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## Recent Development in Yoga: A Scientific Perspective

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### Abstract

*In ancient Indian medicinal system, yoga practice is described as the link between the individual and the universe. Yoga and meditation can play an important role in our life because these help in controlling the function of our mind i.e. ego, desire and intellect. Yoga is a well-known physical, mental and spiritual practice since the ancient time and still benefitting people globally. It helps in the expansion from narrow egoistic personality to the all-pervasive, endless and delightful state of reality. The practice includes physical postures, regulated breathing, meditation and relaxation, which is helpful in improving life-style and also in bringing down the prevalence of medical emergencies like psychological, neurological and metabolic disorders. Moreover, it helps people to remain happy and healthy even with many life stresses. The present review focuses on the current status of yoga and meditation in India and overseas in terms of research and development.*

**Keywords:** Complimentary medicine, immune function, international yoga day, mental stress, yoga practice

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### INTRODUCTION

Yoga is a form of relaxation and exercise that incorporates stretching, meditation and the knowledge of the body's full potential. It helps in relieving tension and stress, and helps to increase the strength and vitality. In ancient Indian medicinal system, yoga is described as the link between the individual and the universe (Parmatma). It can play an important role in our life by controlling the function of our mind i.e. ego, desire and intellect. Yoga is a well-known physical, mental and spiritual practice since the ancient time and still benefitting people globally [1]. The growing popularity of yoga and its increasing socialization attracted many workers for scientific enquiry in the science of yoga. It is interesting to know that in the past few decades, the interest of yoga has increased tremendously, particularly in western countries. In USA, yoga is gaining popularity and has now become a multi-billion dollar business. This acceptance of yoga science is mainly due to growing urbanization and

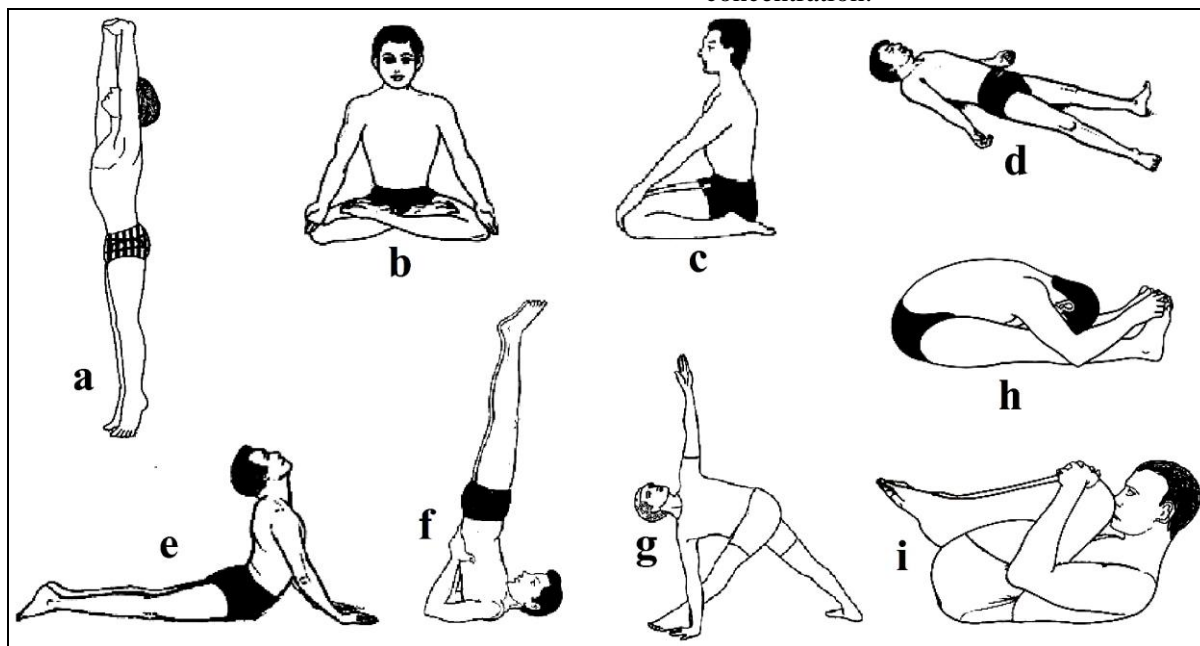
industrial development in western countries which caused varying degree of social conflicts, mental tension and stressful situations. As a result, increase in the incidence of psychosomatic diseases like hypertension, ischemic heart disease, bronchial asthma, diabetes, peptic ulcer and ulcerative colitis [2]. Although, modern science has failed to prevent such kind of ailments but yoga practice has potential to provide relief from anxiety and tension.

Yoga as a way of life is more true to its ancient tenets. It constitutes asanas, regulated breathing (pranayama), and awareness of yoga sutras (principles) that govern the mind. Regular practice of yoga enhances awareness of mind and body, which is needed in the self-management of diet and exercise plan in diabetes. According to Patanjali, yoga consists of eight steps or limbs, which are all equally important and are related as parts of a whole. The purpose of these eight limbs is discriminative enlightenment or self-

realization. But here the emphasis will be on health benefits. The eight steps or limbs of yoga are as follows:

1. Yama: Codes of restraint, abstinences, self-regulations;
2. Niyama: Observances, practices, self-training;
3. Asana: Meditation posture (Figure 1);

4. Pranayama: Expansion of breath and prana, regulation, control;
5. Pratyahara: Withdrawal of the senses, bringing inward;
6. Dharana: Concentration;
7. Dhyana: Meditation and
8. Samadhi: Deep absorption, meditation in its higher state, the state of perfected concentration.



**Fig. 1:** Various Popular Asanas (Postures) Useful for Physical and Mental Health. (a) Tadasana; (b) Padmasana; (c) Vajrasana; (d) Shavasana; (e) Bhujangasana; (f) Sarvangasana; (g) Trikonasana; (h) Paschimottasana; (i) Pawanmuktasana.

## MATERIAL AND METHOD

Most recent literature based on the effect of yoga and meditation on human health, particularly on psychological disorders (e.g., mental stress, anxiety, etc.), endocrine disorders (e.g., thyroidism, gigantism, etc.), metabolic disorders (e.g., diabetes, hyperlipidemia, cancers, etc.) and neurological disorders (e.g., Alzheimer's disease, etc.) was thoroughly reviewed. All the literature was accessed from four most popular search engines i.e. PubMed, Scopus, Web of Science and Google Scholar. The papers from the standard scientific journals were only included, in which the researches on clinical trials were mainly focused in the present review.

## RESULTS

Literature revealed that yoga is not only effective in improving life-style but effective in many health and mental disorders. Its effect against diabetes, hyperthyroidism, obesity,

respiratory problems, mental stress, oxidative stress is well studied in the past few years. In addition, certain breathing exercises like anuloma viloma, kapalbhati and bhrumari of pranayama, the main components of yoga were found to be the best remedies to tackle respiratory illness caused by air pollution and other naturally occurring respiratory diseases [3]. In addition to the role of yoga in reducing levels of oxidative stress and cellular aging in obese men, it causes reversal of markers of aging, mainly oxidative stress, telomerase activity, and oxidative DNA damage. It does not only delay aging and prolong a youthful healthy life but also prevents onset of many lifestyle-based disorders [4]. Various clinical trials support the significant role of yoga and meditation in reducing anxiety and improving mood of HIV-patients [5], chronically ill-patients [6], pregnant woman [7] and children living in orphanages [8]. Yoga practice is also called to be a complimentary medicine for

most of the serious ailments and various studies, conducted worldwide support its efficacy against various disorders.

### **Yoga as a Complimentary Medicine**

Complementary medicine is a diverse set of treatments that has significantly increased among people over the past few decades. The approach of complementary medicine has been applied to a variety of physical and mental disorders including post-traumatic stress and other trauma-related disorders with varying levels of efficacy [9]. Such approaches are highly effective in reducing mindfulness-based stress in cancer-related fatigue and related symptoms [10]. Yoga is actually a behavioral practice to improve health which includes physical movement, breathing and meditation. It also promotes hematological and biochemical alterations in human [11]. Yoga has been the subject of research in the past few decades for therapeutic purposes for modern epidemic diseases like mental stress, obesity, diabetes, hypertension, coronary heart disease, and chronic obstructive pulmonary disease. Individual studies report beneficial effect of yoga in these conditions, indicating that it can be used as nonpharmaceutical measure or complement to drug therapy for treatment of these conditions. Various clinical trials indicate that yoga is a safe and effective intervention for managing hypertension that is not associated with more adverse effects than other forms of physical activity. Moreover, yoga practice can increase parasympathetic activity and decrease sympathetic activity, perhaps by increasing GABA activity [12]. Many reports revealed that yoga has ability to rejuvenate the main glands involved with diabetes, i.e. the pancreas that is involved with insulin release. Moreover, the stress glands are believed to be involved where a high stress level can overload the blood with high sugar as a response to stress [13]. Although, there is no scientific evidence yet available to prove curative role of yoga in the cancer. However, few studies revealed that yoga could be helpful in sleep disturbance and anxiety in cancer patients. Smith and Pukall reported that yoga can reduce anxiety, depression, fatigue and stress together with improvement in the quality of sleep, mood and spiritual wellbeing in some cancer patients [14, 15]. It is

associated with some positive effects on psychological wellbeing for people with cancer. Apart from above cases including psychic disorders, the yoga is also helpful in piles, obesity, joint pain and arthritis. Peppone *et al.* found that yoga reduces in musculoskeletal symptoms such as general pain, muscle aches and total physical discomfort from pre- to post-intervention in breast cancer survivors on hormonal therapy [16]. Moreover, yoga and meditation at least for 12 weeks can be considered a safe and effective complementary intervention for menopausal symptoms in breast cancer survivors [17].

Yoga also improves health status, physical functioning, role functioning, emotional functioning, cognitive functioning and social functioning in cancer survivors by improving cancer-related symptoms, including fatigue, pain, insomnia, constipation, anxiety, and depression [18, 19]. A 2 months study by Chu *et al.* revealed that yoga practice for a short period of time is although not very much effective in improving heart rate variability but significantly effective in reducing anxiety [20]. Furthermore, short-term yoga therapy leads to a remarkable improvement in the quality of life of the subjects and can contribute favorably in the management of psychosomatic disorders [21].

The researchers from world over confirmed the neuroprotective effects of yoga practices. Yoga contributes to protect the brain against age-related decline and also tunes the brain toward a parasympathetically driven mode and positive states [22]. Few researches also suggested that breathing, meditation and posture-based yoga increased overall brain wave activity including gray matter, amygdala and frontal cortex activation [23]. Studies also support that yoga and meditation practitioners have stronger functional connectivity within basal ganglia cortico-thalamic feedback loops than non-practitioners [24]. Such practices are also safe and effective for the management of symptoms of multiple sclerosis e.g., fatigue, imbalance, cognitive impairment, bladder and bowel dysfunction, visual and speech impairments, depression, sensory disturbance, and mobility impairment [25].

### Current Status of Yoga Practice and Research

In view of role of yoga in wellness of human, the UN general assembly on 11 December 2014 declared 21 June as the International yoga day which was first celebrated in the year 2015 by 192 countries, the biggest ever event. Usually, yoga is used in the form of asana, pranayama or short periods of meditation for therapeutic purposes. Moreover, general perception about yoga is also the same, which is not correct. Yoga in fact means union of individual consciousness with the supreme consciousness. It involves eight rungs or limbs of yoga, which include yama, niyama, asana, pranayama, pratyahara, dharana, dhyana, and samadhi. Intense practice of these leads to self-realization, which is the primary goal of yoga. An analytical look at the rungs and the goal of yoga shows that it is a holistic way of life leading to a state of complete physical, social, mental, and spiritual well-being and harmony with nature. A recent report based on the effects of mindfulness meditation on stress and anxiety in the college students revealed that it effectively decreases anxiety and stress, and increases mindfulness whereas its effect on physiological stress was found inconsistent [26]. This is in contrast to purely economic and material developmental goal of modern civilization, which has brought social unrest and ecological devastation [27].

Yoga is being tried for its benefit not only in India where it is traditionally familiar but in US, UK and Australia as well. In view of the benefits it has shown in short-term studies, long-term studies with support for yoga practice and follow-up are required and this requires a collective effort on the part of the researcher, government, society, and the funding agency [28].

### National Status

A number of research practices are under progress in India to discover the role of yoga in physical and mental health. Ministry of Ayush, Government of India is supporting research on various fields of yoga science. Recently, department of science and technology (DST) also launched a scheme called science and technology of yoga and meditation (SATYAM) to promote the yoga research.

Indian Prime Minister Narendra Modi stated in his speech during UN general assembly that yoga is not just about fitness or exercise, it is about changing one's lifestyle, and emphasized to plugging for ancient practice that was introduced to the west by Swami Vivekananda. Recently, he insisted that yoga is our ancient medical therapy and it should be mandatory in the syllabus of all schools/colleges. In this connection, the University Grants Commission (UGC) has planned to induct yoga into the curriculum of public-funded universities, hoping to cash in on Prime Minister's push for the ancient discipline and its growing popularity across the world. As per Brajesh Kumar's report [29], the apex regulatory body for higher education has prepared a proposal to introduce BSc and MSc in Yoga in all 40 central universities from the 2016–17 academic session and, later, in state and deemed universities. It is imperative that Indian universities engage themselves in strengthening scientific evidence of the positive effects of yoga and meditation on human health. In order to pursue education and practice in yoga, it is proposed to establish centers and departments of yoga in the public-funded universities.

### International Status

Not only in India but scientists from world over getting close to proving what yogis have held to be true for centuries and how yoga and meditation can ward off stress and disease? Disease prevention and back pain relief are the most important health reasons for yoga practice in America [30]. Dr. Denninger, a psychiatrist at Harvard Medical School, studied the role of yoga and meditation on genes and brain activity in the chronically stressed [31]. This study found that yoga practice (mind-body techniques) can switch on and off some genes linked to stress and immune function. Earlier studies based on the mental health benefits of yoga and meditation have tended to rely on blunt tools mainly participant questionnaires, heart rate and blood pressure monitoring. However, the use of advanced neuro-imaging and genomics technology by Denninger *et al.* allowed scientists to measure physiological changes in greater detail. The study further revealed that yoga has true biological effects, not just in the brain but throughout the body. The



pharmaceutical medicines are still essential to prevent the onset of depression through stress reduction. However, the yoga and meditation are useful additions and act as a complimentary medicine in psychiatric conditions. It has been found that Kundalini, a form of yoga, incorporates meditation, breathing exercises and the singing of mantras in addition to postures. Due to strong meditation component, kundalini yoga practice can enhance the expression of genes involved in energy metabolism and insulin secretion and reduce expression of genes link to inflammatory response and stress. Yoga and meditation were also found to enhance mindfulness and mystical experiences together with kundalini effects [32]. Kundalini yoga was found to be complimentary for cognitive behavioural therapy which significantly improved the state and trait anxiety, depression, panic, sleep and quality of life [33].

In addition to Harvard, the scientists from the University of California at Los Angeles also started examining the biology behind yoga. Nobel Prize winner Elizabeth Blackburn found that yoga and meditation at least for 12 min per day for eight weeks can improve stress-induced aging by increasing telomerase activity up to 43%. Moreover, scientists from Boston University School of Medicine reported that yoga works by regulating the nervous system and increasing vagal tone, the body's ability to successfully respond to stress. Bilderbeck *et al.* found that yoga and meditation practices were helpful in decreasing perceived stress and improving mood in prison populations in UK [34]. However, Hernández *et al.* found that a group of meditators experienced relatively reduced brain activation concomitant with the deepening of the state of mental silence over right inferior frontal cortex, probably reflecting an effortless process of attentional contemplation associated with this state [35].

## CONCLUSIONS

The public interest towards yoga and meditation is increasing day by day due to their beneficial effects in mental and physical health. Since the ancient time, yoga has been used as a holistic relaxation practice which is

effective against hypertension, obesity, anxiety, insomnia and aging [36]. Although various researches confirmed a complimentary role of yoga in many life threatening diseases including diabetes and cancer, but its efficacy as an adjunct to routine treatment is still a great challenge due to lack of the underlying molecular mechanisms. Hence, the evidence-based researches are warranted to evaluate the physiological, biochemical and hematological effects of various yogic practices to establish its scientific basis so that such practices may be applied to tackle certain problems on mental and physical health.

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