – usually stated as ‘bodily system’. Higher yoga often leads to *Siddhis*: unusual powers like reading others minds, clairvoyance, intuition etc. Such phenomena have been recorded globally throughout the ages. However, the current dominant paradigm of mechanistic understanding of consciousness does not permit serious research into such faculties except some studies conducted by serious scientists studying extrasensory perception and reincarnation. There have been also studies on morphic resonance and increase in learning speed across the same species. However, these investigators seem to be unaware of Vibhutipad of Patanjali Yoga-darshan, where-in remarkable *siddhis* have been described as a part of higher consciousness in Yogis.

It is interesting to quote Albert Einstein, “Ideas come from God.” The most challenging field of research in neurosciences is the nature of consciousness. Francis Crick, the Nobel Laureate, for the discovery of DNA structure together with Jim Watson, changed over to research on awareness, primarily for visual pathways. Paradoxically he stated, “There is no scientific study more vital to man than the study of his own brain.” (Emphasis ours).

Yoga is a science and practice of studying one's own mind. Eckhart Tolle said lucidly, “The brain does not create consciousness, but consciousness created the brain, the most complex form on earth, for its expression”. We hope that a yoga-neuroscientist from India, discovers the neuronal correlates of certain psychedelic drugs, like dimethyltryptamine, which induce states of consciousness often experienced and described by *Sidhhayogis* [22,23].

Dr. H.R. Nagendra, Dr R. Nagarathna, and Prof. B N Gangadhar have carried out research in diverse physiological studies and disease. Several of these studies have been a continuity and progression of the dreams of SK [24]. But covering their research would require an entire review in and of itself.

In conclusion, while we celebrate the centenary of the ‘Science of Yoga’, in India, we should not lose the vision of SK, Swamy Vivekananda and Sai Makarand to deeply investigate higher states of consciousness. The current overemphasis on only asanas and pranayama has led to a global revival of yoga but that should not detract us from research in transformative yoga. The renaissance in yoga can have a profound and positive influence in our post-Covid 19 world for nutritional equity, human harmony and peace, as a consequence of transformation of the human personality.

Declaration of competing interest

Nil.

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